From Knowledge to Action: Shaping the Future of Curriculum Development in Alberta

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Alberta Government

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This report provides information to shape the development of future curriculum at provincial and classroom levels. Although direction and parameters were provided to the researchers, the content reflects the authors' perspectives and does not necessarily reflect the position of Alberta Education.

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FOREWORD

The purpose of this report is to present the research findings (the theory, quantitative and qualitative studies, and promising and innovative practices) from Alberta, Canada and around the world related to curriculum and its development.

The objective of the research, including literature reviews and environmental scans, was to collect, collate and analyze relevant information and, where possible, consider the knowledge to improve understanding of curriculum and instructional processes and, specifically, to consider this research for curriculum development.

Three research roundtables were held in the spring of 2011. The roundtables brought together educational partners and stakeholders to share, review and discuss research, literature reviews of both quantitative and qualitative studies and article summaries, and to share practical experiences and applications. These research roundtables, other discussions with stakeholders, and a variety of reports and initiatives, such as Inspiring Education, provided the basis for the direction of this report and the concepts researched.

This report provides a comprehensive analysis of curriculum research up to February 2012. Research directions and parameters were provided to the researchers and reflect the approaches and perspectives adopted by the authors. The content of this report does not necessarily reflect the position of Alberta Education nor any future directions that may be taken by the ministry. It is hoped, however, that the research report will be of interest and benefit to many parties.

Alberta Education is pleased to acknowledge **Dr. Jim Parsons** (Professor, Faculty of Education, University of Alberta) and **Dr. Larry Beauchamp** (former Dean, Faculty of Education, University of Alberta) for their research and writing of the report.

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EXECUTIVE SUMMARY

BACKGROUND

In 2008, the Government of Alberta was tasked with creating a long-term vision for education in Alberta. In 2010, a variety of engagement processes, involving thousands of Albertans, were used to create a transformational vision for Kindergarten to Grade 12 education: *All students are inspired to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit*. During the Inspiring Education engagements, Albertans expressed pride in the education system, but in looking ahead, called for a transformation of the education system to help students engage actively in a global, knowledge-based society so as to better prepare them for the rapid changes occurring at the local, national and international levels.

Through these engagements, Albertans indicated that they value education's vital role in the formation of families, communities and the province, and recognize the impact Kindergarten to Grade 12 has on one's quality of life. However, it is also clear that as Alberta experiences changes in demography and confronts increasing global competitiveness, education needs to evoke change as well. This has led to the raising of questions related to Alberta's education system.

Is the current Alberta curriculum relevant to students? How can it be more student-centred? Is it responsive to their needs? Will it meet the needs of students when they transition to the world of work or higher education? How are other jurisdictions transforming their curriculum so students receive the education they will need? What is working well and where are the areas in need of improvement?

These are some of the questions that have been the impetus for Alberta Education's *Curriculum Redesign*. Work has been underway since the spring of 2011, with the aim of ensuring that Alberta's curriculum (programs of study, assessment, and learning and teaching resources) remains responsive and relevant for students.

The goals of the *Curriculum Redesign* are:

Goal 1 – to develop revised standards and guidelines for future curriculum (programs of study, assessment, and learning and teaching resources)

Goal 2 – to develop a cohesive and collaborative process for curriculum development that will ensure that curriculum is responsive to students in a rapidly changing world.

Curriculum Redesign must be anchored in research[1] (theory, quantitative and qualitative studies, and promising and innovative practices) that exists within Alberta, Canada and around the world. The

[1] *Research* is defined, for the purpose of the *Curriculum Redesign*, as the gathering of data, information and facts in order to discover (new) information to reach a new understanding of a concept. This definition was derived from Cambridge Dictionaries Online (http://dictionary.cambridge.org/dictionary/british/research_1) and Experiment-Resources.com (http://www.experiment-resources.com/definition-of-research.html#ixzz1VPMinEpI).

objective of the research, including literature reviews and environmental scans, was to collect, collate and analyze the information obtained and, where possible, to consider the knowledge gained to inform the development of revised standards and guidelines for future curriculum and curriculum development processes.

PURPOSE OF THE REPORT

The purpose of this report is to present the research findings that will support curriculum development. The research, to date, considers the issues, opportunities and the two goals of the project, as noted above, and was conducted within a set of concepts to be investigated through various research approaches.

This report provides descriptions of the available research on specific concepts that were chosen for examination and represents the research efforts up to the end of February 2012. It incorporates data derived from various sources, including literature reviews of professional journals, international and national government reports, websites of education departments of other countries, environmental scans at provincial, national and international levels, and a review of Alberta Initiative for School Improvement research and publications, related to the following:

- educational concepts that have more than one definition or understanding, such as competencies, interdisciplinary curriculum or assessment
- nine guiding topics/questions, as described in the report, that inform directions for *Curriculum Redesign*:
    1. **Curriculum Development Processes** – Consideration of roles and responsibilities and processes in updating, developing or revising curriculum.
    2. **Competencies** – What all students will need to be able to know and do in order to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit.
    3. **Ways of Knowing** – Understanding the different ways by which students come to know.
    4. **Breadth and Depth** – Broad exploration and deep understanding of knowledge acquisition and skill development.
    5. **Interdisciplinary Learning and Interdisciplinary Curriculum** – The development of skills and knowledge across subject/disciplines areas.
    6. **Flexible Timing and Pacing in a Variety of Learning Environments** – Access to curriculum at anytime, any pace, and any place to meet students' learning needs.
    7. **Responsive Curriculum for a Digital Age** – Curriculum that evolves in response to emerging student and societal needs.
    8. **Student-centred/Personalized Learning** – Curriculum that promotes student choice and engagement.
    9. **Assessment** – The evidence *for*, *as* and *of* learning in relation to student learning and achievement.

The report also includes considerations for curriculum development as it relates to each concept.

METHODOLOGY

Four sources of information to develop the research plan for Alberta Education's *Curriculum Redesign* (see Appendix A for the guiding research questions) were used and culminated in the efforts in this report. These included:

- documents generated within Alberta Education, such as *Inspiring Education: A Dialogue with Albertans* and *Setting the Direction*, and stakeholder documents, such as *The Courage to Change*
- comments made by students on the current curriculum in venues such as Speak Out
- opportunities identified by Alberta Education
- information gleaned from discussions department staff had with educators in preparation for the three research roundtables held in April and May 2011.

From all of the above sources, a list of topics/concepts was compiled. In addition to these sources of information, the question, "What might we want to do differently?" was used to guide and direct the research literature review and e-scanning work. This approach yielded a number of concepts which related to the two goals of *Curriculum Redesign*.

To guide the development of the research and the writing of the report, three principal questions were used, so that decisions about both product and process could be evidence-driven. These questions were:

1. Has research been done on this concept?
2. Have any jurisdictions implemented this concept in practice?
3. Has this concept/practice been assessed and/or evaluated?

A review of the relevant literature was conducted and environmental scans of other provincial/ territorial and international education jurisdictions were undertaken. In addition, as part of the planning and execution of research, roundtable working groups were established, including internal staff and external stakeholders, and these members also contributed a significant amount of literature from their own collections related to the topics being discussed at their specific roundtable.

RESEARCH FINDINGS

Educators must consider a wide range of important research and concepts when making policy decisions. The idea of *evidence-based decision making* aids educational professionals at many levels. For example, research concepts and evidence can enhance teaching and learning at the classroom level, can improve learning at the school level by using data on how a school day is organized, and can formulate policy to guide strategies for desired changes in education at the provincial level. Underlying the concept of evidence-based practice is a belief in the validity and reliability of research, as a way to help educators make more effective choices about their practice and to build educational policy that can attend to the complexity and difficulty of such decisions.

Within the learning system, Alberta's educators must continue to make use of research (e.g., theoretical foundations, qualitative and quantitative studies and what is occurring in practice) to improve their understanding of curriculum and instructional processes and, specifically, to consider the research for curriculum development. In this report, both theoretical constructs and quantitative and qualitative research findings were investigated, in addition to practical applications, where possible.

Theoretical foundations for each concept provide a review of the foundational literature and set the stage for qualitative and quantitative research and practices. Quantitative research helps answer questions related to the effectiveness of specific curriculum decisions and instructional approaches. Qualitative research methodologies help generate questions and raise awareness of factors that might influence the effectiveness of curriculum decisions and instruction. Together, both research approaches are essential in developing a complete understanding of how curriculum and instruction function in particular educational and cultural contexts.

Educators concede that combining quantitative and qualitative research with what is learned from practice (e.g., Alberta Initiative for School Improvement projects) provides powerful information about curriculum change and renewal. Every attempt was made in this process to utilize educational theory and research as a productive way to bring a rich variety of data that, together, might better illuminate educational decisions and provide insight into considerations for curriculum. The convergence of evidence from the research, included in this report, ultimately represents the best sense of the decisions to be made for curriculum development in Alberta with the view of improving education for Alberta students.

The following are highlights of key research findings for each concept, as described in the chapters.

1. **Curriculum Development Processes** – Consideration of roles and responsibilities and processes in updating, developing or revising curriculum.

   From a theoretical point of view, there are four general models for curriculum design and development: instrumental, communicative, artistic and pragmatic. Each of these models serves a particular purpose. For example, a communicative design model offers consensus building as one of its tenets. On the other hand, if the development of content-specific curriculum is the desired product, then the artistic or pragmatic model may be the preferred option. Having different models, with varying elements, provides options to choose from in development and design processes and for defining roles and responsibilities of the different stakeholders involved in curriculum development.

   In practice, governments around the world are responsible for setting the goals and aims of curriculum. Jurisdictions, however, do vary in the degree of control they directly exercise on curriculum design and development. Governments are generally responsible for the development of programs of study and assessments, but are less involved in the direct production of learning and teaching resources.

Typically, in Western Europe, Australia and New Zealand, for example, governments do not develop learning and teaching resources because of the independent role of the publishing industry in these jurisdictions. Other jurisdictions develop curriculum through government funded, but arms-length non-government agencies, with well-defined governance in place. There is also evidence that many jurisdictions are moving toward a balance between a hierarchical "top-down" approach (full governmental control) and a more democratic "consensus-based" approach (co-creation with stakeholders) in curriculum development.

There is, however, limited documentation on the actual processes used by various jurisdictions, although there is some degree of understanding regarding the development of content for programs of study. Evidence regarding curriculum, as both a product and a process is less obvious. In general, the processes for developing or revising curriculum are initiated by the identification of a rationale for change (triggers), followed by design, development and implementation phases. Each phase is usually evaluated before proceeding to the next phase.

Only in the last few years, since 2009, does there appear to be an emerging consensus that curriculum is comprised of components (programs of study [learning content], assessment, and learning and teaching resources), with each component having a defined purpose in developing student learning and assessing student achievement. This consensus brings forth the need to define new processes that will ensure coherence, consistency and efficiency in how these components are designed, developed and ultimately implemented.

2. **Competencies** – What all students will need to be able to know and do in order to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit.

   It has been argued that the 20th century witnessed the closing of the Contents Era—an era where the educational emphasis was placed on acquiring content. In the 21st century, the emphasis in education is expanding to competence beyond subject/discipline content. Today, many countries throughout the world (e.g., New Zealand, Australia, Germany, Finland, Singapore) have moved to make competencies central to their educational reform efforts, as a way to help their citizens engage actively in today's global, knowledge-based society and to better prepare them for the rapid changes that are occurring at local, national and international levels.

   Although there are many definitions around the words "competency" and "competency-based," there is consensus that competencies are capabilities people need to have in order to live, learn and contribute as active members of their communities. It is also acknowledged that competencies cannot be learned in isolation; rather, competencies need to be demonstrated in the performance of tasks and are most effectively developed in contexts with embedded meaning and purpose. Competencies exist on a continuum; e.g., from novice to expert and from micro to macro. Competencies are developed throughout life, and increased proficiency comes from the ability to combine and use key competencies appropriately in increasingly complex situations.

3. **Ways of Knowing** – Understanding the different ways by which students come to know.

   Ways of knowing is a concept that has recently received increased attention in the academic literature as students of all cultures, but especially First Nations, Métis and Inuit, demonstrate learning that is occurring in sometimes difficult and challenging situations. Within the current predominantly Eurocentric-based conventional schooling system, the ways in which they come to know are not officially recognized in schooling as being valid.

   Epistemology and ontology are inherent in the understanding of ways of knowing. Epistemology relates to what is knowledge and what is believed to be true about a given body of knowledge, while ontology is the classification system used to categorize the concepts that form that body of knowledge. Both are used to describe thought processes on an individual basis, and cultural beliefs and practices on a larger scale.

   While literature on this concept primarily examines Aboriginal or Indigenous *ways of knowing*, it should be noted that there is research that looks at other *ways of knowing*; e.g., gender-related, subject/discipline, embodied and intuitive.

   The research emanating from this review shows that *ways of knowing* have an impact on the manner in which students learn and how they see themselves as learners within learning contexts that may be different from their own culture and cultural beliefs, as is evidenced specifically with Canada's First Nations, Métis and Inuit peoples. Studies in science with First Nations, Métis and Inuit students, for example, is showing that when their ways of knowing and knowledge are recognized and are part of the program, both Indigenous and non-Indigenous students showed higher levels of achievement and engagement in learning. A similar experience is noted by research in embodied learning and intuition as *ways of knowing*.

4. **Breadth and Depth** – Broad exploration and deep understanding of knowledge acquisition and skill development.

   Many feel that an educated person must experience curricula displaying both a breadth and depth of knowledge and skills. Although current graduates have a certain breadth of knowledge, there is a question as to how many students actually graduate with a depth of knowledge, as teachers and students struggle to meet the many learner outcomes of current curricula.

   Breadth and depth can best be defined through deep and surface learning. In deep learning, learners routinely make use of higher-order cognitive skills, such as the ability to analyze, synthesize, problem solve and think metacognitively, in an effort to construct long-term understanding. Unfamiliar ideas are analyzed critically in an effort to link them to known concepts and principles in order that new understandings can be generated and used to problem solve in unfamiliar contexts. Deep learners reflect on the personal significance of their learning, which in turn, promotes understanding and application for life. Surface learning is the tacit acceptance of information as isolated and unlinked facts, often leading to superficial retention of material. It does not promote understanding or long-term retention of information or knowledge.

It has been demonstrated through qualitative studies that students who engage in deeper learning show higher achievement levels than those who only acquire surface learning. Students also express greater satisfaction in their learning and better retention of what they have acquired when engaged in activities that require deeper learning. Project-based learning is one model that is used in schools to deepen students' knowledge and skills. However, it is acknowledged that breadth of learning is still the entry point to deep learning and one cannot exist without the other. The challenge becomes finding the balance.

5. **Interdisciplinary Learning and Interdisciplinary Curriculum** – The development of skills and knowledge across subject/disciplines areas.

   As school learning has been combined with the history and philosophy of industrialization, one comes to think of "schooling" in the same way as manufacturing. For example, today's schools are generally specialized in content and delivery, and as specialization breaks a "total world" into efficient delivery for students, pieces of the broken world become subject area content suitable for easy sharing with students. The result is that North American students currently go to schools where days are broken into pieces (periods) and content is delivered in separate chunks (school subjects) by content experts (e.g., English, science and mathematics teachers).

   Interdisciplinary learning provides opportunities for students to integrate what they have learned in a progressive manner, encourages real-world learning and promotes student-centredness. Interdisciplinary curriculum is an alternative to the delivery of knowledge and skills in isolated content areas. Interdisciplinary learning provides patterns and connections for more complex reasoning and enhanced learning by meshing knowledge, skills and information from different disciplines. Content standards and assessment are essential components in developing interdisciplinary learning experiences. Interdisciplinary learning requires schools to move away from traditional methods of content delivery.

6. **Flexible Timing and Pacing in a Variety of Learning Environments** – Access to curriculum at anytime, any pace, and any place to meet students' learning needs.

   Educational reform has existed since the inception of formal education. It has been argued that many have merely tinkered with existing practices. Proof can be found in the fact that the overwhelming majority of schools run on the same length of school year, the same daily schedule, the same student groupings, the same staff organization, and, fundamentally, in the same type of buildings as in the late 1890s. Even though technology has transformed the way in which people live, work, play and learn, the education system remains generally the same as 100 years ago. For the most part, students sit in desks in brick and mortar schools accessing content through textbooks that may be outdated.

   Today, learning is less constrained by time, space and the organizational requirements of schooling. Now, more than at any time in history, people continue to take more control over their own learning, especially with the growing access to learning through available technologies. Flexible timing suggests that learning is scheduled at times to suit students' needs and not constrained by what is available in traditional settings. Flexible timing puts learning in

the students' control. Flexible pacing allows all students to gain a deeper understanding of content or an opportunity to move ahead in a given curriculum, as they master content and skills at a pace that provides a steady challenge without unreasonable pressure. Different jurisdictions are entertaining options, such as providing flexibility in adjusting instructional hours to meet individual student needs or providing flexible entry and exit points to programming to meet students' needs and passions. Flexible timing and pacing allow students to take control, responsibility and ownership for their learning.

A variety of learning environments permit flexible timing and pacing, as learning spaces can go beyond the traditional school walls and into the community, including the students' home. Design considerations for the use of space, within the school and community, can include allowing for flexibility within a learning setting regarding space allocation, with multiple usage in mind; providing students and teachers with more control of how space is used; and providing students with the ability to take ownership of their learning environment through access and use. Different uses of space can also facilitate interdisciplinary learning.

7. **Responsive Curriculum for a Digital Age** – Curriculum that evolves in response to emerging student and societal needs.

   The rapidly changing "digital" society continues to become more complex, unpredictable and interwoven. Opportunities for learning are more numerous and openly available because digital technologies are more widespread in formal educational settings. Non-educational organizations are also becoming aware of the power and potential of technology for training. At the same time, practical and social knowledge is being shared, continuously, via the social web, adding another level to the way in which people learn.

   The ability to critically evaluate information is especially important today, because there are so many widely available information sources. Critical media literacy is important for students, because it teaches them to engage media representations and discourses critically, and because it stresses learning to use media technologies as modes of self-expression and social activism when appropriate.

   A responsive curriculum goes beyond the ever-changing influences of technology and responds to changes in society and students' learning needs. This means considering notions, such as allowing more "white space" in the curriculum (as Singapore has done) to permit deeper learning or using technology to make learning more accessible through various e-learning models.

8. **Student-centred/Personalized Learning** – Curriculum that promotes student choice and engagement.

   In the latter part of the 18th century as the Industrial Revolution came to rule society's economic life, large numbers of workers were needed to produce goods in large quantities. Workers required at least some education and skills, and the industrial activities of the day seemed to transfer easily into the educational milieu. It became common to teach groups of students academic skills at the same time in the same classroom, instead of teaching

individually. This was the beginning of "mass education." Generations have experienced this mass education and the system has worked to become more standardized, more efficient and more practical. Asking teachers to teach everyone in similar ways seemed democratic, and the method of mass education reduced costs, time and energy, which are all important values in an era of industry.

Prior to mass education, students mostly received individual instruction—usually a single teacher worked with a single student or small numbers of students. Today, there is again a move toward a more student-centred learning, often referred to as the personalization of learning. Personalized learning requires that content (sometimes including instructional technology) and the pace of learning are based upon the abilities and interests of each individual learner; personalization starts and ends with the student in mind, and considers voice and choice in how students like to learn and how they wish to demonstrate what they have learned. When these factors are considered there is a demonstrated increase in student engagement and success in learning.

9. **Assessment** – The evidence *for*, *as* and *of* learning in relation to student learning and achievement.

   Assessment is at the centre of education policy debates. The goal of schooling is to maximize student learning by using assessment to provide a picture of what students know and can do. The purpose of assessment is to inform parents and students about student progress and to certify whether students have met standards to advance to the next grade or to graduate from school. There is concern, however, that some prominent assessments currently being used, are inadequate and may have a significant, if not, negative impact on student learning. Because tests measure a limited range of knowledge and skills, they often can provide inaccurate and incomplete pictures of what students know and are able to do.

   Since learning is extremely complex, using a single measure to assess what has been learned is less than insightful. Rather, a well-rounded (balanced) assessment system is important to determine whether a student benefits from instruction and what changes might be needed to enhance that student's learning. Specifically, a well-rounded assessment system needs to provide the best evidence that learning has occurred and indicate what has been acquired.

   It has been suggested that a comprehensive system of cohesive assessments needs to be aligned to standards. To be truly effective, assessments must be transformed from isolated instances to ongoing events. To achieve coherency in assessment, there needs to be horizontal, vertical and developmental alignment of the assessments being used at the school level, regional level and provincial level.

   For assessment to be meaningful to students, it needs to provide information that moves learning forward. Competency-based approaches help educators understand what students know and what their level of knowledge and skills is. Competency-based approaches also permit for assessments to be more authentic and purposeful.

CONCLUSIONS

The following considerations, derived from research presented in each chapter, have been viewed as important in informing future curriculum development.

Curriculum Development Processes

Research has shown that there is generally a similar pattern used for curriculum design and development (i.e., for most jurisdictions, this means programs of study). To meet the needs of all students, what needs to be considered in the Alberta context, as a mainstay, is a simultaneous development and implementation process, in both French and English, that considers continual enhancements to curriculum (programs of study, assessment, and learning and teaching resources). As a result, new development processes that involve constant monitoring and evaluation of success will also require new management skills and long-term collaborative and interdependent approaches that can support innovation through capacity building, greater experimenting (e.g., prototyping) and customizing, new collaboration models (e.g., co-creation) and learning from experience.

Competencies

Because society is changing at a rapid pace, the future of today's learners cannot be predicted with certainty. Alberta students need to learn in ways that develop their capacities to discern and react to novel and complex situations. Dealing with an unpredictable future necessitates an approach that must move away from "prescriptiveness" and embrace the principle of diversity and variation, while providing students with the attitudes, values, skills and knowledge they need in order to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit.

From a curriculum perspective, competencies serve to develop learning programs that can better meet the needs of diversity in learning, as students gain competency in attitudes, values, skills and knowledge, at their own pace and in their own unique ways.

Ways of Knowing

Educators are often not self-critical about Western biases within curriculum and pedagogy. It is important that educators recognize their biases and are willing to see the connections of these biases to curriculum development. In the future, when opportunities arise for curriculum change, it will be critical for curriculum developers and teachers to consider that students come to the education system and to learning with a set of beliefs, values and different *ways of knowing* (e.g., Indigenous, gender-related, subject/discipline, embodied, intuitive) that need to be recognized, acknowledged, valued and nurtured within curriculum and, ultimately, learning.

Breadth and Depth

Curriculum has generally been developed to introduce students to a broad range of topics. Traditionally, schooling ensures that students will at least have some acquaintance with most areas of human knowledge by the time they graduate; yet, such broad knowledge cannot help but be somewhat superficial, and omit a crucial aspect of true education—deep learning. Curriculum developers and designers will need to be cognizant that it is not an "either or" situation; rather, there will always need to be a balance between when breadth is needed and when depth can happen, bearing in mind that without breadth of knowledge and skills, deep learning is less likely to occur.

Interdisciplinary Learning and Interdisciplinary Curriculum

Interdisciplinary experiences enhance student engagement and student learning, and serve to bridge knowledge and meaning making with 21st century skills and attitudes. A 21st century education depends on integrative curriculum that unites core academic subjects, interdisciplinary themes and competencies with instructional approaches in which pedagogies, technologies, resources and contexts work together to prepare students for life. Interdisciplinary learning permits integration in a seamless fashion, moving away from the notion of isolated subject and discipline areas to learning that resides in real-world contexts and involves students using competencies to engage in meaningful learning.

Flexible Timing and Pacing in a Variety of Learning Environments

In the current system, time is considered a currency. In order to make learning the focus, timing needs to be viewed in a different manner. It needs to speak to students and their needs and not to the mechanics of the Industrial Revolution and factory model. Curriculum developers need to consider that, when developing learning programs, time should not be the driver but rather learning diversity should be the focal point. When time is viewed differently, changes in pacing can be more easily implemented. Pacing respects an inclusive learning model and, as such, will impact "how much content" can be inserted in learning programs. Varying learning environments also plays a key role in supporting flexible timing and pacing. Providing students with different places and spaces to engage in learning also enhances their educational experience. Thinking in fresh ways about reshaping schools and school curricula demands preparation and research; otherwise, the known is reiterated.

Responsive Curriculum for a Digital Age

A responsive curriculum requires that its development be iterative, continuously informed and revised based on feedback from its principal users—students and teachers. It must be: 1) flexible; 2) emergent rather than rigidly predefined; 3) tolerant of diversity and differences; 4) meaningful to students; and 5) open to constant input from its users. For this to occur, students need to move from consumers of information to active participants in the production of information, and teachers need to move from deliverers of knowledge to collaborators in

knowledge creation. Assessment will play a key role in determining responsiveness, as it will need to represent the process of meaning making and knowledge construction, thus changing the notion of "what is assessment" and "what is standardization." When these factors come into play, it will become apparent that curriculum is more responsive and evolving to meet ever-changing needs.

Student-centred/Personalized Learning

Theories and research on what is student-centred/personalized learning have generated a number of insights for curriculum development and design. Student-centred/personalized learning is predicated on a belief system where every student matters and where attention needs to be paid to individual motivation and ways of learning (learning styles and preferences). Curriculum needs to entice students into taking ownership and to engage them in learning that is challenging and meaningful.

A "tight" curriculum, based on accountability, does not necessarily effectively support meaningful personalized learning. To increase student motivation and achievement that leads to higher self-confidence and more positive feelings about school, curriculum needs to broaden the what, when, where, how and at what pace students achieve defined learning outcomes. As such, curriculum design needs to give students the opportunity to build on individual strengths and achievements, to pursue their passions and interests, and to learn in ways that are consistent with their individual ways of learning. In the end, a curriculum that focuses on both learners and learning helps to offset alienation and helps students to feel more connected to learning and the world around them.

Assessment

Learning occurs best when learning outcomes, instruction and assessment align. Assessment can take a multitude of forms—diagnostics, classroom-based formative and summative assessment, standardized tests—that measure student proficiency of the defined learning outcomes. However, to achieve alignment, a comprehensive and coherent assessment system needs to find balance between different formative and summative assessments (e.g., standardized, classroom) to meet diverse learning needs and to ascertain that the learning outcomes have been achieved. Establishing linkages between standardized assessments and classroom assessments and their alignment with the achievement of learning outcomes is desirable. This involves the consideration of varied and numerous assessments that are purposeful, that can obtain effective results through quality criteria and that have students involved in the assessment process so they can better understand themselves as learners.

INTRODUCTION

BACKGROUND

In 2008, the Government of Alberta was tasked with creating a long-term vision for education in Alberta. In 2010, a variety of engagement processes, involving thousands of Albertans, was used to create a transformational vision for Kindergarten to Grade 12 education: *All students are inspired to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit* (Alberta Education, 2011c, p. 6). During the Inspiring Education engagements, Albertans expressed pride in the education system, but in looking ahead, called for a transformation of the education system to help students engage actively in a global, knowledge-based society so as to better prepare them for the rapid changes occurring at the local, national and international levels.

Through these engagements, Albertans indicated that they value education's vital role in the formation of families, communities and the province, and recognize the impact Kindergarten to Grade 12 has on one's quality of life. However, it is also clear that as Alberta experiences changes in demography and confronts increasing global competitiveness, education needs to evoke change as well. This has led to the raising of questions related to Alberta's education system.

Is the Alberta curriculum relevant to students? How can it be more student-centred? Is it responsive to their needs? Will it meet the needs of students when they transition to the world of work or higher education? How are other jurisdictions transforming their curriculum so students receive the education they will need? What are we doing well? Where can we improve?

These are some of the questions that have been the impetus for *Curriculum Redesign,* which is aimed at ensuring that Alberta's curriculum (programs of study, assessment, and learning and teaching resources) remains responsive and relevant for students. This redesign reflects the province's commitment to continually improve its work in providing a world-class, student-centred curriculum for students now and in the future.

The goals of *Curriculum Redesign* are:

- Goal 1 – to develop revised standards and guidelines for future curriculum (programs of study, assessment, and learning and teaching resources)
- Goal 2 – to develop a cohesive and collaborative process for curriculum development that will ensure that curriculum is responsive to students in a rapidly changing world.

Curriculum development and design are anchored in research[2] (theory, quantitative and qualitative studies, and promising and innovative practices) that exists within Alberta, Canada and around the world. The objective of the research, including literature reviews and environmental scans, was to

[2] *Research* is defined, for the purpose of *Curriculum Redesign*, as the gathering of data, information and facts in order to discover (new) information to reach a new understanding. This definition was derived from Cambridge Dictionaries Online (http://dictionary.cambridge.org/dictionary/british/research_1) and Experiment-Resources.com (http://www.experiment-resources.com/definition-of-research.html#ixzz1VPMinEpl).

collect, collate and analyze the information obtained and, where possible, to consider the knowledge gained to inform the development of revised standards and guidelines for future curriculum and curriculum development processes.

GOALS AND OBJECTIVES OF THE RESEARCH REPORT

Evidence-based decision making is currently used by educators to "guide a range of decisions to help improve the success of students and schools" (Marsh, Pane & Hamilton, 2006, p. 1). Data from research studies are "intended to support generalizable conclusions about *what works*" (Moss & Piety, 2007, p. 1). The impetus for revisiting standards and processes at the provincial level is to better respond to today's students with a curriculum that is relevant, more accessible at any time and that meets their own pace in a variety of learning environments.

Many, if not most, of the directions proposed in Inspiring Education are of a "leading edge" nature and, in many cases, have only been practised in a few other jurisdictions and, then, only for short periods of time. The result, in such cases, is that there is a limited amount of empirical research available worldwide, and what is available leans more toward theoretical discussions of how such concepts might work best and/or are descriptions of the practices being followed.

PURPOSE OF THE REPORT

This report provides descriptions of the available research on specific concepts that were chosen for examination, and provides considerations for curriculum development. Data from research studies are "intended to support generalizable conclusions about *what works*" (Moss & Piety, 2007, p. 1). The information provided is intended to inform and provide a balanced and comprehensive view of each concept in relation to curriculum development principles, standards and guidelines, and processes for the development of future curriculum.

This report includes a summary of data derived from:

- peer-reviewed journal articles
- international and national government reports
- websites of education departments of other countries
- environmental scans at a provincial, national and international level
- a review of Alberta Initiative for School Improvement research and publications.

The report is structured in a format to help readers to access research and findings that are of most interest to them. As well, the modular structure of the chapters would enable the report to be updated as new research emerges and has significant considerations for curriculum development.

RESEARCH CONTEXT

Alberta students have performed well on national and international testing programs. Factors contributing to this high achievement are the province's programs of study, supported by a strong relationship with learning and teaching resources and provincial assessments, as well as stakeholder involvement in robust development processes. This relationship, complemented by extensive consultation, collaboration and communication with clients, partners and stakeholders, contributes to the development and implementation of high-quality curriculum.

However, students are entering an increasingly knowledge-based economy that is global in nature, competitive and driven by technology and innovation. Curriculum standards and development processes need to be transformed to provide students with the opportunity to develop the competencies—through the development of attitudes, skills and knowledge—that will enable them to take full advantage of living, learning and working in a globalized society while at the same time acknowledging that Alberta is largely a resource-based economy, and related skills will continue to be in high demand. The development of curriculum needs to:

- consider moving in a direction that fully leverages opportunities provided by technology to act upon these trends, thereby ensuring curriculum remains responsive to student and societal needs
- provide students with meaningful learning experiences that can be achieved through flexible timing and pacing and through a range of learning environments, while maintaining high standards for learning.

As was noted in *Inspiring Action on Education* (2010b, p. 1):

> Nationally and internationally, Alberta's education system is doing very well. Given the high-performing system we currently have, why is the government taking a bold and courageous step and asking, "What will we, the people of Alberta, require of education 20 years out?"
>
> While many Albertans are proud of where we are today, they are also thinking ahead. It is important not to rest on assurances that we are among the best in the world, but rather to ask, "Is today's system good enough to prepare students for the future?" As good as our system is today, we believe that substantive improvements are essential to sustain our world-class education system.

The dialogue with Albertans that began with the Inspiring Education Initiative and resulted in the *Inspiring Education Steering Committee Report* (2010a) combined with the Ministry's response, *Inspiring Action on Education* (2010b), provides insight into how the future of education might look. The vision can be summarized as the three *Es*: **E**ngaged thinker, **E**thical citizen and **E**ntrepreneurial spirit. Underlying the three *Es* are six core values: opportunity, fairness, citizenship, choice, diversity and excellence.

As a result, the following policy directions and aspects from the *Inspiring Education Steering Committee Report* and *Inspiring Action on Education* documents have informed and provided direction for Alberta Education's *Curriculum Redesign*:

- curriculum (programs of study, assessment, learning and teaching resources)
- competencies of an educated Albertan required to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit
- student-centred education
- personalized learning with flexible timing and pacing through a range of learning environments
- technology for learning and innovation
- collaboration and shared governance
- parental and community engagement
- inclusive education
- a coordinated approach to early learning
- responsibility for high standards and performance
- research.

The research report also considered the results of other initiatives within the ministry that provided overall context for the research; e.g., *Learning in the 21st Century;* the *Distributed Learning Strategy;* the *Locally Developed Courses Strategic Review;* the *Literacy Action Plan*; the department's *Action Agendas,* specifically on the topics of First Nations, Métis and Inuit services, inclusion, curriculum, legislation, teaching and leadership, and research.

In addition, pan-Canadian and international environmental scans provided useful information regarding approaches being taken in other jurisdictions.

These reports and initiatives, and discussions with key stakeholders and with staff across the ministry, provided the basis for the selection of concepts to be researched.

METHODOLOGY

Research Plan Development

Formulation of the Research Plan and Data Collection

Four sources of information were used to develop the research plan for Alberta Education's *Curriculum Redesign* (see Appendix A for guiding research questions). The first source was comprised of ministry documents such as *Inspiring Education*, *Inspiring Action on Education*, and *Setting the Direction*, and stakeholder documents, such as *The Courage to Change*. For example, the *Inspiring Education* document spoke to the need for a "competency-based curriculum" and since this notion is not yet formally a part of the Alberta curriculum, it was seen as a necessary area of research.

The second source of information used was the need to revisit the current curriculum in light of comments being made by students through venues such as Speak Out and the ministry's dialogue with Albertans.

The third source of information was the identification of opportunities by Alberta Education. For each issue that was identified, an opportunity was paired with it. For example, the limited engagement with a breadth of stakeholders (e.g., industry, post-secondary) was paired with the opportunity to broaden the spectrum of stakeholders and engage them through communication technologies, such as videoconferencing, as a means of reducing "windshield time." A related exercise was the "less is more" where discussions identified what curriculum should be doing "less of" and what curriculum should be doing "more of." An example of this would be to consider more depth and less breadth within programs of study.

The fourth source of information came from discussions department staff had with educators in preparation for the three research roundtables hosted by Alberta Education in April and May 2011. In these discussions, other concepts, such as w*ays of knowing*, were identified for which more information was needed in order to arrive at common Alberta understandings of the concept. These research roundtables also had as a goal to enhance, through research and discussion, the knowledge base for the concept.

From all of the above sources, a list of topics/concepts was compiled. These sources of information were also used to formulate the question, "What might we want to do differently?" This particular question directed the research literature review and e-scanning work.

Research Approach and Activities

Once the Research Plan was formulated, a review of the relevant literature and environmental scans of other provincial/territorial and international education jurisdictions was conducted.

To guide the research of the defined list of topics/concepts, three principal questions were developed. Each question was approached as a topic, and the question structure for each topic/concept was identical:

1. Has research been done on this concept?
2. Have any jurisdictions implemented this concept in practice?
3. Has this concept/practice been assessed and/or evaluated?

Literature Reviews

Once the framework for the research was formulated, an extensive review of the literature and publications by accredited scholars and researchers was conducted. This included web-based searches on the research topics and assembly of literature. The Alberta Government Library, as part of the research parameters, also performed searches within the identified topics. As well, the working groups

planning the roundtables contributed literature reviews related to the concepts being discussed at their specific roundtable.

Research Roundtables

Three roundtables (see Appendix B) were held in the spring of 2011 which brought together education partners and stakeholders to share, interpret, review and discuss research and literature reviews and to share practical experiences and personal knowledge. The roundtables provided an opportunity to develop common understandings of key concepts identified in *Inspiring Education: A Dialogue with Albertans* (2010a) and *Inspiring Action on Education* (2010b) for consideration in future curriculum development. The key concepts addressed at the roundtables were: competencies; literacy and numeracy;[3] interdisciplinary learning; ways of knowing; student-centred/personalized learning; breadth and depth; interdisciplinary curriculum; flexible timing and pacing in a variety of learning environments; responsive curriculum; assessment of competencies; and assessment. Common understandings provided some insight into the level of understanding around these concepts.

Environmental Scans on Curriculum Development Processes

Another avenue of the data collection process was environmental scans at the pan-Canadian and international levels. The purpose of the scans was to identify the current processes used by other jurisdictions to develop curriculum and to substantiate what these jurisdictions were viewing as global trends in education, such as the inclusion of competencies, and how these trends were being integrated in current or future curriculum design. Another purpose of the environmental scans was to identify innovative practices relating to curriculum development.

Pan-Canadian E-Scan

An environmental scan of websites of other Canadian Ministries of Education was carried out to identify the processes used by these jurisdictions to develop curriculum, including templates or common frameworks.

International E-Scans

The information detailed in the international e-scan portion of the report is based on two environmental scans. The following countries were selected for e-scans, and data from each country's respective government and Ministry of Education website was analyzed for this report:

- Australia (Queensland)
- Finland
- New Zealand
- Republic of Korea.

To complete the analysis, information was also drawn from a number of other resources, including the Organisation for Economic Co-operation and Development, the International Review of Curriculum and

[3] Although literacy and numeracy were concepts discussed at the roundtables, they were not a focus of the *Curriculum Redesign* research and are, therefore, not discussed in detail in this report.

Assessment Frameworks Internet Archive, Eurybase, and the United Nations Educational, Scientific and Cultural Organization (UNESCO). These sources provided detail on the structure and organization of education systems in select countries, government policies with respect to education, and findings from other published research studies.

Data from Alberta Initiative for School Improvement

While many of the Alberta Initiative for School Improvement projects focus on teacher development and instructional practice, a few projects address aspects such as assessment *for* learning and/or differentiated instruction, and a few engage with competencies and cross-curricular learning. Relevant Alberta Initiative for School Improvement project reports were reviewed and findings are included in the relevant chapters of this report.

Assembly, Analysis and Reporting of Data Collected

The information from the literature reviews, the environmental scans, the review of Alberta Initiative for School Improvement publications and the results of the Research Roundtable Working Groups have been summarized in this report. In some of the concept or direction areas, little research has been conducted and/or no jurisdiction has implemented the particular concept or direction; therefore, the information provided for this report reflects the current state of research and practice to date.

CONCEPTS AND POSSIBLE CONSIDERATIONS FOR CURRICULUM

This section contains a discussion of the concepts that have been researched, indicating both the nature of the topic/concept and the reason why it was chosen for consideration for curriculum.

Put in a different way, curriculum development requires two types of information: "*What is?*" and "*What can be done?*" The question "*What is?*" focuses on researching each of the curriculum concepts by examining literature, trends and practices around the world, and the question "*What can be done?*" focuses on what research and practice informs future needs, directions and considerations for curriculum development in Alberta.

Concepts for Curriculum Development Processes

The following concepts relate to curriculum development processes:

Consistency and Commonality in the Design of Programs of Study

In discussing opportunities to be explored for *Curriculum Redesign*, the following possible directions were identified for investigation:

1. What is the feasibility and value of developing a common framework for all programs of study (all subjects) and of including, within that framework, common elements for potential preambles (e.g., philosophy, rationale, overview, principles, glossary, shared learning outcomes)?
2. What is the feasibility and value of ensuring consistency in front matter and in the terms used in programs of study; of ensuring clarity of language and common understandings of philosophy?

Strategies and Practices for Developing and Updating Curriculum

This would involve updating curriculum, as needed, triggered by new information and research. This may involve one or more subject areas at a time, as needed, and could be enabled by a modular structure and due to the technological nature of curriculum; e.g., curriculum revisions can be made much more quickly than is true at present. It would also involve curriculum update projects proceeding in a more synchronous manner; e.g., coincident development of English and French curriculum; development of assessment and learning and teaching resources related to programs of study learning outcomes soon after the individual or subset of outcomes are identified.

The following two principles were articulated as important in providing background as to possible approaches for the development and updating of curriculum:

1. Every curriculum update project will use a project management approach. Depending on the size of the change, this may involve several elements; e.g., a business case, a project charter, a risk analysis, desired outcomes, an evaluation plan. Smaller changes would have either fewer of these components and/or more rudimentary versions of them. Again, depending on the size of the change, Alberta Education could consider different levels of approval of an updated curriculum.
2. All curriculum development will be informed by research (a policy direction identified in *Inspiring Action on Education*).

Role of Government and Level of Stakeholder Involvement and Engagement in Curriculum Development

This would involve Alberta Education moving from direct development of curriculum components to establishing standards and acquiring, adapting and/or obtaining development from others, such as stakeholders, partners, publishers and the private sector, with the department playing more of a contract management role. This could include an approach whereby any partner can develop/modify any component/module of the curriculum and propose it for addition/change to the curriculum, with the proposals vetted by a reviewer/team from the partnership. Additionally, the approach would require:

1. Broadening the definition of stakeholders whose input is sought on curriculum to include others; e.g., business and industry, researchers, post-secondary.
2. Using technology to increase the breadth and depth of stakeholder collaboration.

Concepts for Curriculum Development

The following concepts relate to curriculum development:

Competencies

Inspiring Education: A Dialogue with Albertans (2010a) *and Inspiring Action on Education* (2010b) identified competencies of an educated Albertan as a major topic and which competencies students will

need to have in order to live, learn and work in the future. In the *Framework for Student Learning* (2011, p. 2) the following competency groupings are listed: critical thinking, problem solving and decision making; creativity and innovation; social, cultural, global and environmental responsibility; communication; digital and technological fluency; lifelong learning, personal management and well-being; and collaboration and leadership. Of interest to the project is not only what competencies are understood to be and which ones are being identified on a worldwide scale, but also how such competencies might be embedded into the curriculum and, possibly, across and within subject areas.

Literacy and numeracy are, according to *Inspiring Action on Education* (2010a), the two "competencies of primary importance to all learning." Both concepts are very broad and extensively researched. As such, neither had been included as concepts that the *Curriculum Redesign* needed to explore, since Alberta Education had undertaken associated research efforts prior to the launch of *Curriculum Redesign*. The concepts were discussed at Research Roundtable 1 and, as such, are noted here.

Ways of Knowing

This concept was articulated as important in supporting First Nations, Métis and Inuit student success. The concept is not only discussed in *Inspiring Action on Education* and other ministry documents, but it is also related to one of the three Alberta Education business plan goals. While this concept is not restricted to First Nations, Métis and Inuit *ways of knowing*, the research focused primarily on information related to First Nations, Métis and Inuit *ways of knowing*. Of interest to *Curriculum Redesign* is developing an understanding of how ways of knowing can inform the development of curriculum while facilitating different ways of learning.

Breadth and Depth

The section "Curriculum: Programs of Study" of *Inspiring Action on Education* (p. 19) indicates that a transformation of programs of study involves placing more emphasis on "in-depth study of concepts" and "in-depth knowledge and understanding," as well as "reducing the scope of provincially-mandated programs of study." Of interest to *Curriculum Redesign* is arriving at an understanding of the nuances of these notions, how much of a shift can/should be made and how it could be achieved in order to improve student outcomes.

Interdisciplinary Learning and Interdisciplinary Curriculum

In *Inspiring Education* (p. 7), there is reference to a curriculum that allows for more interdisciplinary learning experiences to encourage the development of skills and knowledge, in order to be able to address and solve real-world problems. Interdisciplinary learning is an approach that enables the development of competencies. Of interest to *Curriculum Redesign* is how this can be done effectively, while ensuring that subject-specific outcomes are also achieved.

Flexible Timing and Pacing in a Variety of Learning Environments

This concept is found throughout *Inspiring Action on Education*. It is articulated as a policy direction (aligned with personalized learning) and is further emphasized in the "Curriculum: Programs of Study" section of *Inspiring Action on Education* as it relates to flexibility.

Also related to flexibility is the concept of supporting elements of the curriculum through technology, providing a comprehensive learning experience that gives teachers and students access to a rich suite of curricular resources (e.g., learning and teaching resources, assessment, learning outcomes). This is articulated in the "Curriculum: Learning and Teaching Resources" section of *Inspiring Action on Education*.

Responsive Curriculum for a Digital Age

This concept has many facets, including a curriculum that evolves in response to current and emerging student, societal and economic needs and employment for jobs that currently do not exist. A responsive curriculum will facilitate meeting the needs of students who will have to solve problems for which we currently lack awareness. Responsive curriculum is supported by other concepts mentioned above; e.g., development of competencies, ways of learning and knowing, breadth and depth of learning, student choice in the fulfillment of individual potential, a variety of assessments, and learning and teaching resources that are adaptable and accessible in a variety of learning environments.

Student-centred/Personalized Learning

Inspiring Action on Education identified "student-centred education" and "personalized learning" as a policy direction. Of interest to *Curriculum Redesign* is the development of an "Alberta" understanding of what these concepts mean, as well as the investigation of possible approaches to enhance these concepts in curriculum development. Differentiated instruction is being researched as one of a number of possible approaches to enable flexibility in the classroom delivery of learning.

Assessment

Inspiring Action on Education includes a section on "Curriculum: Balanced Assessment," which includes comments, such as "students have varied assessments that provide timely and relevant feedback" and "assessments are compatible with high-quality and engaging learning opportunities" (p. 20). It also notes both "assessment *for* learning" and "assessment *of* learning" as being of equal importance and expands the scope of assessment to include "assessment *as* learning." Of interest to *Curriculum Redesign* is how an assessment approach can be supported by ensuring that all learner outcomes enable the use of a variety of appropriate assessment strategies and that effective approaches to the development of assessment are facilitated, as defined by two objectives: 1) to determine how well students have met the criteria; and 2) to use data to inform teaching and learning.

The concepts of competencies and assessment are brought together in *Inspiring Action on Education*, which indicates that taking a preferred approach to assessment involves, among other things, ensuring that "assessments are based on learning outcomes for competencies defined by the programs of study" (p. 20). Of interest to *Curriculum Redesign* is how approaches to assessment of competencies can be effectively assessed.

BIBLIOGRAPHY

Alberta Education. (2009). *Setting the direction framework*. Retrieved from http://education.alberta.ca/media/1082136/sc_settingthedirection_framework.pdf

Alberta Education. (2010a). *Inspiring education: A dialogue with Albertans*. Retrieved from http://www.inspiringeducation.alberta.ca/LinkClick.aspx?fileticket=BjGiTVRiuD8%3d&tabid=37

Alberta Education. (2010b). *Inspiring action on education*. Retrieved from https://ideas.education.alberta.ca/media/2905/inspiringaction%20eng.pdf

Alberta Education. (2011). *Framework for student learning: Competencies for engaged thinkers and ethical citizens with an entrepreneurial spirit*. Retrieved from http://education.alberta.ca/department/ipr/curriculum/framework.aspx

Marsh, J. A., Pane, J. F., & Hamilton, L. S. (2006). *Making sense of data-driven decision-making in education.* Retrieved from http://www.rand.org/pubs/occasional_papers/2006/RAND_OP170.pdf

Moss, P. A., & Piety, P. J. (2007). Introduction: evidence and decision making. *Yearbook of the National Society for the Study of Education, 106*(1), 1–14.

CHAPTER 1: CURRICULUM DEVELOPMENT PROCESSES

"We cannot become what we need to be, by remaining what we are."
Max De Pree, 1987

Curriculum is the foundation of the teaching-learning process. The development of programs of study, learning and teaching resources, lesson plans and assessment of students, and even teacher education are all based on curriculum. Curriculum and curriculum development at first glance appear to be of chief concern to educators, governments and parents, and both have relevance and impact on the development of communities and prosperity. According to De Coninck (2008), curriculum, more than ever before, is now viewed as being at the centre of daily life and the responsibility of society as a whole.

Levin (2007) noted that curriculum documents were "a very large part of the work done by ministries of education in creating curriculum content (para. 1)." However, over time, Levin (2007) states that educational change is more complex, and "as governments have attempted to make large-scale changes," curriculum change has become "less of an activity in its own right" and curriculum renewal has become part of a broader strategy for change in education.

Curriculum development today presents both a strategic process challenge as well as a policy challenge. For example, should the policy aim to teach what is of value, as embodied in subject disciplines, and for deep understanding in preparation for competing in the global economy? Or should policy aim for a personalized curriculum that recognizes students as active partners in their learning and develops their potential as a person? One response to the question could be "both" (Ackerman, 2003).

In Germany, for example, the 1997 Programme for International Student Assessment results revealed that education in Germany did not compare as well as other countries and the quality of education was assumed to be not as good. The curriculum policy response in Germany was to undergo a fundamental shift toward competencies, resulting in a curriculum with education standards at different levels for "the so-called subject-specific, personal, social, methodological competencies for each subject or subject area, and … the compulsory competencies and content of the core curriculum" (Leyendecker & Letschert, 2008, p. 27). Schleicher (2011) states that high performing education systems are characterized as *knowledge rich* in which collaborative partnerships and leadership are essential to formulating policy. In Alberta (Alberta Education, 2011), the policy aims were set out as, *All students are inspired to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit*.

There are many models for curriculum development. Generally, as a process, curriculum development is concerned with reviewing, planning, developing, implementing and maintaining curriculum[4] while ensuring that the stakeholders engaged in this process have a high level of commitment to and ownership of the curriculum. In formulating policy, the challenge lies in the discourse on the form, content, aims and goals of curriculum, often referred to as curriculum orientations (Eisner & Vallance, 1974, as cited in Joseph, 2011). These curriculum orientations have a profound impact on roles of stakeholders, parents, educators and students as they relate to vision and practice, decision making, curriculum planning, development, implementation and evaluation. These orientations or "cultures" of curriculum, in turn, have an impact on the curriculum development process (Joseph, 2011). Given the importance of curriculum, a number of questions arise, "How is curriculum developed, who develops it, and how are curriculum development processes evolving?" However, before these questions can be answered, the first question that needs to be asked is, "What is curriculum?"

Surprisingly, there is no fixed definition of curriculum (Sahlberg, 2011). The word *curriculum* is derived from the Latin verb *currere* which means to run.[5] As Sahlberg notes, in Anglo-Saxon countries curriculum refers to what students should learn, within a framework of goals, objectives, content and pedagogy. In countries such as Sweden (*läroplan*), Holland (*leerplan*) and Germany (*Lehrplan*), curriculum is defined as a "plan for learning" (Taba, 1962, as cited in Thijs & van den Akker, 2009). Curriculum can also be "concerned with what is planned, implemented, taught, learned, evaluated and researched in schools and at all levels of education" (McKernan, 2008, p. 4). This latter definition of curriculum is seen to be more as a process rather than just a product.

Johnson (1967) defines curriculum as a "structured series of intended learning outcomes" that prescribes the results of instruction. Curriculum is, therefore, viewed as an output of the development process. Research in curriculum development has focused more on improving the process of curriculum than on curriculum theory, which aims to better understand the educational significance of what students are learning (Pinar, 2004).

Given that there are a number of activities related to curriculum, distinctions among various levels of curriculum activities (e.g., policy, design and development, implementation) and the level of curriculum development (van den Akker, 2007, pp. 37–38) provide deeper understanding of curriculum products. The analysis in Table 1 reveals that curriculum is more than a process; it is also a product. These products may vary in scope and in detail. Curriculum development can be viewed narrowly (e.g., developing a specific curriculum framework) or more broadly (as an ongoing process of improvement that takes into account teacher education and assessment programs). The problems of decision making and implementation of curriculum are complicated by a long cyclical process, which often involves many stakeholders, typically with their own perspectives and interpretations of curriculum. Additionally, as Levin (2007) notes, "everyone in society wants her or his particular interest included in the work of the

[4] These terms can be defined in this way: reviewing (identifying what is working well, issues and concerns), initiating (development of proposal), planning (development of project plan), developing (development and field test of program of studies), implementing (authorization of program of studies and resources, and orientation for teachers), and maintaining (support and sustain, monitor feedback).

[5] Latin derivation obtained from http://www.thefreedictionary.com/curriculum

school, putting pressure on governments to include more and more in the curriculum. Increasing social diversity has also led to calls to add more content" (para. 7). He further notes that the problem is compounded by the typical curriculum development process where teams of "experts tend to want more and more complex elements of their own disciplines or subject areas included in the curriculum" (para. 8).

Table 1: Levels and Curriculum Products (Adapted from Thijs & van den Akker, 2009)

Level	Description	Examples
Supra	International	• Common European Framework of References for Languages. Usually "generic" in nature. • Examination programs; e.g., Third International Mathematics and Science Study or Programme for International Student Assessment or Progress in International Reading Literacy Study.
Macro	Provincial, national, regional	• Intended core objectives (specified in a curriculum framework and/or program of studies). • Authorized learning and teaching resources. • Attainment levels. • Examination programs; e.g., Pan-Canadian Assessment Program.
Meso	School jurisdiction, school	• School program (locally developed courses). • Educational program with an emphasis on specialized school-based activities (e.g., specific focus on arts, sports, or academics). • Site-specific learning and teaching materials developed, identified and accessed.
Micro	Classroom, teacher	• Instruction plan for module or course. • Learning and teaching materials.
Nano	Student, individual	• Individualized learning plan. • Individualized course of learning or learner pathways.

Curriculum development at national or regional levels that is focused on curricular frameworks, as mentioned above, or on assessment programs is a reflection of government policy. Since governments are, for the most part, responsible for the quality of education, the central challenge for curriculum development is addressing multiple societal expectations relating to educational content and learner outcomes in well-balanced and articulated frameworks. To monitor and report on the quality of educational outcomes and outputs (e.g., number of high school graduates), periodic assessments, such as Programme for International Student Assessment or Pan-Canadian Assessment Program, are undertaken. Clearly, the model or approach to curriculum development at the national or regional levels will be different from that which occurs at the school-based level, which is more of a practical process that is part of the lived experience of the school community (Kennedy, 2010). As Thijs and van den Akker (2009) note, the processes for curriculum development are more focused on building

synergy among curriculum development, teacher development and school organization development, in responding to community concerns, needs and conditions.

THEORETICAL FOUNDATIONS

Regardless of whether curriculum development is taking place at national or regional levels or at the school level, at its core, curriculum is a plan for learning that students will encounter and experience in a variety of learning environments. Curriculum development, as a process, continually strives to find newer, better, more effective and efficient means of improving the quality and relevance of education. As such, processes for curriculum development include reviewing, planning, developing, implementing and maintaining curriculum.

A major challenge for curriculum development is to define the components that will comprise the curriculum, and the three major planning elements involve content, purpose and organization of learning (van den Akker, 2007, p. 38). The relevance of these components, as identified in Table 2, can vary depending on the previously mentioned levels of curriculum. For example, learning environments are of greater relevance at a micro or nano level, while international assessment programs such as Trends in Mathematics and Sciences Study or Programme for International Student Assessment are often of greater relevance to policy makers at provincial and Pan-Canadian levels.

Table 2: Components and Related Questions (Adapted from Thijs & van den Akker, 2009)

Component	Related Question
Program Rationale or Vision	Why are students learning what they are learning?
Program Goals and Objectives	What are the goals, aims and objectives of what they are learning?
Program/Course Content	What are they learning? (e.g., competencies, knowledge, skills)
Learning and Teaching Resources (print and/or digital)	What are they using to learn? (e.g., print and/or digital resources, reference materials)
Learning Activities	How are they learning? (e.g., simulations, discussions, design and build)
Instructional Time	When are they learning?
Teacher's Role	How is the teacher facilitating learning?
Student Groupings	With whom are they learning? (e.g., age, grade, other groupings)
Location	Where are they learning? (e.g., classroom, online, work experience)
Assessment	How is learning measured? (e.g., *of*, *as* and *for* learning)

The approach taken to date of what to include in curriculum (program of studies) has been to balance the three following priorities (Thijs & van den Akker, 2009):

- Knowledge – what academic and cultural heritage is essential for learning and future development? (e.g., history, geography, science, literature, languages).
- Society – which issues should be included given societal and global trends and needs? (e.g., global warming, other environmental issues, sustainability).
- Learner – which elements are of importance for learners' personal and educational needs and interests? (e.g., competencies, requirements for post-secondary study, careers).

Providing responses to the previous questions requires navigating through diverse stakeholders and interest groups to arrive at a coherent curriculum that is not overloaded or fragmented because of a large number of separate subjects. Public pressure, resulting from unfavourable media reports on students' supposedly inadequate knowledge of something, often leads to the addition of content in curriculum or the development of too many separate courses that most schools are unable to offer (Levin, 2007). As well, curriculum of today is striving to be "more challenging and intrinsically motivating" and move toward instruction that is more meaningful and autonomous (Thijs & van den Akker, 2009). The overloaded curriculum does not respond to students' interests and teachers feel pressured to cover the curriculum that may be pitched at a level that is too high for students to achieve (Levin, 2007).

Additional challenges in curriculum development often arise from gaps between the *intended curriculum* (policy, vision, rationale and philosophy underlying a curriculum), the *implemented curriculum* (curriculum as interpreted by school administration and teachers; the process of teaching and classroom practices) and lastly, the *attained curriculum* (learning as experienced by learners, resulting from defined learning outcomes for students). If a curriculum revision process is overly ambitious, is carried out within short timelines and is within an environment of low investment in teachers, problems will inevitably arise. A particular curriculum may include knowledge and require pedagogy that teachers may or may not have. To address this problem, education systems provide "professional development for teachers, but it is highly unlikely, given the amount and variety of curriculum content, that we can provide enough support to enable most teachers to teach most subjects with a very high level of content and pedagogical knowledge" (Levin, 2007, para. 14).

Further, if there is poor planning and linking with other system components, such as assessment programs and learning and teaching resources, problems will arise. When problems and tensions do arise, participants tend to engage in blaming each other for problems in the education system. Thus, curriculum needs to be thought of as a web of interrelated and aligned activities dedicated to achieving common learning goals (Thijs & van den Akker, 2009) as identified in Figure 1.

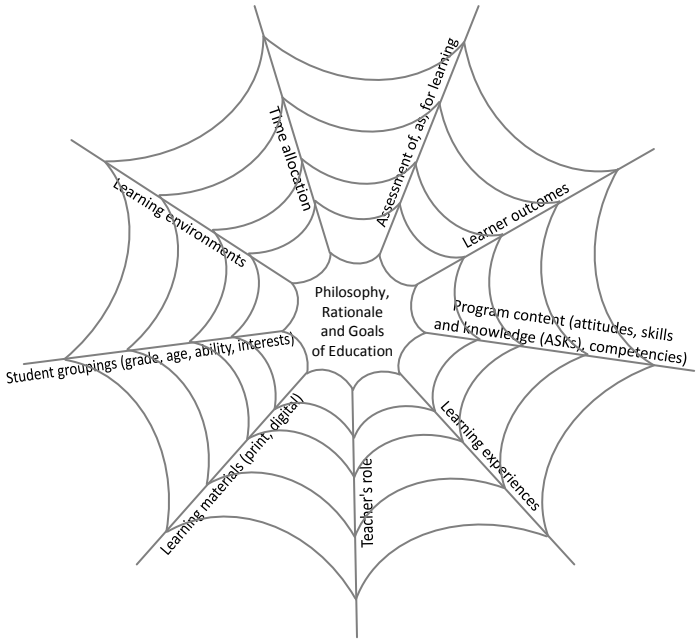

Figure 1: Web of Interrelated Learning/Curricular Activities (Adapted from Thijs & van den Akker, 2009)

Curriculum developers face many uncertainties in a complex task undertaken within very dynamic contexts (Thijs & van den Akker, 2009). Curriculum developers want theoretically underpinned and empirically tested development principles and methods. Unfortunately, current research, with its focus on descriptive knowledge, does not provide developers with useful solutions to their problems. These problems usually arise from the ambitious and complex nature of reform policies that affect many facets of education at multiple levels, ranging from macro level policy formulation to micro level realization. As Levin (2007) notes, "curriculum, when done well, can be a mainstay of effective teaching and learning, but if we are naïve about the real pressures on school curricula we are unlikely to be able to achieve our educational goals" (para. 17). Caskey (2002) notes that coherent, integrative and democratic curriculum requires a great deal of thought and is a time-intensive activity. Success in achieving educational goals, therefore, depends upon careful planning and implementation of these activities in a range of levels and contexts.

Sahlberg (2006) makes the following observations about curriculum:

- Curriculum development is an ongoing process and not just a product. Further, curriculum development can no longer be viewed as a project that has a start and an end. In today's rapidly changing world, the curriculum designed today and implemented in the years to come could still be responsive and relevant in five years conceptually but specific facts may not be so. Curriculum should be viewed as a "living, organic instrument to help teachers and schools to find optimal ways to educate" students (p. 8).

- Curriculum lies at the heart of educational enhancement policies, geared to quality improvement. Curriculum should support teachers in developing their schools, increasing access to all students and raising the quality of the learning-teaching process. To achieve this, qualified experts are required to lead the process that is based on consensus and aligned with accepted policy defining the purpose of curriculum.
- Direct copying or transfer of curriculum from another jurisdiction as a means of addressing mobility and qualifications, without taking into account cultural and political differences, teaching traditions and provision of education, is not advisable.
- Finally, curriculum development processes require expertise and continuous production of new knowledge of these processes. As such, it requires that well-resourced and well-equipped research structures be in place (Joyce and Showers, 1995, as cited in Sahlberg, 2006, p. 9). Stronger research is needed on potential directions (path finding) and curriculum models of development with systematic follow-up and analysis of implementation of curriculum in schools.

This last point underscores the importance of viewing curriculum development as a process and not just a static product.

Models for Curriculum (Programs of Study) Development

Models can be defined as interacting parts that serve to guide actions (Lunenburg, 2011). In the case of curriculum development, there are several models that exist. In many ways, these models are more similar than different and often only differ in the elements that comprise the model. Most models have a cyclical process, characterized as analysis, design, development, implementation and evaluation. Where these models do differ is in the process of development which, to some extent, will reflect the curriculum orientation. An analysis of models and their strengths and weaknesses is a useful analytical tool for the curriculum specialist developing curriculum, and points to the need for planning regardless of the model used.

Thijs and van den Akker (2009, pp. 16–19) describe four basic models of curriculum development that are summarized in Table 3.

Table 3: General Characteristics of Four Curriculum Development Models

Curriculum Orientation / Elements	Instrumental	Communicative	Artistic	Pragmatic
Description	Based on the Tyler model (1949) and further elaborated by Taba (1962) and emphasizes a goal-directed approach to design. Systemic development process based on thorough analysis. Clear measurable objectives for the development process are formulated (i.e., the step-by-step planning process allows for the formulation of clear, measurable objectives for the development process). This approach has been described as technical-scientific (Ornstein & Hunkins, 2009).	Based on the Walker model (1971, 1990) to address the complex practice of negotiating desired features of curriculum products. The development process is primarily a social process that emphasizes the importance of relational strategies; i.e., to build relationships with stakeholders and solicit input, starting with the subjective perceptions and views of developers and various stakeholders, including students. Deliberation and negotiation are central to this orientation. This approach is similar to Glatthorn's Naturalistic Model and the Deliberation Model that build a constituency and acknowledge the social dimension of curriculum development processes.	Based on Eisner's (1979) concept of *connoisseurship* that emphasizes the developer's creativity. This holistic systemic-aesthetic approach assumes that the developer is an artist, who creatively anticipates from his or her own vision, intuition, taste and experience the identification of what is educationally relevant. There are no objective criteria or fixed processes to follow. This approach has been described as nontechnical-nonscientific (Ornstien & Hunkins, 2009) and also shares some characteristics with post-positivist/ post-modern methods, where curriculum continuously renews itself through human experience and a social and emergent manner and not through a specific model.	This approach focuses on the practical use of curriculum products. Curriculum development requires close interaction with local practice and those who actually use the product.

Curriculum Orientation / Elements	Instrumental	Communicative	Artistic	Pragmatic
Development Phases and Process	This orientation is comprised of four key elements. ▪ Identification of purpose or diagnosis of need: *Which objectives should be the aim of education?* ▪ Identification of learning/teaching experiences or selection of content: *Which learning experiences are most suitable to achieve the stated objectives?* ▪ Organization of learning and teaching experiences or content and learning activities: *How can these objectives be organized effectively to meet the identified learning experiences?* ▪ Evaluation of the objectives: *How do we know the objectives have been achieved?*	This orientation is comprised of three phases. ▪ Phase 1–Definition of need or problem: *Curriculum developers and other stakeholders present their views and opinions on problems, with a view to achieve consensus.* ▪ Phase 2–Deliberation: *Curriculum developers and other stakeholders brainstorm possible solutions to identified problems to arrive at the most desirable solution(s).* ▪ Phase 3–Design: *The results of the deliberations carried out in Phase 2 are used to draft the final product(s).*	This approach considers the following dimensions of curriculum: ▪ Intent: *A review and identification of what really matters in schools; i.e., learning objectives.* ▪ Structure of Schools: *A review of how schools and learning environments are and can be structured, how roles are defined and how time is allocated to facilitate learning opportunities.* ▪ Curriculum: *The design must include ideas that matter, skills that count and strategies that engage students in the learning process*. ▪ Pedagogy: *Quality of teaching is of primary concern, and requires support, scrutiny and assistance. Schools must serve teachers, if teachers are to serve students*. ▪ School-based Evaluation: *Based on defining what*	At the core of this orientation is formative evaluation where the development and evaluation process occur in an interactive manner. ▪ Preliminary Study: *Experts and literature are consulted and a rough draft of possible products is developed fairly quickly.* ▪ Prototyping: *Specifications of the prototype are generated and a prototype is developed to undergo rounds of design, evaluation and revision. During this phase, there is close interaction with the schools and school community to gear the products and possibilities to end users.* ▪ *Deploy*ment and Evaluation: *Moves from prototyping to deployment of curriculum products. The evaluation process means that a curriculum product is never really finished, as it will be periodically*

Curriculum Orientation / Elements	Instrumental	Communicative	Artistic	Pragmatic
			really matters for students. Teachers and school administrators approach evaluation as continuous improvement.	*revisited, assessed and revised.*
Process Activities Sequence	Logical.	No strict sequence.	Completely open process.	Cyclical.
Main Characteristics of Process	Rational process.	Intensive deliberation in identifying needs, and in seeking input and advice during the development process.	The entire process revolves around creative reflection.	Frequent evaluation by and with end users.
Definition of a "Good" Curriculum	Meets predetermined objectives or requirements.	Meets requirements achieved through broad consensus-building.	Meets the developer's requirements.	Meets the user's requirements.
Strengths	Complex development processes reduced to a few questions. Rational, fact-based and goal-directed approach.	Broad social support for curriculum as stakeholders are given ample opportunity for input and advice. Stakeholder engagement in the planning and development stages empowers and acknowledges them, especially teachers, as valuable contributors.	Ongoing revision of curriculum is made meaningful and possible, as emphasis is on creative interaction with curriculum in practice, especially at school and student levels.	Increased ownership and practical usability of the curriculum product(s).
Challenges	Emphasis on attainment of predetermined objectives leaves little flexibility for adjustments to be	The processes for deliberation can be time consuming and resource intensive, and can result in curriculum products that may not be	The particular view of the developer and focus on a specific context (e.g., classroom, school or subject) can result in curriculum products	The close interaction with end users can be challenging, at times; for example, if the users' wishes vary greatly (e.g., beliefs on the use of

Curriculum Orientation / Elements	Instrumental	Communicative	Artistic	Pragmatic
	made. Is limited to factual/empirical data. Does not reflect personal views, opinions and socio-political aspects that are important to curriculum. Relegates the art and informed practice of teaching to a technical process based on built-in procedures.	consistent and aligned internally. Consensus is often hard to achieve when developing curriculum at national or regional levels.	with a narrow scope.	worksheets in mathematics) or are difficult to combine with the insights of experts and what has been identified in the research literature; e.g., strengths of problem-based learning.

Each of the four models described above contains valuable elements that can be considered for curriculum development. The model used for curriculum development is influenced generally by the level at which the development is occurring. For example, for Pan-Canadian or regional curriculum development the models used are often derived from the instrumental or communicative model, as frameworks and specific learning objectives are the key aim of these development activities, and consensus among partners is a desired outcome. At the local or school level, the artistic model is best suited for curriculum development since there is more flexibility as the locus of control resides at these levels.

The scope of the curriculum product(s) also determines the model to be used. For example, for more "generic" products (e.g., curriculum frameworks or national assessments of literacy and numeracy), the instrumental or communicative approach may be especially useful as specific aims need to be achieved. The artistic or pragmatic models may be more suited to the development of context-specific curriculum product(s) for which a specific user has been identified (e.g., locally developed courses and learning resources, assessments *for* and *as* learning).

Finally, the composition of the team involved in the development process can have an impact on the product. For example, an individual working alone or a small team has more latitude for creativity but may be restricted by the amount of experience and knowledge he or she may have on pedagogy and practice. On the other hand, larger teams of developers lend themselves more readily to an instrumental and/or communicative development model (Thijs & van den Akker, 2009).

IN PRACTICE

The following information reflects what is occurring in current curriculum design and development processes used by Canadian and international jurisdictions, and is presented according to three themes: 1) consistency and commonality in the design of programs of study; 2) strategies and practices for developing and updating curriculum; and 3) the role of government and level of stakeholder involvement and engagement in curriculum development.

Theme 1: Consistency and Commonality in the Design of Programs of Study

Consistency and commonalities in the way in which programs of study are designed and developed can be a desirable characteristic. This process allows for teachers and other stakeholders, such as students and parents, to have better access to the learning outcomes. The following section provides an overview of what is currently happening in Canada and in other jurisdictions in the world.

Canada

The Saskatchewan Ministry of Education has recently revised its curriculum development process to include the use of common templates for every subject area. These templates have common front matter and contain three broad areas of learning: Building Lifelong Learners, Building a Sense of Self and Community, and Building Engaged Citizens. In Saskatchewan, this is a result of a conscious decision by the government to clarify expectations and ensure consistency in programs of study (Saskatchewan Ministry of Education, 2010, p. 1).

The Manitoba Ministry of Education develops curriculum frameworks that include outcomes and standards. All documents, published mostly in print form, with a movement toward electronic versions, are comprised of an overview, description of the discipline, a rationale, a philosophy, and two levels of learning outcomes (general and specific). All documents also include information on the foundational skill areas of literacy and communication, problem solving, human relations and technology (Manitoba Education, n.d.).

From a review of the Ontario Ministry of Education's (2010) website, it is also evident that programs of study follow a common format and include a common front matter and common elements and skills.

The British Columbia Ministry of Education (2012) has begun a *curriculum redesign* that will include an internal and external review involving a first draft that will be reviewed internally within the ministry. The second draft or "Response Draft" will be used with external stakeholders and other government ministries. Internal review guidelines have been developed to guide reviewers as they provide feedback.

Australia

For the first time in its history, Australia is moving to a national curriculum. This move created the need for an organizational authority to create new programs of study for its member states. A document entitled *Curriculum Design*, developed by the Australian Curriculum, Assessment and Reporting Authority, provides information to guide the writing of the Australian national curriculum, including common elements, design considerations and technical specifications. It also includes instructions on specific actions that need to be taken when drafting curriculum. The common elements are rationale, aims of the learning area, organization of the "learning area" curriculum, general capabilities (competencies), and cross-curriculum dimensions (infusion of Indigenous perspectives and knowledge of Asia and Australia's engagement with Asia).

In addition, the following design considerations were identified as key to the development of new Australian programs of study: the nature of the learner and learning (consideration for developmental appropriateness); the relationship of the learning area to other curricular areas as a whole; structural matters relating to commencement and completion of school and transition points; inclusivity of diverse student needs; description of the connection between the learning outcomes and the capabilities (competencies), and inclusion of cross-curricular dimensions. Each design consideration has defined parameters for curriculum development through key considerations and actions to be taken. A section entitled technical specifications outlines the specifics around each design consideration, including achievement standards. For example, for the rationale, a definition is provided and directions for content development are indicated. In this case, the maximum number of words is 200 and the target audience is Kindergarten to Grade 12.

The *Australian National Curriculum Development Paper* (Australia National Curriculum Board, 2008), indicates that the content will provide:

- a rationale that explains why the content is important
- aims and objectives for teachers and students
- description of how the content is organized
- the knowledge, understanding and skills that students are to acquire.

The curriculum is also expected to be clear about what has to be taught and what should be learned at each stage of schooling, to be based on reasonable expectations of time and resources, to be flexible and to be developed collaboratively with schools and jurisdictions. The Australian National Curriculum is intended to provide an outline of what students should learn. However, it is the teachers who will ultimately decide on how best to organize learning, the contents for learning and the overall depth of learning that will take place for each student (Australian Curriculum, Assessment and Reporting Authority, 2010a).

England

In January 2011, the Secretary of State for Education announced a major review of the national curriculum (ages 5 to 16) in England. This review was necessitated by the rapid economic and technological changes and declining student achievement in international assessments (England Department for Education, 2011b). The review by an expert panel conducted an international comparative research and presented its findings in December 2011.

Currently, in England, the school curriculum has the following structure. *The Framework for the National Curriculum: A Report by the Expert Panel for the National Curriculum Review* (England Department for Education, 2011a) makes the following statements:

- The national curriculum is the statutory core and foundation subjects required to be published by the Secretary of State for Education. This includes the programs of study and the attainment targets for core and foundational subjects (pp. 18–19).
- The basic curriculum is also a statutory requirement in addition to the national curriculum that includes religious education, sex education and work-related learning, and schools have the flexibility in implementing the requirements.
- Local curriculum complements the national and basic curricula with school and community needs. Local curriculum supplements other areas of learning in vocational learning, and allows for additional extension and contextualization of the national curriculum. School and communities can, therefore, determine the programs they feel are most appropriate (p. 19).

Recommendations in *The Framework for the National Curriculum: A Report by the Expert Panel for the National Curriculum Review* (England Department of Education, 2011a) to revise the National, Basic and local curricula include:

- The national curriculum should remain a combination of core and foundation courses, and specify, in detail, the "essential knowledge in core subjects but focus on a more limited set of significant expectations" for foundation subjects (p. 20).
- The core subjects should include:
  - English, mathematics and science (p. 25).
- The foundation subjects should include:
  - geography, history and physical education (Key Stages 1–4); art and design, and music (Key Stages 1–3); and modern foreign languages (Key Stages 2–4) (p. 25).

The report also makes recommendations for a common structure for programs of study. These recommendations are as follows:

- The key stages structure should be modified, as some are too long (Key Stage 2), and be split into two stages. They propose to use the key stage structure over a year-by-year (i.e., grade-by-grade) based specification of what is taught, learned and assessed (p. 8), and recommend that local authorities who wish to continue to use the year-by-year approach do so at their level.

- Programs of study must establish a "very direct and clear relationship between *that which is to be taught and learned* and *assessment* (both formative and ongoing and periodic and summative)" (p. 9).
- Programs of study should include statements of "purposes, anticipated progression and interconnections within the knowledge to be acquired, with attainment targets being stated as statements of specific learning outcomes related to essential knowledge" (p. 9).
- Using two columns, the programs of study could present the developmental description of the key concept on the left-hand side, and the essential learning outcomes to be assessed at the end of a key stage (attainment targets) could be represented on the right-hand side column (p. 9). These attainment targets would be closely aligned to the content and would be few and concise and would focus on essential learning outcomes (p. 43).
- In primary education, the focus should be on depth and that all students have the appropriate understanding before "moving to the next body of content" (p. 9).

Other recommendations pertaining to curriculum included that the design of curriculum should have a clear purpose, so as to ensure congruence and coherence for the alignment of resources, hiring of teachers, pedagogy, assessment and inspection of schools (p. 13).

Finland

Finland moved to the development of a new national framework in 1994, and revised the framework in 2004, as the government became more aware that, as a result of a decentralized public administration, teachers were not using curriculum documents. The national core curriculum creates cohesion and consistent goals, values and direction. The 2004 framework describes learning experiences, rather than being content specific. The national core curriculum has two roles: it is an "administrative steering document … [and] a tool for teachers to develop their own pedagogical praxis" (Vitikka, Krokfors & Hurmerinta, 2012, p. 1). Each municipal district develops its own curricula. Schools and teachers determine curriculum implementation, providing them with more autonomy and choice at the local level to meet diverse student needs (Finnish National Board of Education, 2004). The framework is comprised of "general educational aims, objectives and contents of different subjects as well as the principles of pupil assessment" (National Board of Education, 2001, p. 21). For each subject area, the national core curriculum provides a description, objectives, core content, a description of good performance for the end of sixth grade and final assessment criteria (Finnish National Board of Education, 2004). According to Sahlberg (2011), the new framework enhances school improvement as schools can progress at different paces, allowing for diversity in programming and for teachers to become more engaged in the process as they develop communities of practice.

Germany

As noted earlier, curriculum reform in Germany resulted in curriculum policy with a competencies orientation and in a change of paradigm in curriculum policy by moving away from an input-based approach to an output-based approach, focused on continuous quality monitoring. The Standing Committee of the Ministers of Education and Cultural Affairs of the federal states *Kultusministerkonferenz* began to formulate national standards (learner outcomes) for mathematics,

German language and the first foreign language for grades 7–10 in 2003, and, in 2004, began to establish national standards for biology, chemistry and physics. Standardized tests to measure competencies were also developed. All 16 states agreed to comply with the standards which formed the framework for revision of state curricula (Leyendecker & Letschert, 2008).

To address the significant paradigm shift to competencies, the Berlin Ministry of Education developed new curriculum frameworks (*Rahmenlehrpläne*) and provided a number of specifications to the Institutes for Schools and Media for the development of the *Rahmenlehrpläne* to ensure uniformity (Leyendecker & Letschert, 2008). These included:

- a common layout and format with a list of contents for all *Rahmenlehrpläne* to follow. For example, the curriculum for primary education has a common structure with the following components:
  - introduction to education
  - subject area and competencies
  - description of standards
  - topics and content
  - assessment
- adherence to the competency model, with reference to competencies articulated by the Organisation of Economic Co-operation and Development
- articulation of standards that are specified in terms of student activity and student-centred instruction, along with exemplary tasks
- essential subject matter content from existing curricula
- inclusion of cross-curricular aspects
- competencies for bilingual instruction
- required content and topics with the provision of optional or additional content and/or topics.

The *Rahmenlehrpläne* are also intended to be user-friendly in regard to comprehension and readability, as they are meant to be shared with parents to actively support the learning of their children and to orient students.

New Zealand

New Zealand began a very lengthy curriculum revision process for their national curriculum beginning in the 1990s. The decision was made to have a national syllabus that was general in nature, so that at the local level they could adapt the broad guidelines, defined in the curriculum document as outcomes-focused, to meet the needs of their students. This was a philosophical change from the dozen or more specific syllabi and guidelines that pre-dated the 1990s curriculum overhaul. The current curriculum document (New Zealand Ministry of Education, 2007) describes, in a succinct manner, what each learning area is about and how the learning is to be structured. The key elements defined in the national document are the vision, principles, values, key competencies, official languages and effective pedagogy. The elements provide schools with the scope, authority and flexibility they need to take the national curriculum and shape it to meet their local needs. The entire curriculum document, with programs of study for all subject areas, is a single 45-page document, which provides a one to two page

description of what each learning area is about, why it should be studied and how it is structured (New Zealand Ministry of Education, 2007).

The New Zealand curriculum describes the overall direction for teaching and learning in New Zealand schools. It represents a framework, as opposed to a fully comprehensive learning plan. Although schools are obligated to align their curriculum with the principles contained within the New Zealand curriculum, schools are given sufficient latitude to plan programs to meet local school needs (New Zealand Ministry of Education, 2007).

The curriculum is not time-structured and, as such, schools may deliver a broad and balanced overview of the curriculum through a number of different methods. There are no established rules in place with respect to timetabling or the amount of time that schools must allot for teaching each subject area, albeit English and mathematics are required to be taught each school day in the majority of primary schools (INCA, 2008a).

Korea

Korea has a national curriculum in place that is revised periodically to attend to the needs and demands of a changing society. The national curriculum is compulsory for all schools from Kindergarten to upper secondary education, including private schools. The national curriculum details set regulations for the number of school days, the subject areas that will be covered, as well as the time allotted for teaching each subject area in a given school year. There is, however, some flexibility given to either local education authorities or individual schools to:

> modify the national curriculum or to develop new subjects, based on the needs and circumstances of the school and local communities and on the interests of students, teachers and community members. This decentralized policy was continued in the seventh curriculum revision. It is intended that, by giving more autonomy to schools and local authorities, curricula will become more appropriate to individual schools and students, and will contribute to increasing the diversity of educational programmes (INCA, 2011b, para. 8).

The national curriculum also specifies that the criteria are followed when developing textbooks and it outlines broad-based guidelines for teaching and learning activities and methods of assessment (INCA, 2011b).

Theme 2: Strategies and Practices for Developing and Updating Curriculum

Another aspect of curriculum development involves determining what constitutes the need for curriculum review or an overall change. The following provides insight into some of the conditions that cause a jurisdiction to undertake a review of curriculum.

Canadian Jurisdictions

Provincial and territorial jurisdictions involved in standardized curriculum development often refer to this aspect as *triggers* for curriculum change. Jurisdictions across Canada use a wide variety of timelines and criteria for updating their curricula. There are a number of factors that typically initiate curriculum revision in Canada. These are:

- changes in government policies
- emerging socioeconomic issues (e.g., British Columbia's low graduation rate of Aboriginal students)
- influence of research findings
- age of existing curriculum
- stakeholder and educator feedback
- significant changes in subject or discipline content (e.g., the fall of the Berlin Wall) and/or the age or availability of learning and teaching resources.

A few provinces have established schedules for curriculum revision. In Ontario, revisions occur every seven years, in Prince Edward Island they occur on an ongoing three-year cycle and in Newfoundland and Labrador they occur on a five-year cycle.

International Jurisdictions

The approach used to develop curriculum varies widely among international jurisdictions. The following section describes a few jurisdictions that have undertaken curriculum change within the last decade and the circumstances or conditions that initiated (triggered) these reviews.

Australia and New Zealand

Australia has a detailed curriculum development process document that outlines four steps in the development process: Curriculum Shaping, Curriculum Writing, Implementation, Curriculum Evaluation and Review.

New Zealand's curriculum development process can be described through triggers leading to discovery, design and development, implementation and evaluation. Triggers identified in New Zealand include the elapsed time since the previous development, satisfaction of teachers, student performance on national and international tests, and research. The Australian Curriculum Shaping phase corresponds to the Discovery Phase in New Zealand. It entails planning, research and an advice paper outlining objectives, general capabilities, organization and other aspects.

In Australia, processes used previously for state and territorial level curriculum development, such as advisory groups and regular face-to-face meetings, were not scaled up at the national level due to the expense and complexity. As a result, one of the requirements for national curriculum development is robust and dynamic communication channels to ensure transparency and provide for information exchange, input and commentary from all interested parties.

The National Curriculum Board sets the writing guidelines for subject area/discipline content. Curriculum development in each subject area/discipline is led by a national subject chair, appointed by the National Curriculum Board, and supported by national reference groups. Draft curriculum documents are written by specialists recruited to a national writing pool. State and territory authorities and school organizations provide formal feedback on overall directions and on draft documents through a closed online web application. Development work is managed by project officers.

Belgium (Flanders)

With the decree of 1991, attainment levels and objectives for curriculum were developed. These attainment levels and objectives are the frame of reference for curriculum development, describing a minimum level for schools and students. However, schools are given a great deal of leeway in interpreting these attainment levels.

As a first step, the Department of Educational Development draws up a design for the curriculum. The role of the department is to use an independent and objective approach developed by expert working groups comprised of educators. This is done to ensure the design is both feasible and realistic. During this stage, the Flemish Advisory Council for Education provides advice to the minister of education. The advice provided by the advisory council is based on input received from participants, such as schools, trade unions, parents and students, and, during the early stages, other sectors besides the educational sector are also consulted. A broad social debate is initiated and within the Department of Educational Development an information and communication work group for attainment levels is established.

During the decision-making stage, the Flemish government then decides whether to present the proposal and advice from the Flemish Advisory Council for Education to the Flemish parliament for approval. In case of agreement, this will occur within a month; in case of disagreement, the dossier will be referred back to one of the previous stages for a new proposal. Finally, the Flemish parliament will confirm the attainment levels, if necessary, after amendments have been made.

England

As noted earlier, in January 2011, the Secretary of State for Education announced a major review of the national curriculum in England. The process of review, led by the Department for Education and supported by an advisory committee (comprised exclusively of educators and a review panel made up of teachers, academics, business and industry), provided insight into strategies and practices for future curriculum development.

The advisory committee's role is to support the Department of Education in carrying out the review and in framing the final recommendations, with the goal of offering a wider perspective on the proposals put forward by the expert panel on strategic issues arising from the review. One of the major objectives of the review is to give teachers more autonomy on how they plan and teach the curriculum. As well, there is a desire to enable parents to better understand what their children are learning, so they may support their education. One of the rationales for the review is that the government hopes to reduce "unnecessary prescription, bureaucracy and central control throughout the education system" (England Department of Education, 2011b, p. 3).

Given the scope and the challenge of the review, the government decided to extend the timetable, so that the implications for and recommendations by the expert panel could be debated further by teachers, governors (school trustees), academics, business and parents, and so that schools have more time to prepare for a new curricula. Instead of new curricula for English, mathematics, science and physical education being implemented in 2013—and any other subjects in 2014—new curriculum for all subjects will now be implemented in 2014.

The draft programs of study will be sent to the Secretary of State for Education, the Minister of State for Schools, the Minister of State for Further Education, Skills and Lifelong Learning, and other members of the Ministerial team in the Department for Education for consideration, followed by public consultation. It would appear that the Department for Education is committed to consulting with a range of stakeholders in developing programs of study and intends to "organize a series of consultation events for key stakeholders and work to ensure head teachers, classroom teachers, parents and others are able to contribute to the work of developing the new national curriculum" (England Department of Education, 2011b, p. 7).

Scotland

In 2002, the Scottish parliament committed to a collaborative approach to educational reform (Hooghoff & Bron, 2008, p. 12). Preliminary work on curriculum development was limited to the main professional institutions, such as the Scottish Qualifications Authority, school boards, universities, teachers and head teacher representatives (Hooghoff & Bron, 2008, p. 25).

From the National Debate on Education in 2002 through to the drafting and preparation of the experiences and outcomes for publication, teachers were asked to contribute their knowledge and expertise to the process. Writing teams of practitioners were formed for each curriculum area, brought in, on secondment, from the classroom and other posts in education to Learning and Teaching Scotland to develop the experiences and outcomes. Throughout, they worked in collaboration with colleagues from the Scottish government, HM Inspectorate of Education and Scottish Qualifications Authority.

The teams drew upon evidence of effective practice in Scotland and beyond, research and international comparisons. One of the main responsibilities of members on the development teams was to ensure that, throughout the process, they drew on the expertise and advice of a wide range of staff in early learning centres, schools, universities, colleges and across all settings where learning takes place. They did this at meetings, events, seminars and focus groups, picking up ideas and case studies of good practice. They maintained contact with subject networks and other specialist forums.

Learning and Teaching Scotland published the proposed experiences and outcomes in draft format to give practitioners and wider stakeholders the opportunity to comment. There was further extensive engagement during the refinement process leading up to publication.

The curriculum guidelines were subjected to a rigorous quality assurance process to ensure they would meet the needs of learners and that they were in keeping with the purposes and principles of *Curriculum for Excellence*. The Curriculum for Excellence Management Board, made up of organizations which have national roles in Scottish education, has overall responsibility for delivering the program. The

organizations involved include the Scottish Government, the Association of Directors of Education in Scotland, Learning and Teaching Scotland, the HM Inspectorate of Education and the Scottish Qualifications Authority (Education Scotland, 2012).

Learning and Teaching Scotland published the draft experiences and outcomes in stages for engagement and trialing (piloting). The main purpose of this activity was to gather views on the draft experiences and outcomes, in order to further develop and make improvements in response to those views. In addition, engagement and trialing was an important contribution to the process of change for the *Curriculum for Excellence*.

The University of Glasgow, commissioned to do the analysis on the draft experiences and outcomes, summarized the feedback for each subject area and provided insights to inform the next stages of development. Groups of curriculum and subject area specialists, drawn from all sectors of education and national organizations, examined the analysis of responses for each curriculum area and made recommendations for action to refine and supplement the draft experiences and outcomes. Further engagement was then used to test reactions to the proposed changes—those involved included a wide range of practitioners, partners and specialists.

The final quality assurance and approval stages involved all national partners and the Curriculum for Excellence Management Board. Following further quality assurance processes, the new curriculum guidelines were published in 2009 for implementation in 2010. Education Scotland continues to support the profession, local authorities, schools and teachers in developing, at a local level, *Curriculum for Excellence* during this period and beyond.

Finland

Vitikka, Krokfors and Hurmerinta (2012) describe the process of creating the national curriculum as being both democratic and hierarchical. Educators, parents and a wide range of stakeholders are consulted. The process of development includes school administrators, teacher unions and school staff to build both ownership and consensus on curriculum as policy. The development of structures for collaboration has been central to the development process. The authors also note this approach has resulted in more coherent curriculum than in the past, when curriculum was developed by subject matter experts with scant attention to shared approaches, educational aims and pedagogy. However, it is known that triggers for curriculum change, like in New Zealand, include time between development cycles, teacher satisfaction with programming outcomes, student performance on national and international tests, and research.

Further, in terms of management strategies and practices, one of the most significant principles of Finnish education since the 1970s is to "… facilitate networked-based school improvement collaboration between schools and non-governmental associations and groups" (Sahlberg, 2011, p. 126) and within this principle is the idea of *networked collaboration.* This idea moves beyond New Public Management and into networked governance, which is seen by Bourgon (2008) as "… the most powerful innovation in organizational development of the past 25 years" (p. 396) and capable of "… transforming the role of … government" (p. 396). Networked collaboration is a way for governments to capitalize on social capital

created through community interactions for policy development on mutually agreed-upon goals. Networked collaboration requires a significant shift in government moving away from hierarchical, legal authority and market mechanisms to shared values and trust. In so doing, government can engender greater participation, satisfaction and outcomes for the community. For curriculum in Finland, this means the creation of government and community structures that are based on a collaborative relationship that is long term and involves highly interdependent linkages, shared common missions, risk and reward (Brown & Keast, 2003, pp. 2–3, 11).

Theme 3: The Role of Government and Level of Stakeholder Involvement and Engagement in Curriculum Development

Role of Government

Canadian Jurisdictions

In Canada, all provincial and territorial ministries have roles in curriculum development and the revision process. These roles can include leading, developing and distributing curriculum, developing assessment standards and providing lists of either prescribed or recommended resources. Some ministries also create their own resources.

All Canadian provincial and territorial ministries write at least a portion of their own programs of study. However, provinces and territories may be part of partnerships, such as the Western and Northern Canadian Protocol or the Council of Atlantic Ministers of Education and Training. Within these partnerships, ministries may adopt curriculum without changing it, adopt it with modifications (e.g., Newfoundland and Labrador adapted the Western and Northern Canadian Protocol mathematics) or choose not to use it. The Council of Atlantic Ministers of Education and Training has developed Essential Graduation Learnings that have been adopted by the four Atlantic provinces. These overarching learnings provide a framework for provincial curricula from which further learner outcome development occurs.

International Jurisdictions

Australia

In 2009, the Australian parliament established a statutory authority called the Australian Curriculum, Assessment and Reporting Authority. This independent authority has the following main functions: developing a national Kindergarten to Grade 12 curriculum that consists of content and achievement standards; developing and administering national assessments; and collecting, managing and analyzing student achievement and other data to report on school and system performance (Australian Curriculum, Assessment and Reporting Authority, n.d.b, para. 1). School education (including enrollment policies, curriculum content, course accreditation and certification procedures, and assessment practices) is considered the constitutional responsibility of the states.

School jurisdictions and authorities are responsible for supporting the implementation of the Australian Curriculum. With support from the Australian Curriculum, Assessment and Reporting Authority, states and territories have already begun planning for implementation and this work continued in 2011. The learning/subject areas of English, mathematics, science and history were implemented in 2011. The education ministers had agreed earlier that the nature and timing of implementation of curriculum was a matter that had to be considered by each state and territory, with schools being able to opt into earlier implementation. However, the ministers also agreed that significant implementation needed to be in place in all schools by the end of 2013 (Australian Government, Department of Education, Employment and Workplace Relations, 2010; Australian Curriculum, Assessment and Reporting Authority , 2010a). The Australian Curriculum, Assessment and Reporting Authority site contains the plans devised by each state and territory for implementation of the national curriculum.

With the upcoming national curriculum coming on board, the Australian government moved to centralize various services under an umbrella organization called Education Services Australia. Schools Catalogue Information Service represents the merger of Curriculum Corporation and Education.au Limited and is now a not-for-profit business unit within Education Services Australia. The Schools Catalogue Information Service represents an established partnership involving all Australian Education Ministers and the New Zealand Ministry of Education (Education Services Australia, 2012b). Its main purpose is to provide schools with an access to a resource cataloguing database that contains resource records that are written, following established standards. The aim of this service is to reduce the cost and duplication efforts of resource cataloguing in schools, while ensuring high quality and consistency in cataloguing of materials for schools. The Schools Catalogue Information Service database contains over one million educational materials; i.e., books, audiovisual materials, digital resources, websites.

Other resources are also provided through Education Services Australia. One of the entities that is managed by Education Services Australia is the National Digital Learning Resources Network for the Ministerial Council on Education, Early Childhood Development and Youth Affairs that uses research to inform the use of digital resources for learning and teaching (formerly known as The Le@rning Federation). This service aligns digital resources with the Australian curriculum, provides access to the national collection of digital resources (supported through jurisdictional digital resource sharing) maintains licensing and copyright for the national collection, in addition to maintaining the technical infrastructure. The National Digital Learning Resource Network is also responsible for hosting existing systems to permit national distribution of acquired digital resources.

The collection, infrastructure and standards were developed as a collaborative effort by all the Australian jurisdictions and are jointly owned. Currently there are over 12 000 digital resources available free of charge to all schools in Australia, accessed through state or territorial portals or through the *Scootle* portal. The available resources include interactive multimedia resources; audio, video and photo collections; open-ended tools that permit teachers and students to create learning resources; interactive assessment materials; samples of student work, teacher ideas, unit plans and curriculum resources. The infrastructure houses the digital resources and metadata repository (an exchange system that allows for teacher sharing), and links to web services provided by the states and territories

as well as the national web portals for teachers and preservice teachers (Education Services Australia, 2012c).

Another interesting feature that is available is the *Schools Online Thesaurus* (ScOT), which provides an ensemble of vocabulary terms used in Australian and New Zealand schools, including terminology related to school subjects and educational and administrative processes. The purpose is to aid teachers in identifying high quality learning and teaching resources to meet their needs and those of their students. The thesaurus also has the capacity to link non-preferred terms to those used in the curriculum to assist in alignment. The other feature of this system is that "ScOT terms enable [sic] clusters of related resources to be identified within vast pools of content … [and] can be used as a tool to zoom in on items of interest" (Schools Online Thesaurus, 2012, para. 3).

In addition, Curriculum Press is a major provider of curriculum materials in Australia. Its compilation of curriculum resources is intended to support both experienced teachers and those new to the profession in developing enriching learning experiences for their students.

Belgium (Flanders)

Currently, Flanders has four different educational umbrella groups responsible for schooling. These include the Council for Community Education, Free Subsidized Education, the Educational Secretariat of Towns and Municipalities and Flanders Provincial Education. These umbrella organizations form an intermediate level in the policy formulation between the Department of Education and the schools themselves.

As a result of the ties with political parties, the different umbrella organizations have, over the years, built up their unique and autonomous governance. For example, the Council for Community Education has only a single school board, while the other organizations consist of a collection of school boards, each of which is independent from the next. Guidelines from the umbrella organizations and other community education bodies may or may not be observed by the local school boards.

Unusual for a European jurisdiction, Flanders does not have a central examination program, nor does it have a centrally developed curriculum. In relation to other surrounding countries, the Flanders educational system is very autonomous. To ensure the quality of the education, there is an inspectorate body for primary, secondary and adult education. The main tasks of the inspectorate are outlined in a decree (1991) requiring the inspectorate to focus on the school rather than on each individual teacher (De Coninck, 2008).

The Flemish parliament is responsible for approving this procedure and receiving various inputs from society, in general, to ensure the developed minimum attainment levels will have broad social support and will have the approval of the majority of interested parties.

England

The Department for Education, which can be traced back to the Department for Education and Skills, was a United Kingdom government department between 2001 and 2007. It was responsible for the education system and children's services in England. In 2007, the department was split in two by

Gordon Brown's government into the Department for Children, Schools and Families and the Department for Innovation, Universities and Skills.

In May 2010, the Department for Education was formed. The department, responsible for both education and children's services, focuses on a number of priorities, such as the reform of the national curriculum, and gives greater autonomy to schools on how they plan and teach the curriculum.

As noted earlier, the Department for Education is currently leading the review of the national curriculum by relying upon an advisory committee of educators and review panel made up of teachers, academics, business and industry to provide recommendations to the government. Stakeholder engagement has been done through questionnaires and face-to-face seminars (Bron, Hooghoff & Timmerhuis, 2009, pp. 28–29), and e-consultations. Extrapolating from the current review process of the National Curriculum, it would appear, that while the Department for Education will be leading, it will be doing so in collaboration with educators and stakeholders by seeking advice, input and recommendations for future curriculum and other reform initiatives in England.

Finland

The Finnish government sets out the general goals and purposes of education, as well as the distribution of classroom hours for each subject area. The Ministry of Education outlines the legislation and the government's decisions with respect to education (Kupiainen, Hautamäki & Karjalainen, 2009). Education in Finland is organized and provided by local authorities (mainly municipalities) who play an important role as education providers.

"There are two ministers within the Ministry of Education—the Minister of Education and Science deals with issues relating to education and research, while the Minister of Culture and Sport focuses on responsibilities related to culture, sports, youth, copyright, student financial aid and church affairs" (Eurybase, 2009/2010, p. 10).

The Finnish National Board of Education is a national agency subordinate to the Ministry of Education. The board is tasked with a number of responsibilities related to education, including pre-primary and basic education; general upper secondary education; vocational education and training; formal adult education and training; liberal adult education; and basic education in the arts (Finnish National Board of Education, n.d.a).

The national core curriculum is developed by the Finnish National Board of Education. Reform processes are initiated at the national level, but schools and municipalities have the responsibility to develop their own curricula, select textbooks and instructional methods. Thus, the strategy is a blend of centralized and decentralized approaches (Frassinelli, 2006). Schools are authorized to access the national framework for developing curriculum that is more localized in nature. Within the local curriculum, decisions are made with respect to the educational and teaching tasks of basic education while addressing the purpose of the subject matter outlined in the national core curriculum (Finnish National Board of Education, 2004, p. 8).

The Finnish National Board of Education also coordinates information networks and services in the education sector, produces indicator data and information for anticipating educational needs, maintains the financing system for the education sector, and publishes training guides (Finnish National Board of Education, n.d.b). Vitikka, Krokfors and Hurmerinta (2012) note that previously the Finnish National Board of Education approved all textbooks, but now publishers can develop resources that have a strong influence on teaching and learning in Finnish schools. The learning materials used in Finnish schools are mainly produced by commercial publishers. The Board also produces materials with a relatively small circulation for unique groups. Schools and teachers are able to decide on the materials and textbooks and/or resources to be used in the classroom. This also applies to the use of information and communication technology.

Kupiainen, Hautamäki and Karjalainen (2009, p. 21) note that the Finnish National Board of Education conducts national assessments of curricular outcomes in general and in vocational education. "These comprise alternate yearly assessments of mathematics and mother tongue at the end of basic education (Grade 9), occasional assessments in other subjects and at other grade levels and, lately, longitudinal assessments in key subjects" (p. 21). The national guidelines and principles for student assessment are detailed in the core curriculum.

Assessment is the responsibility of individual schools in Finland. However, there is a national standardized examination called the National Matriculation Examination (Frassinelli, 2006). This examination, much like the Scholastic Aptitude Test, enables students to continue to post-secondary studies and takes place at the end of upper secondary school and is regulated by Section 18 (766/2004) of the *Upper Secondary School Act*, the *Act on the Organisation of the Matriculation Examination (672/2005)* and the *Government Decree on the Matriculation Examination (915/2005)*. "The Matriculation Examination Board is responsible for administering the examination, its arrangements and execution" (The Finnish Matriculation Examination Board, n.d., para. 4).

In terms of technology, Finland has experienced three stages of policy innovation in digital learning resources resulting in varying and overlapping methods of incorporating digital resources in schools. There has been a gradual shift of focus away from: 1) providing digital infrastructure and teacher professional development opportunities with new technologies; and 2) creating curricular materials and digital tools for teachers. There is now a more direct focus on using digital resources in conjunction with whole school reform and learning environments, with the goal of altering classroom pedagogy (Organisation for Economic Co-operation and Development, 2008).

The majority of new approaches have benefited from communication exchange with other Nordic countries throughout the 1990s. As such, a variety of innovative techniques have resulted in classroom and school infrastructure standards, a wide selection of quality digital resources from various government and non-government areas, various university-based research and development activities, online teacher in-service programs, and novel uses of video game resources and equipment.

In addition, Finnish teachers have access to the Peda.net tool, which is a subscription-based service that originated from a small research and development project at the Finnish Institute for Educational Research, University of Jyväskylä. This project provides municipalities and schools in Finland with the

technological capabilities (via a portal) for teachers to develop, accumulate, modify and distribute information. It is also a tool for writing, maintaining and publishing the school curriculum. The fees associated with Peda.net are dependent on the population and number of schools within a municipality or the number of students enrolled in a school. Future plans to further develop the Peda.net involve the incorporation of additional tools that will offer pedagogical support, including features related to new uses of digital learning resources and curriculum-based models and practices (Organisation for Economic Co-operation and Development, 2008).

Germany

Germany is a federal republic with 16 states (*Bundeslaender*), and, constitutionally, each state has sovereignty over education. The federal parliament and government can influence education through financial support, but each state has its own school system. The Standing Conference of the Ministers of Education and Cultural Affairs of the federal states (*Kultusministerkonferenz*) meets regularly to discuss education.

The Programme for International Student Assessment results released in 2001 and the global political and economic changes, including the reunification of Germany, resulted in the need for education policy. Specifically, the German Ministry of Education called for policy aimed at higher performance, increased enrolment in higher education, and a focus on individual students' strengths and abilities. In addition to national standards, other reforms such as reduction of school years from 13 to 12 for Gymnasium schools and the creation of a research institute (*Qualitätsentwicklung im Bildungswesen* within Humboldt University) in 2004 to establish national performance standards and tasks for implementation (Leyendecker & Letschert, 2008). Drafts were developed and posted for feedback with the final stage involving the curriculum being tested in schools. Curriculum or the *Rahmenlehrpläne* then defines educational standards for each subject, while schools and teachers are required to design instruction (Leyendecker & Letschert, 2008, p. 41).

To facilitate implementation of curriculum, the two state institutes for school development (National Institute for School and Media in Berlin and Brandenburg) were combined into a single institution. This institute is now responsible for the development of curriculum, standards-based examinations for secondary schools, curriculum pilot projects, professional development, and multimedia and web-based resources (Leyendecker & Letschert, 2008).

Korea

The various organizations tasked with the administration of education consist of the following three levels of authority: the Ministry of Education at the national level, offices of education at the municipal and provincial level, and district offices of education at the county level. In order for educational autonomy to occur at the local level, each municipal or provincial office of education has a board of education. This board has administrative powers related to important decision-making matters pertaining to education. Each school also has a school council, which ensures the autonomy of the school's management and assists in increasing community involvement (INCA, 2011a).

Korea's Ministry of Education, Science and Technology is responsible for all areas related to school education, vocational education and lifelong learning, education policy planning and human resources policy, educational welfare, science and technology policy, educational research policy, and international cooperation (INCA, 2011b). "Article 23 of the *Elementary and Secondary Education Law* states that schools should administer the curriculum; that the Minister of Education has the power to determine the standards and content of the curriculum; and that school superintendents may establish further standards and content to reflect their district's particular situation (within the limits of the curriculum set by the Minister)" (INCA, 2011b, para. 2).

Korea's Ministry of Education, Science and Technology sets the curriculum for each level of schooling from Kindergarten to high school. However, recent curriculum reforms in Korea have placed more importance on the decentralization of curriculum control. For instance, the Sixth National Curriculum permitted local education authorities to select and teach appropriate subject areas and to determine the unit number of courses required at the high school level. Individual schools were also encouraged to amend the national curriculum or develop new subjects while considering the needs and circumstances of the school and local communities, and the interests of students, teachers and community members (INCA, 2011b).

The Korea Institute for Curriculum and Evaluation, established in 1998, is an educational research institute that receives funding from the Korean government. It provides advanced research on curriculum development for elementary and secondary schools and educational evaluation. The research work of the Korea Institute for Curriculum and Evaluation has also included "… improvement of teaching and learning methods, development and authorization of textbooks and the implementation of national-level educational tests" (Korea Institute for Curriculum and Evaluation, n.d., para. 2).

Close collaborative ties have been formed between the Korea Institute for Curriculum and Evaluation and government, academic circles, and teachers and students through public meetings and seminars. The institute is also involved in policy development and actively participates in collaborative international research projects. Over 600 research projects having been completed since its inception. The institute actively engages teachers, students and education specialists in its research pursuits. Research into elementary and secondary school curricula has been one of the main functions carried out by the institute. Its objective is to contribute to the development and formation of Korea's national curriculum as well to carry out research into curriculum by analyzing comparative international studies (Korea Institute for Curriculum and Evaluation, n.d.).

Korea's Ministry of Education, Science and Technology also sets the criteria for developing textbooks and instructional materials. There are three types of textbooks—those:

- whose copyrights are held by the Ministry of Education (nearly all elementary school textbooks are government copyrighted, as well as those for Korean, Korean history and moral education at the middle and high school levels)
- produced by commercial or private publishers which are authorized by the Minister of Education (this applies to most textbooks used in middle schools and high schools)

- which are approved by the Ministry of Education, on the request of school principals or superintendents of municipal and provincial boards of education (this is the rarest type of authorized textbook in Korea (INCA, 2011a 2011b).

In addition to textbooks, Korea's Ministry of Education, Science and Technology expects municipal or provincial education authorities to create and distribute various types of teaching and learning materials. Schools are encouraged to also make use of a number of multimedia resources; e.g., radio or television programs, audiovisual materials and computers. Furthermore, teacher handbooks, audiotapes and videotapes, computer software, etc. are also made available to schools (INCA, 2011a).

For Kindergarten, a collection of government-copyrighted instructional materials has been developed. The government also regularly develops four or five types of instructional materials, such as teachers' instructional guides, students' play tools and parents' educational materials, which it distributes free of charge to Kindergartens nationwide (INCA, 2011a).

In relation to other types of curriculum materials, the Educational Broadcasting System has been in operation since 1990 to provide support and expand opportunities for education. It operates one public television channel, two satellite television channels and one radio channel. While the Educational Broadcasting System is involved in the planning, organization, production and delivery of education broadcasting, the Korean Broadcasting System is responsible for its transmission. Approximately 40% of the budget is subsidized by Korea's Ministry of Education, Science and Technology which provides its feedback on the basic format of all programs (INCA, 2011a).

Educational broadcasting programs are accessible via television for most hours in the day from Monday to Friday (over 13 hours) and for 24 hours over the weekend, while radio programs are broadcast 20 hours each day (INCA, 2011a). Access to technology has been made available through the Digital Library Support System, which is "a system that supports school libraries which are built within Metropolitan and Provincial Offices of Education, and is an Internet-based, one-stop service system that helps the school library carry out the function of a teaching learning support centre, digital library, and a reading and culture centre" (Korea Education and Research Information Service, 2004, p. 10).

Another prominent initiative is the Cyber Home Learning System, which is targeted primarily for elementary and secondary students in grades 4–10. The primary goals and outcomes for this initiative include more educational opportunities for students who are economically and geographically challenged, reduced costs related to private tutoring for lower income families, and higher achievement rates for students with lower academic achievement.

New Zealand

The Government of New Zealand determines the overall structure and layout of education. The Ministry of Education is responsible for providing guidance to the government and assists in the implementation of education policy. The Ministry of Education offers policy advice to the Minister of Education on all education matters extending from early childhood to post-secondary education (UNESCO, 2006). "It is also responsible for developing specifications for the curriculum (curriculum statements), allocating resources and monitoring effectiveness. Local government has no educational role" (INCA, 2012).

Schools in New Zealand are self-governing and individual schools establish their own rules, school policies and teaching programs.

The Ministry of Education controls curriculum development for schools. The New Zealand curriculum is the official policy document that outlines teaching, learning and assessment in New Zealand's English state schools (including integrated schools). The main objective of the New Zealand curriculum is to set the overall direction for student learning and offer assistance to schools as they plan and evaluate their curriculum. The curriculum itself is designed to encompass "all students … irrespective of their gender, sexuality, ethnicity, belief, ability or disability, social or cultural background, or geographical location" (New Zealand Ministry of Education, 2007, p. 6). A similar document was also created for the Māori-language schools.

The New Zealand Ministry of Education sets the standards for learning through the development of national guidelines that include curriculum statements and achievement standards. The ministry also supports teachers and principals through professional leadership opportunities, professional development programs, scholarships and awards. In addition, they support teaching and learning through resources and assessments (New Zealand Ministry of Education, 2012a).

The current national curriculum guideline provides a succinct description of each learning area (subject) and how learning is to be structured. This document, created by the government, was validated by more than 15 000 stakeholders (students, teachers, principals and teams of academics) prior to its implementation in 2007 to ensure that the outcomes outlined were current, relevant and well-defined (New Zealand Ministry of Education, 2012b). The national curriculum serves to outline broad outcomes and schools are required to develop their own curricula based upon these guidelines.

The New Zealand Qualifications Authority, appointed by the New Zealand Ministry of Education, ensures the credibility and robustness of New Zealand students' qualifications nationally and internationally. As schools have the mandate to develop curriculum at the local level, they also determine the methods by which they will gather, analyze and make use of assessment information. The Ministry creates a number of resources to assist with school-based assessment practices. The Assessment Resource Banks include an online compilation of assessment materials in English, mathematics and science. The *Assessment Tools for Teaching and Learning* is another resource tool (available in both English and Māori) that is used to assess students' literacy and numeracy skills. In using this tool, teachers may choose their test content and difficulty, which are aligned with their teaching programs; *Assessment Tools for Teaching and Learning* also analyzes and graphs student performance. Teachers then access a list of online classroom resources which they can use to plan future learning (New Zealand Ministry of Education, 2005; INCA, 2012).

Learning Media is a state-owned company that collaborates closely with the Ministry of Education. The company produces many of the resources that the Ministry of Education then provides, typically free of charge, to educators and students. "The New Zealand approach is not a textbook-based curriculum. Consequently, books are not approved by the State. However, some curriculum-related resources are developed with government funding and are published by Learning Media on a contract basis, or by the New Zealand Council for Educational Research" (INCA, 2008a).

Learning Media is also an exporter of literacy materials and programs to a number of international countries, including the United States, Canada, the United Kingdom, Australia and nations of the Pacific. The company is considered the largest publisher of te reo Māori resources and their materials are published in five Pasifika languages. Learning Media also manages the Ministry of Health's education resources and creates educational resources that are aligned with the curriculum through a variety of media outlets for various public and private organizations in New Zealand (Learning Media, 2009).

A professional development team at Learning Media creates and oversees literacy and assessment training programs for schools and teachers in New Zealand. The company has been providing professional development services to the Ministry of Education over the past six years. It also collaborates with the Ministry of Education in developing teaching and learning guides for senior secondary school subject areas. These documents serve as additional components to the New Zealand curriculum and offer guidance on planning, teaching and assessment (Learning Media, 2009).

New Zealand's National Education Monitoring Project was designed to examine the educational achievements and attitudes of students enrolled in primary and intermediate schooling from 1995–2010, and was funded by the Ministry of Education. It was organized by the Educational Assessment Research Unit at the University of Otago. The cost of the contract was roughly $2.7 million per year and nearly half of the funding was used to pay for the time and expenses of the teachers who provide assistance with the assessments as task developers, teacher administrators or markers. The main objectives of the National Education Monitoring Project was to provide a broad understanding of students' knowledge and abilities across all major learning areas in the school curriculum so that trends in educational performance could be identified, as well as to provide information to aid policy makers, curriculum specialists and educators with their planning. The National Education Monitoring Project also informed the public about national trends in students' educational achievement (National Education Monitoring Project, 2009).

Scotland

Since 2002, curriculum has been revised for students from ages 3 to 18. This initiative, launched by the Scottish government, was to make curriculum address the needs of future citizens and the knowledge economy and to increase the coherence, efficiency and effectiveness of the curriculum. This initiative was not launched because of any perceived weakness in the curriculum; rather, it was the first major action of the newly installed Scottish parliament that was established as a devolved government within the United Kingdom. Prior to the revision of curriculum, the Scottish government initiated the National Debate in 2002 that focused on ways to create shared values for Scottish education and to identify strengths of the existing curriculum and desired changes. The debate included all education authorities

and independent schools in Scotland. The Minister of Education endorsed the conclusions of the debate and followed up with a ministerial response in 2003. Following the ministerial response, a Curriculum Review Group, comprised of educators, parents, administrators and a school board chair, was struck to develop the objectives of the *Curriculum for Excellence*. Specifically for curriculum, these findings included:

- increasing choice of curriculum to meet students' needs and aspirations and realize their individual talents
- reducing the duplication and inconsistencies in the curriculum
- improving the continuity between the different stages of curriculum from ages 3 to 18
- reducing the number and complexity of assessments and making sure these assessments and examinations are used to support learning
- improving numeracy and literacy
- preparing youth for work by providing skills for tomorrow's job market
- creating a better balance between general and vocational skills.

Features of the existing curriculum that were retained included the:

- flexibility of the Scottish education system
- balance between breadth and depth of the curriculum by providing more space in the curriculum for in-depth study and the attainment of broader outcomes from school education
- quality of teaching materials.

In February 2011, Education Scotland was established to lead and support the implementation of *Curriculum for Excellence* and to evaluate the quality of education by providers, such as local authorities. Education Scotland was also charged with promoting professional learning and stimulating innovation. The Minister will continue to set policy and strategy for the education system at the national (Scottish) level (Education Scotland, 2011).

As part of their curriculum change process, the Ministry of Education has moved to a closed access interface that is situated within the GLOW portal, allowing teachers to plan and monitor learning through a web page called *My experiences and outcomes*. GLOW provides for a trusted and safe environment for students, parents and teachers to create personalized programs and to share learning and teaching resources. GLOW also provides for a variety of online tools to enhance learning and to facilitate collaboration across the network (Education Scotland, n.d.).

In GLOW, users can browse through experiences and outcomes within and across subject areas. They can save outcomes as they browse and then organize them into themes or organizational groups. They can then be stored online or saved as a downloadable file for future use. The GLOW network includes teaching and course materials, schedules and feedback interfaces, and connects over 800 000 teachers and students (Hooghoff & Bron, 2008, p. 39).

Stakeholder Involvement and Engagement

Nationally and internationally, the definition of education stakeholders includes those working in the education field; i.e., teachers, principals, central office staff, university researchers, professors of education. The importance and the assumed value of engaging with the client/customer and consumer of education is recognized in some jurisdictions. The engagement of teaching communities, professional associations, academics, industry and parent and community groups is considered essential for developing and implementing curriculum at the national or provincial/territorial or state level. Technology is providing for a variety of ways in which stakeholder input and feedback is being used to develop and vet curriculum. Technologies, such as videoconferencing, podcasts, chats, online forums, e-mail, surveys and online newsletters, are used to facilitate engagement. Interactive websites are also being used to allow for varying degrees of engagement for different stakeholder groups and to allow for the self-identification of stakeholders who may not be immediately evident.

The following section describes some of the practices that are being used to extend and enhance stakeholder involvement and engagement. The descriptions provide a glimpse into what has occurred in recent curricular change in various jurisdictions around the world. It is important to note, however, that the engagement processes described below may not necessarily represent standard practice.

Canadian Jurisdictions

British Columbia, in its *redesign*, will engage with a number of stakeholders internally and externally. In the past, to solicit feedback, the department has used online survey forms, which can be filled out and submitted electronically for new or revised curriculum.

In Ontario's review process the following stakeholders are involved: Minister's Advisory Council on Special Education, Faculties of Education, parents, students, universities, colleges and other ministries (Ontario Ministry of Education, 2010).

International Jurisdictions

Australia

Australia's state governments agreed to establish the Australian Curriculum Assessment and Reporting Authority to oversee the development of the country's national curriculum. This authority is developing the Australian curriculum in consultation with a network of stakeholders, which includes teachers, principals, government, state and territory education authorities, professional education associations, business and industry, community groups and the general public. This authority has also been advising education ministers on the approach to developing the learning areas for health and physical education, economics, business, information and communication technology, design and technology, and civics and citizenship (Australian Government, Department of Education, Employment and Workplace Relations, 2010).

As Australia continues to go through its development of a national curriculum, stakeholders are invited to register on the Australian Curriculum, Assessment and Reporting Authority website to read the draft outcomes, and review and provide feedback by means of an online questionnaire and also through the submission of comments by e-mail. This is a closed access website which requires the user to create a login name in order to participate. The feedback is then used to make revisions to the draft. Once the curriculum document has been vetted and feedback has been obtained, it is posted on an open access website which is available to the public. Users can search by subject area and are offered multiple filters for accessing the subject area content and learner outcomes that they seek. The available options by which to filter the information are strands, general capabilities and cross-curriculum priorities. "View options" provides flexibility for the user as the content can be viewed by learning area, one year at a time, by year across learning area, by multiple years for the same learning area and by content level descriptions.

Belgium (Flanders)

As noted earlier, in the development of attainment levels, there is considerable engagement of Belgian (Flanders) society as a whole via social debate led by the Department of Educational Development. This procedure is designed to receive various inputs from society, in general, in order to ensure the developed minimum attainment levels will have broad social support and will have the approval of the majority of interested parties. While the attainment levels are developed by educator working groups, the Flemish Advisory Council for Education provides advice to the minister of education. Within the Council, all participants, such as schools, trade unions, parents and students, are also consulted.

Once the attainment levels have been developed, the Flemish government presents the proposal and advice from the Flemish Advisory Council for Education to the Flemish parliament for approval.

England

As noted earlier, when describing the current situation relating to the review of the national curriculum in England, the Department for Education, while leading the review, was relying upon an advisory committee of educators and a review panel made up of teachers, academics and business and industry to provide recommendations for the national curriculum in England.

To address the scope and challenge of the review, the government has been engaging primarily stakeholders from education in this review. For example, the expert panel reviewing subjects that are currently part of the national curriculum is comprised of educators and chaired by an official from the Department for Education. For the national curriculum, stakeholder engagements have included questionnaires, face-to-face seminars (Bron, Hooghoff & Timmerhuis, 2009, pp. 28–29) and e-consultations. As part of the review, the Department for Education has used a number of channels to raise awareness of the review. These include the department's website, social media, partner and stakeholder organizations, and publications. Events have also been organized to engage subject matter stakeholders. The review team and department officials participated in a number of events, such as workshops, meetings and conferences.

The implications and recommendations of the expert panel will be debated further by teachers, governors (school trustees), academics, business and parents. At present, the process of development of the draft programs of study for the revised national curriculum calls for a review and consideration by the Secretary of State for Education, the Minister of State for Schools, the Minister of State for Further Education, Skills and Lifelong Learning, and other members of the Ministerial team in the Department for Education. This review and consideration would then be followed by a public consultation with a range of stakeholders about developing programs of study. To enable this engagement and consultation, the Department for Education intends to "organize a series of consultations events for key stakeholders and work to ensure head teachers, classroom teachers, parents and others are able to contribute to the work of developing the new national curriculum" (England Department of Education, 2011b, p 7).

Finland

An extensive consultation process takes place before the core curricula is approved in Finland. The Finnish National Board of Education collaborates with a number of key partners, including expert and interest groups, providers of education, teachers, etc., when preparing the curricular framework and determining the details of education programs.

> For instance, the most recently reformed core curriculum for pre-school education was prepared in extensive co-operation with the Ministry of Education, the Ministry of Social Affairs and Health, the National Research and Development Centre for Welfare and Health, the Association of Finnish Local and Regional Authorities, the Trade Union of Education, the Finnish Book Publishers Association, as well as with the local authorities and their day-care centres and schools (UNESCO, 2007, p. 11).

Vitikka, Krokfors and Hurmerinta (2012) characterize the Finnish development process for the common core curriculum as a blended model between hierarchical–centralized and democratic–decentralized approaches to curriculum development. Reform processes are initiated at the national level, but schools and municipalities, in consultation with educators, parents, stakeholders, teacher unions and unions, have the responsibility to develop their own curricula, select textbooks and instructional methods. This blended strategy aims to increase ownership of the curriculum (Frassinelli, 2006).

New Zealand

Representatives from a number of groups were involved in the development process which included "trials in schools, collaborative working parties, online discussions, and an inquiry into relevant national and international research" (New Zealand Ministry of Education, 2007, p. 4). This re-development process led to the release of *The New Zealand Curriculum: Draft for Consultation 2006.* The Ministry of Education gathered over 10 000 responses from the public following its draft publication. These submissions were then examined and taken into account when the final document was written (New Zealand Ministry of Education, 2007). "The national curriculum statements … are developed … after widespread consultation with teachers, other educators, boards of trustees, and the wider community, including the business community. In this way all (national curriculum) statements build on the best of New Zealand experience and research" (INCA, 2008b).

Scotland

From the outset, teachers were to be engaged fully in shaping the *Curriculum of Excellence*. Engagement enabled anyone with an interest in education to be part of the feedback and revision process. The draft experiences and outcomes were published online and were accompanied by an online questionnaire for individuals, groups, schools and organizations to use to provide feedback on their thoughts and views.

More than 600 early learning years centres and schools took part in formal trialing to test specific experiences and outcomes in practice across all curriculum areas. Schools and centres chose experiences and outcomes to trial and submitted reports containing feedback that was used to inform the revision process.

Thirty-seven focus groups were held, covering each curriculum area and involving practitioners, senior education managers, representatives from professional bodies, industry, parents and learners, to discuss the draft experiences and outcomes. In addition, 133 submissions were received from a range of sources including learned societies and specialist groups. The University of Glasgow collated, analyzed and reported on the feedback for all curriculum areas in April 2009 for implementation in 2010. A report of the findings is posted on the website with next steps indicated (Education Scotland, 2012).

Education Scotland has developed materials to involve school staff and learners in the Building Your Curriculum process. Schools, centres and their partners are expected to work together within and across school communities to share thoughts, views and ideas as they develop *Curriculum for Excellence*. Building your Curriculum is a process developed by Learning and Teaching Scotland to help schools and centres review their curriculum structures. School curriculum is a collaborative process which can be used to involve and engage the school community comprised of staff, parents, students and partners. They identify and build on their existing strengths and identify their priorities for change. Finally, they will create a curriculum plan to map out their proposed journey to show what the school will look like in a few years' time.

CONSIDERATIONS FOR CURRICULUM

From this chapter, it can be seen that the curriculum development process is as vast and varied as are the students for whom curriculum is intended. However, valuable learnings can be derived from the theory and experiences described in this chapter.

In 1998, Alberta Education produced the document *Deciding What Students Should Learn, How School Programs are Developed in Alberta* to detail what constituted programs of study and resources, and to describe the processes used for their development (see Appendix C). A more detailed draft framework of the curriculum development cycle processes and products was developed in 2006 (see Appendix D). The 2006 draft framework served as the baseline for curriculum development processes in Alberta Education. The stages outlined in the 2006 draft framework are to review, initiate, plan, develop, authorize, implement and maintain. Figure 2, which is an adaptation of the Curriculum Development process from 2006, shows these stages and identifies key aspects of each stage.

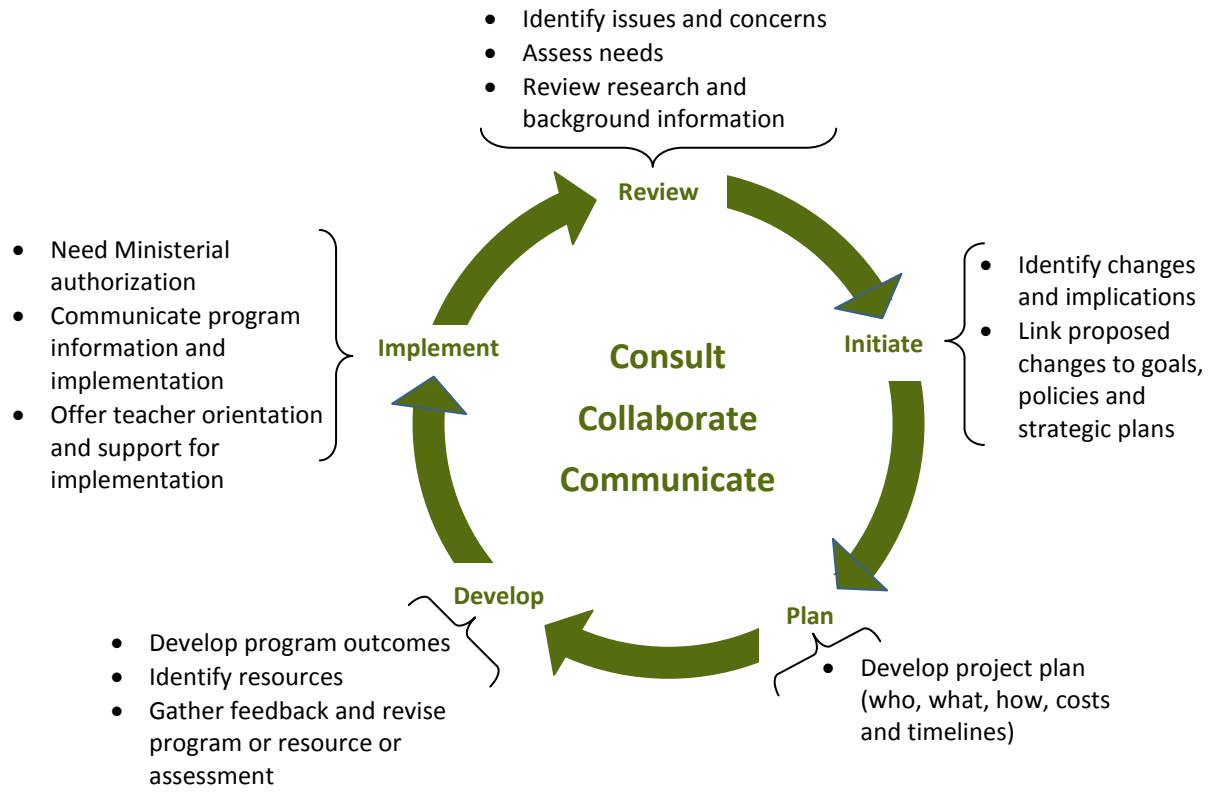

Figure 2: Adapted from Alberta Curriculum Development Process, September 2006 (Appendix D, p. 329)

This cycle has served well in the development of programs of study, but it has not been effective or efficient in meeting the rapidly changing needs of Alberta society, in developing curriculum (programs of study, assessment, and learning and teaching resources) in a simultaneous fashion nor indeed, in "evergreening" curriculum in a timely manner. As such, the following considerations can provide insight into possible future directions for curriculum development.

Theme 1: Consistency and Commonality in Programs of Study

Consistency throughout programs of study allows for all programs to be presented in the same manner to ensure coherence and cohesion in student learning regardless of the learning environment (e.g., face-to-face, e-learning, distributed learning). Different jurisdictions have achieved this in various ways, from developing broad curricula that is localized at the regional or school level to centralized curricula that is very prescriptive in nature. Different processes have been used to achieve this goal, such as government-appointed advisory committees that develop the curriculum, internal writing committees that include broad stakeholder engagements and that allow for contributions and feedback to be provided in a variety of ways; e.g., face-to-face engagements, e-mails, online surveys.

Looking for consistency and coherence is a cornerstone to successful implementation. One possibility for achieving this in the future is through the use of online access that allows for the tagging of programs of study data (learner outcomes) so that individuals can "build" a unique, customized, collection of programs of study or learner outcomes based on the individual needs of their students, as

has been done in Scotland. Programs of study can be organized by discipline or by level, or by any other categorization deemed educationally relevant. Commonality in the design of programs of study facilitates teacher understanding of the "big picture" goals of education. A common preamble can lay a foundation for the essential aspects of learning, such as competencies across all subject areas and subject-specific disciplines.

At its core, curriculum is concerned with the aims and content of learning which have been typically found in programs of study. A broader view of curriculum can be thought of as having a number of components, such as programs of study, assessment, and learning and teaching resources. Table 4, below, illustrates these components with their corresponding purpose. When these components are considered as a whole, as is the view of jurisdictions such as Australia and New Zealand, a more holistic and aligned learning experience is made available to students.

Table 4: Curriculum Components and Purpose (Adapted from Thijs & van den Akker, 2009, p. 12)

Component	Purpose
Programs of Study Rationale Goals and Objectives Content (e.g., affective, cognitive and procedural skills knowledge–factual and conceptual)	Describes: • the ***why*** of what students are learning • ***which aims and goals*** students are learning • the ***what*** that students are learning.
Assessment	Describes ***how student learning is being assessed*** whether *for*, *as* or *of* learning, including: • attainment levels and descriptors of indicators for each of the levels • assessment programs at provincial and jurisdiction levels.
Learning and Teaching Resources	Describes ***what*** students are learning ***with***, also includes supports for pedagogy, including: • assessments *for*, *as* or *of* student learning at a classroom or grouping (i.e., non-graded) level • learning activities based on learning experiences.

To achieve this coherency and consistency, process development plays a key role. Van den Akker and Kuiper (2007, as cited in Thijs & van den Akker, 2009, p. 15) describe a five-phased cyclical approach that occurs interactively and iteratively as seen in Figure 3 below. This approach is most often used when generic curriculum development occurs (p. 5). The process usually begins with the analysis phase and moves to the design phase, then to the development phase and then through to implementation;

however, central to this process is the evaluation phase that occurs at multiple points, as is demonstrated by the arrows. It is this iterative process that permits curriculum to become a quality product.

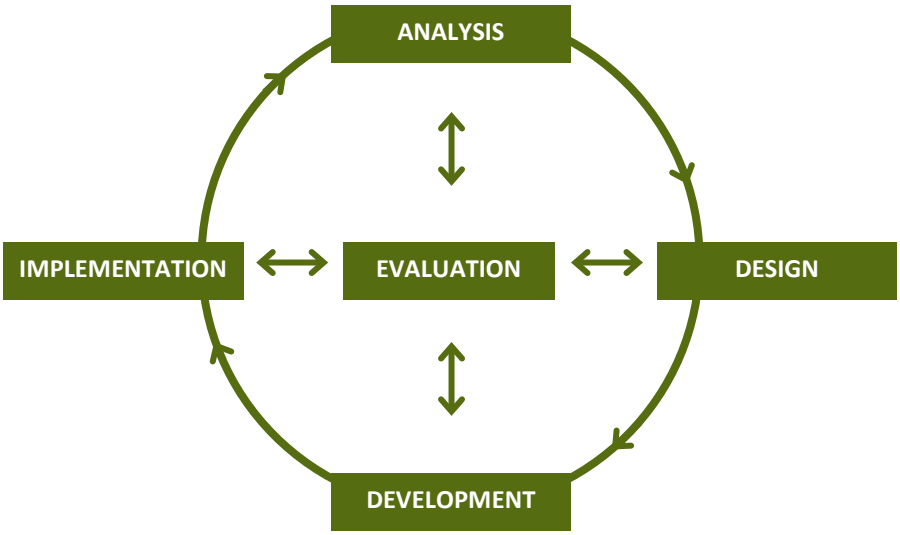

Figure 3: Core Activities in Curriculum Development[6]

The process for future curriculum development will likely retain these five general stages; however, the details will need to change to meet the needs of Alberta students and the rapidly changing society in which they find themselves.

Theme 2: Strategies and Practices for Developing and Updating Curriculum

There is limited documentation regarding the strategies used to develop curriculum or the "best or promising" practices employed by different jurisdictions. The identification of a rationale for change (triggers) and the nature of triggers seem to be fairly consistent across jurisdictions and this commonality in the triggers is not surprising. Triggers seem to play a significant role in launching major curriculum reviews or reforms and they will continue to impact the decisions made by governments related to education, but without necessarily being anticipated by societal and economic considerations. Acting upon triggers and emerging or perceived needs, then, are challenges for all governments.

[6] ©Netherlands Institute for Curriculum Development (SLO). *Curriculum in development.* 2009. Enschede, the Netherlands. http://www.slo.nl/downloads/2009/curriculum-in-development.pdf/ (July 2012)

Curriculum design is a complex task as are the processes required to develop curriculum. In today's rapidly changing world, the curriculum designed and implemented today may not be relevant five years in the future (Sahlberg, 2006, p. 8). According to Bron, Hooghoff & Timmerhus (2009, pp. 38–39), the following points should be considered for curriculum development:

- testable learning results should not be the only measures for schools
- broad consultation of stakeholders is desirable
- curriculum content should consider the whole child and link life inside the school with life outside of school
- new curriculum will affect teacher training and professional development; support for implementation requires consideration
- a new curriculum does not mean that the curriculum review is completed; it must be an ongoing endeavour
- there must be a balance between measurable goals and socially-oriented (e.g., citizenship, ethics, environmental responsibility and awareness) goals
- latitude in levels (national, local, school) of curriculum to meet the needs of all students is important.

Sahlberg (2006, p. 9) would add the following points for consideration regarding curriculum development:

- it should be based on a consensus-based strategy and a defined curriculum purpose and policy
- expertise on curriculum development processes is required and this expertise needs to be continuously developed.

In essence, curriculum development projects are designed to solve complex problems of bridging education policy aims to outputs, such as programs of study, assessment, and learning and teaching resources. To achieve high quality outputs, curriculum developers need to combine iterative design and development processes. This iterative approach can be termed as the "prototyping approach" (Plomp & Nieveen, 2007, pp. 90–91). This entails the development of a preliminary version of what is being envisioned, and then testing and refining it before committing to full development and implementation of the final product. Prototyping can be especially useful for curriculum projects that are both complex and innovative, as each prototyping cycle contributes to curriculum design and outputs. A curriculum development model based on prototyping to enable ongoing and synchronous development of curriculum could be as follows.

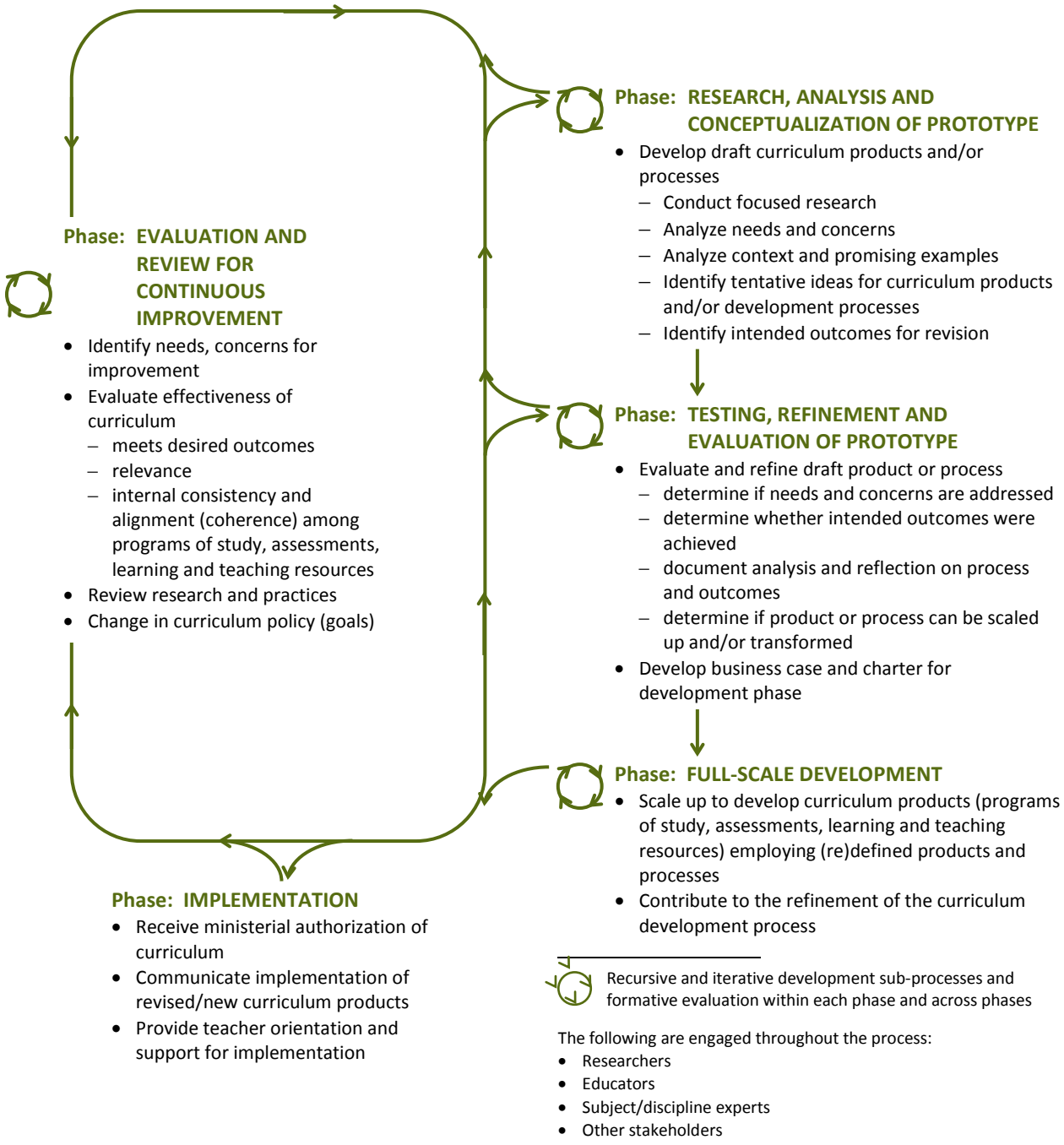

Figure 4: Possible Synchronous and Ongoing Curriculum Development Processes,[7] February 2012*

Figure 4 illustrates the recursive and iterative process that occurs within a phase and across phases in addition to considering the key role prototyping plays in the development of new or revised curriculum. This process could lead to better quality products in a shorter time frame as more upfront time is spent on the prototype and testing it.

[7] Adapted from *Generic Design Research Model* (Wademan, 2005) and *Refinement of Problems, Solutions, Methods and Design Principles* (Reeves, 2000, 2006).

* The above process assumes an enterprise solution.

Theme 3: The Role of Government and Level of Stakeholder Involvement and Engagement in Curriculum Development

Role of Government

Internationally, governments generally are responsible for the development of programs of study and assessments but are less involved in the development of resources.

Some international jurisdictions, such as Finland, Germany and most recently Australia, have established arm's length bodies for the development of programs of study. For example, Australia's state governments agreed to establish the Australian Curriculum Assessment and Reporting Authority to oversee the development of the country's national curriculum. In Finland, the development of the national core curriculum is developed by the National Board of Education established by the Finnish Ministry of Education and Culture while the goals and aims of education are determined by the Cabinet (Council of State). In Germany, many states choose to collaborate; e.g., the Ministry of Education for the state of Berlin, which is responsible for the curriculum, has tasked the National Institute for School and Media to develop the curriculum for primary education, in collaboration with the states of Brandenburg, Bremen and Mecklenburg-Vorpommern.

Canadian jurisdictions, New Zealand, Scotland, Singapore and Korea have departments of education that set the curriculum standards for learning through the development of national guidelines that include curriculum statements and achievement standards. Germany has a long history of collaboration whereas, in Australia, the establishment of the Australian Curriculum, Assessment and Reporting Authority suggests the movement toward a more "hands-off" means of curriculum development.

In this vein, one of the principles of Finnish education since the 1970s is to "… facilitate networked-based school improvement collaboration between schools and non-governmental associations and groups" (Sahlberg, 2011. p. 126) and within this principle is the idea of *networked collaboration* that may provide the most insight into curriculum development. This idea moves beyond New Public Management[8] and into networked governance, which is seen by Bourgon as "… the most powerful innovation in organizational development of the past 25 years" (Bourgon, 2008, p. 396) and capable of "… transforming the role of … government" (Bourgon, 2008, p. 396).

Historically, the provision of public services was provided by government departments that were disaggregated, hierarchical and driven by rules and procedures. As demands for greater effectiveness and efficiency in the provision of services have grown, reforms under New Public Management emphasize the application of business-like principles and practices. These included business plans, and performance measures with greater emphasis on outputs as opposed to inputs. However, these reforms have been largely focused internally, driven from the top down and introduced through market-based solutions to optimize service delivery and utility.

[8] New Public Management refers to the movement of government from the public servant who provided services to the public outside of the political process to government servants who "need to be more responsive to both the preferences of beneficiaries, citizens who pay for service provision through tax, and politicians who represent the collective will and make policy choices." Retrieved from http://epress.anu.edu.au/public_sector/mobile_devices/ch08s02.html

The socioeconomic environment is changing rapidly and citizens are seeking new ways to be connected through more inclusive institutions. Governments too are also looking at ways to capitalize on the social capital created through interactions in and within the community for policy development on mutually agreed-upon goals. In this way, government is moving away from hierarchical, legal authority, and market mechanisms to shared values and trust. In so doing, they engender greater participation, satisfaction and outcomes for the community. For curriculum, this means new ways of combining government and community interests within structures that are based on a collaborative relationship that is long term with highly interdependent linkages, shared common missions, risk and reward (Brown & Keast, 2003, pp. 2–3, 11).

One possible mechanism is through more focused engagement and collaboration with teachers. Internationally, many jurisdictions are involved in research into best practices for teaching to inform curriculum development. During curriculum development, a well-thought-out strategy should be employed (Hooghoff & Bron, 2008, p. 44). This can allow for broad and meaningful stakeholder engagement in the development of curriculum, while ensuring that government objectives remain in focus. As is the case with Finland, the most desirable approach might be a hybrid between a top-down and a bottom-up approach, one that meets the broad educational goals of government, can be realized and embraced by teachers and students in the field, and can make the best use of relevant expertise, while building capacity throughout the education system (Hoogoff & Bron, 2008).

Stakeholder Involvement and Engagement

The involvement of stakeholders in meaningful discussion around curriculum is required for a high-quality curriculum that will be embraced and implemented as intended. The use of technology can facilitate this involvement, providing access for a wider range of interested parties. However, careful consideration needs to be taken in determining who is at the curriculum development table, as can be seen by the decisions brought forth by New Zealand, Australia, Germany and England.

Not every stakeholder needs to be involved at every step of the development process, and the coordination of which stakeholders to involve at each step requires careful planning and insight into the various agendas of all those involved. There are trade-offs and risks associated with the inclusion, or the non-inclusion, of various stakeholder groups and the public at large at different stages in the curriculum development process.

Consideration should be given to the goals and objectives of education as a whole and in relation to a particular curriculum specifically. The end users of the curriculum, teachers and students, must be considered in its development and should be considered as key stakeholders in the engagement process. It cannot be assumed that the roles of any users will remain static over time so consideration must be given to ensure that ongoing changes in the roles of various users and stakeholders are accounted for at every step of the development process.

Conclusion

For Alberta, the synchronous development of curriculum (programs of study, assessment, and learning and teaching resources) and simultaneous development in English and French will require significant changes to the current processes for curriculum development. The development of learning and teaching resources will also need to change significantly to incorporate developments in digital platforms and broader access to online and digital resources in general. In this area, there is an opportunity to look to future trends, such as networked governance, when seeking to identify strategies and practices for curriculum development.

A networked approach to curriculum development would support the integrated development of programs of study, assessment, and learning and teaching resources (simultaneously in English and French). Key elements of any strategies and practices include a planning stage that is broad enough to encompass curriculum development, from conceptualization through to implementation and into monitoring, and an opportunity to connect the lessons learned from one development event to future curriculum developments to encourage and enable continuous improvement. The synchronous development of curriculum that blends the best of hierarchical and centralized and democratic and decentralized approaches to curriculum development will be significantly different than the strategies and processes used to date.

BIBLIOGRAPHY

Ackerman, D. B. (2003). Taproots for a new century: Tapping the best of traditional and progressive education. *Phi Delta Kappan*, *84*(5), 344–349.

Alberta Education. (2011). *Alberta Education action agenda 2011–14*. Edmonton, AB: Alberta Education.

Australian Curriculum, Assessment and Reporting Authority. (2009). *Curriculum design paper v2.0*. Retrieved from http://www.acara.edu.au/verve/_resources/Curriculum_Design_Paper_.pdf

Australian Curriculum, Assessment and Reporting Authority. (2010a). *The shape of the Australian curriculum, version 2.0*. Retrieved from http://www.acara.edu.au/verve/_resources/Shape_of_the_Australian_Curriculum.pdf

Australian Curriculum, Assessment and Reporting Authority. (2010b). *Curriculum development process, version 4.0*. Retrieved from http://www.acara.edu.au/verve/_resources/ACARA_Curriculum_Development_Process_Paper_v4_June_2010.pdf

Australian Curriculum, Assessment and Reporting Authority. (n.d.a). The Australian curriculum online. Retrieved November 9, 2011, from http://www.australiancurriculum.edu.au/

Australian Curriculum, Assessment and Reporting Authority. (n.d.b). About us. Retrieved November 24, 2011, from http://www.acara.edu.au/about_us/about_us.html

Australian Government, Department of Education, Employment and Workplace Relations. (2010). Australian curriculum. Retrieved October 22, 2011, from http://www.deewr.gov.au/Schooling/Programs/SmarterSchools/Pages/_NationalCurriculum.aspx

Australia National Curriculum Board. (2008). *National curriculum development paper*. Paper presented at the "Into the Future – National Curriculum Board Forum," Melbourne, 27 June 2008. Retrieved from http://www.acara.edu.au/verve/_resources/development_paper.pdf

Bourgon, J. (2008). The future of public service: A search for a new balance. *Australian Journal of Public Administration*, *67* (4), 390–404.

British Columbia Ministry of Education. (2012). Draft curriculum review process. Retrieved November 9, 2011, from http://www.bced.gov.bc.ca/irp/draft_review_process.php

Bron, J., Hooghoff, H., & Timmerhuis, A. (2009). *Core affairs: England: Case studies basic education in Europe*. Enschede, Netherlands: SLO–Netherlands Institute for Curriculum Development. Retrieved from http://www.slo.nl/downloads/2009/Core-Affairs__England.pdf/

Brown, K., & Keast, R. (2003). Citizen-government engagement: Community connection through networked arrangements. Retrieved February 21, 2012, from http://eprints.qut.edu.au/4792/1/4792_1.pdf

Caskey, M. M. (2002). Chapter 6: Authentic curriculum–strengthening middle level education. In A. Anfura & S. Staecki (Eds.), *Middle school curriculum, instruction and assessment* (pp. 103–118). Greenwich, CT: Information Age Publishing.

De Coninck, C. (2008.). *Core affairs: Flanders, Belgium: Case studies basic education in Europe*. Enschede, Netherlands: SLO–Netherlands Institute for Curriculum Development. Retrieved from www.slo.nl/downloads/Webversie_core_affairs_LR_Belgi___def.pdf/

De Pree, M. (1987). *Leadership is an art.* East Lansing, MI: Michigan State University Press.

Education Scotland. (2011). Remit of Education Scotland. Retrieved February 7, 2012, from http://www.educationscotland.gov.uk/aboutus/remit.asp.

Education Scotland. (2012). Process of change. Retrieved February 7, 2012, from http://www.ltscotland.org.uk/understandingthecurriculum/whatiscurriculumforexcellence/howwasthecurriculumdeveloped/processofchange/index.asp

Education Scotland. (n.d.). What is glow? Retrieved February 7, 2012, from http://www.ltscotland.org.uk/usingglowandict//glow/whatis/index.asp

Education Services Australia. (2012a). About us. Retrieved February 7, 2012, from http://www.esa.edu.au/about-us/about-us

Education Services Australia. (2012b). School library services: Schools catalogue information. Retrieved February 7, 2012, from http://www.esa.edu.au/services/school-library-services

Education Services Australia. (2012c). National digital learning resources network. Retrieved February 7, 2012, from http://www.esa.edu.au/projects/national-digital-learning-resources-network

Eisner, E. W. (1979). *The educational imagination. On the design and evaluation of school programs*. New York, NY: Macmillan.

England Department for Education. (2011a). *The framework for the national curriculum: A report by the expert panel for the national curriculum review.* London, England: Department for Education. Retrieved from https://www.education.gov.uk/publications/eOrderingDownload/NCR-Expert%20Panel%20Report.pdf

England Department for Education. (2011b). National curriculum review launched. Retrieved February 10, 2012, from http://www.education.gov.uk/inthenews/multimedia/a0073149/national-curriculum-review

Eurybase. (2009/2010). *Organization of the education system in Finland: 2009/2010.* Retrieved from http://eacea.ec.europa.eu/education/eurydice/documents/eurybase/eurybase_full_reports/FI_EN.pdf

Finnish National Board of Education. (2004). *National core curriculum for basic education 2004: National core curriculum for basic education intended for pupils in compulsory education*. Helsinki, Finland: Finnish National Board of Education. Retrieved from http://www.oph.fi/instancedata/prime_product_julkaisu/oph/embeds/47671_core_curricula_basic_education_1.pdf

Finnish National Board of Education. (n.d.a). Front page. Retrieved November 14, 2011, from http://www.oph.fi/english

Finnish National Board of Education. (n.d.b). About us. Retrieved November 14, 2011, from http://www.oph.fi/english/about_us

Frassinelli, L. (2006). Education reform in Finland. A paper prepared for the EAD 845 course. Retrieved February 7, 2012, from http://worldstreets.wordpress.com/2012/02/22/equity-based-educational-reform-in-finland/

Hooghoff, H., & Bron, J. (2008). *Core affairs: Scotland: Case studies basic education in Europe*. Enschede, Netherlands: SLO – Netherlands Institute for Curriculum Development. Retrieved from http://www.slo.nl/downloads/2008/Core_20affairs_20Scotland.pdf/

INCA (International Review of Curriculum and Assessment). (2008a). New Zealand: Curricula (age 3–19); 5.2 Second phase: Compulsory primary, age 5/6–12/13; 5.2.6 Curriculum materials. Retrieved November 14, 2011, from http://www.inca.org.uk/1279.html

INCA (International Review of Curriculum and Assessment). (2008b). New Zealand: 5.4 Fourth phase: Post-compulsory upper secondary, age 16+-18+. Retrieved November 14, 2011, from http://www.inca.org.uk/1281.html?p=1

INCA (International Review of Curriculum and Assessment). (2011a). Education in Korea. Retrieved November 14, 2011, from http://www.inca.org.uk/korea-system-mainstream.html

INCA (International Review of Curriculum and Assessment). (2011b). Korea: Curricula. Retrieved November 14, 2011, from http://www.inca.org.uk/korea-curricula-mainstream.html

INCA (International Review of Curriculum and Assessment). (2012). S*ummary profile–Education in New Zealand.* Retrieved from: http://www.inca.org.uk/new-zealand-system-mainstream.html

Johnson Jr., M. (1967). Definitions and models in curriculum theory. *Educational Theory, 17*(2), 127–140.

Joseph, P. B. (2011). *Cultures of Curriculum* (2nd edition). New York, NY: Routledge.

Kennedy, K. J. (2010). School-based curriculum development for new times: A comparative analysis. In E. H-F. Law & N. Nieveen (Eds.), *Schools as curriculum agencies: Asian and European perspectives on school-based curriculum development* (pp. 3–18). Rotterdam, Netherlands: Sense Publishers.

Korean Institute for Curriculum and Evaluation. (n.d.) About Kice. Retrieved November 14, 2011, from http://www.kice.re.kr/en/introduction/about.jsp

Korea Education and Research Information Service. (2004). *Korea education and research information service*. Seoul, KR: Korea Education and Research Information Service. Retrieved from http://www.keris.or.kr/english/annual/AnnualReport_2004.pdf

Kupiainen, S., Hautamäki, J., & Karjalainen, T. (2009). *The Finnish education system and PISA*. Finland: Ministry of Education.

Learning Media. (2009). *Learning Media: Annual report 2009.* Retrieved from http://www.learningmedia.co.nz/sites/all/modules/filemanager/files/About_us/2009_Annual_Report.pdf

Levin, B. (2007). Curriculum for the 21st century: Does curriculum matter? Education Services Australia. Retrieved on November 25, 2011, from http://www.eqa.edu.au/site/doescurriculummatter.html.

Leyendecker, R., & Letschert, J. (2008). *Core affairs: Germany–Baden-Wuerttemberg and Berlin: Case studies basic education in Europe*. Enschede, Netherlands: SLO–Netherlands Institute for Curriculum Development. Retrieved from http://www.slo.nl/downloads/2008/Core_20affairs_20Germany.pdf/

Lunenburg, F. C. (2001). Curriculum development: Inductive models. *Schooling*, *2*(1), 1–8.

Manitoba Education. (n.d.) Curriculum: Types of curriculum documents. Retrieved November 14, 2011, from http://www.edu.gov.mb.ca/k12/cur/types.html

McKernan, J. (2008). *Curriculum and imagination: Process theory, pedagogy and action research*. New York, NY: Routedge.

National Board of Education. (2001). *The development of education: National report of Finland*. International Bureau of Education, UNESCO. Retrieved from http://www.ibe.unesco.org/National_Reports/ICE_2001/Finland.pdf

National Education Monitoring Project. (2009). *Key features of the national education monitoring project*. Retrieved from http://nemp.otago.ac.nz/_keyfeatures.htm

New Zealand Ministry of Education. (2005). *Assessment tools for teaching and learning (asTTle).* Retrieved from http://www.jisc.ac.uk/media/documents/projects/asttle_casestudy.pdf

New Zealand Ministry of Education. (2007). The New Zealand curriculum online. Retrieved November 10, 2011, from http://nzcurriculum.tki.org.nz/Curriculum-documents/The-New-Zealand-Curriculum and http://nzcurriculum.tki.org.nz/content/download/1108/11989/file/The-New-Zealand-Curriculum.pdf

New Zealand Ministry of Education. (2012a). New Zealand curriculum online: What we do. Retrieved November 24, 2011, from http://www.minedu.govt.nz/theMinistry/AboutUs/AboutTheMinistry.aspx

New Zealand Ministry of Education. (2012b). New Zealand curriculum online: Developing the draft. Retrieved November 24, 2011, from http://nzcurriculum.tki.org.nz/Archives/Curriculum-project-archives/Developing-the-draft

Ontario Ministry of Education. (2010). Curriculum. Retrieved November 24, 2011, from http://www.edu.gov.on.ca/eng/curriculum/

Organisation for Economic Co-operation and Development. (2008). *OECD study on digital learning resources as systemic innovation–Country case study report on Finland.* Retrieved from http://www.oecd.org/dataoecd/25/21/41951860.pdf

Ornstein A. C., & Hunkins, F. P. (2009). *Curriculum foundations, principles and issues*. (5th edition). Boston, MA: Allyn and Bacon.

Plomp, T., & Nieveen, N. (Eds). 2007. *An Introduction to educational design research. Proceedings of the seminar conducted at the East China Normal University, Shanghai (PR China), November 23–26, 2007.* Enschede, Netherlands: SLO–Netherlands Institute for Curriculum Development. Retrieved February 7, 2011, from http://www.slo.nl/downloads/2009/Introduction_20to_20education_20design_20research.pdf/

Pinar, W. F. (2004). *What is curriculum theory?* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Reeves, T. (2000). Enhancing the worth of instructional technology research through "design experiments" and other developmental strategies. Retrieved from http://it.coe.uga.edu/~treeves/AERA2000Reeves.pdf

Reeves, T. C. (2006). Design research from a technology perspective. In J. van den Akker, K. Gravemeijer, S. McKenney & N. Nieveen (Eds.), *Educational design research* (pp. 52–66). London, England: Routledge.

Sahlberg, P. (2006). Models of curriculum development: International trends and the way forward. In P. Sahlberg (Ed.), *Curriculum reform and implementation in the 21st century: Policies, perspectives and implementation* (pp. 108–121). Proceedings of the International Conference on Curriculum Reform and Implementation in the 21st Century. Istanbul, Turkey, June 8–10, 2005. Retrieved December 5, 2011, from http://www.pasisahlberg.com/index.php?id=15

Sahlberg, P. (2011). *Finnish lessons: What can the world learn from educational change in Finland?* New York, NY: Teachers College Press.

Saskatchewan Ministry of Education. (2010). Cross-curricular competencies. Retrieved November 14, 2011, from http://www.education.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=522,523,127,107,81,1,Documents&MediaID=15291&Filename=Crosscurricular+Competencies+-+Sept+27+2010.pdf

Schleicher, A. (2011). Is the sky the limit to education improvement? *Phi Delta Kappan, 93*(2), 58–63.

Schools Online Thesaurus. (2012). What is ScOT? Education Services Australia. Retrieved February 2, 2012, from http://scot.curriculum.edu.au/what_is_scot.html

Taba, H. (1962). *Curriculum development: Theory and practice*. New York, NY: Harcourt Brace and World.

The Finnish Matriculation Examination Board. (n.d.). *The Finnish matriculation examination*. Retrieved December 5, 2011, from http://www.ylioppilastutkinto.fi/en/

Thijs, A., & van den Akker, J. (Eds.). (2009). *Curriculum in development*. Enschede, Netherlands: SLO–Netherlands Institute for Curriculum Development. Retrieved from http://www.slo.nl/downloads/2009/curriculum-in-development.pdf/

Tyler, R. W. (1949). *Basic principles of curriculum and instruction*. Chicago, IL: University of Chicago Press.

UNESCO. (2006). *World data on education: New Zealand.* Retrieved from http://www.ibe.unesco.org/fileadmin/user_upload/archive/Countries/WDE/2006/ASIA_and_the_PACIFIC/New_Zealand/New_Zealand.pdf

UNESCO. (2007). *World data on Education: Finland*. Retrieved from http://www.ibe.unesco.org/fileadmin/user_upload/archive/Countries/WDE/2006/WESTERN_EUROPE/Finland/Finland.pdf

Van den Akker, J. (2007). Curriculum design research. In T. Plomp & N. Nieveen (Eds.), *An introduction to educational design research* (pp. 37–51). Enschede, Netherlands: SLO–Netherlands Institute for Curriculum Development.

Vitikka, E., Krokfors, L., & Hurmerinta, E. (2012). The Finnish national core curriculum: Structure and development. In H. Niemi, A. Toom & A. Kallioniemi (Eds.), *Miracle of education: The principles and practices of teaching and learning in Finnish schools* (pp. 83–96). Rotterdam, Netherlands: Sense Publishers.

Wademan, M. (2005). *Utilizing development research to guide people capability maturity model adoption considerations.* Unpublished doctoral dissertation, Syracuse University. (New York, USA).

Walker, D. F. (1971). A naturalistic model for curriculum development. *School Review*, *80*(1), 51–65.

Walker, D. F. (1990). *Fundamentals of curriculum*. Fort Worth. TX: Harcourt Brace College.

Watson, S., Bowen, E., Tao, L., & Earle, K. (2006). *The New Zealand curriculum draft for consultation 2006: Analysis of long submissions Report*. Paper prepared for the Ministry of Education by Lift Education. Retrieved from http://nzcurriculum.tki.org.nz/content/download/857/6053/file/lift-long-subs1.pdf

CHAPTER 2: COMPETENCIES

> "Competence, like truth, beauty and contact lenses, is in the eye of the beholder."
>
> Laurence J. Peter

Competencies appear to remain one of the most written about topics in education. A recent Google search resulted in 26 100 000 hits. An Education Resources Information Center (ERIC) search for "competencies" resulted in 18 291 citations, 4999 of which came from the past 10 years. Much of the basic work on competencies was done in the 1970s and 1980s. Starting in the mid 1990s, the focus of the work shifted to identifying and developing what were seen as important competencies to be included in emerging educational curricula throughout the world. This later work on competencies is the focus for this literature review.

THEORETICAL FOUNDATIONS

Why Competencies?

The only constant in the Alberta education system over the past few decades has been change. Change will continue. Citizens in the 21st century will be confronted with increasingly complex social, cultural, economic, technological and global challenges. The complexity of these issues will defy handling without the ability to integrate knowledge and transfer it to different and dynamic contexts. Schools are faced with increasingly difficult challenges. Graduates will need to be autonomous and adaptable to the exponential growth of information and constant change. Complex problems need to be addressed by individuals who possess sophisticated, diversified and complementary competencies.

Azemikhah (n.d.) argues that the 20th century witnessed the closing of the "Contents Era." This Era placed the educational emphasis on course content. In the 21st century, education will progressively stretch the emphasis to expand competence beyond subject content. Indeed, many countries throughout the world have moved to making competencies central to their educational reform efforts as a way to help their citizens engage actively in today's global, knowledge-based society.

The Council of the European Union and the European Parliament adopted a Framework of Key Competencies for Lifelong Learning in 2006 (European Communities, 2007). The Organisation for Economic Co-operation and Development has identified 21st century competencies, including creativity, collaboration and digital competency, as skills individuals will need to function in a knowledge-based economy (Organisation for Economic Co-operation and Development, 2005). At the Pan-Canadian level, the Council of Ministers of Education, Canada (2010) discussed, during their meeting in the fall of 2010, the global movement toward incorporating 21st century competencies into public education.

Trilling and Fadel (2009) add further context. They state that "… four powerful forces are converging and leading us toward new ways of learning for life in the 21st century:

- knowledge work
- thinking tools
- digital lifestyles
- learning research" (p. 21).

These four forces will all contribute to, and have an impact on, the way in which today's students are preparing for their lives in the future.

Defining Competency

The term *competence* or *competency* as it is sometimes used in the literature has been the subject of much debate around the world. In many definitions, words such as *skills*, *ability* and *capability,* to name but a few, are used interchangeably with *competency* in an attempt to describe the meaning of the term. However, in the literature, "competency" is employed in two predominant ways. The first meaning of the term refers to the *outputs, or results of training—a competent performance*. The second meaning refers to the *inputs, or underlying attributes, required of a person to achieve competent performance* (Hoffmann, 1999). The understanding embedded in the latter definition guides the more recent work on competencies.

The Organisation for Economic Co-operation and Development defines a competency as "the ability to meet demands or carry out a task successfully, and consists of both cognitive and non-cognitive dimensions" (2002, p. 8).

Beginning in 2002 and culminating in 2010, the Organisation for Economic Co-operation and Development put into motion a lengthy research project to come to a clearer understanding of the term. In the document *21st Century Skills and Competencies for New Millennium Learners in OECD Countries* (Ananiadou & Claro, 2009), the following definitions are provided:

- The Organisation for Economic Co-operation and Development's DeSeCo project states that "a competence is more than just knowledge or skills. It involves the ability to meet complex demands, by drawing on and mobilizing psycho-social resources (including skills and attitudes) in a particular context" (p. 31). For instance, communicating effectively is considered a competency that may rely on several skills, including the person's knowledge of the language being spoken, functional information and technology skills, as well as attitudes towards those with whom the person is conversing.
- The European Commission's Cedefop glossary "defines a skill as the ability to perform tasks and solve problems, while a competence is the ability to apply learning outcomes adequately in a defined context (education, work, personal or professional development)" (p. 31).
- The authors also offer their own definition of 21st century skills and competencies as being "those skills and competencies young people will be required to have in order to be effective

workers and citizens in the knowledge society of the 21st century" (p. 32). The authors provided this type of broad definition because although the topic of 21st century skills and competencies has received much attention, there is no firm agreement on the specific set of such skills and competencies or how they should be defined.

In work done by Jonnaert, Barrette, Masciotra, Morel and Mane (2006) of the International Bureau of Education for UNESCO, *competence* has been defined as a concept for organizing curriculum and as "the dynamic organizing structure of activity that allows a person to adapt to a class of situations on the basis of their experience, activity and practice" (p. 15).

Tardif (2006) defines competency in this manner: "complex knowing how to act supported by the effective mobilization and combination of a variety of internal and external resources within a family of situations" (p. 54).

In countries that are implementing new curricula and using the term *competencies* or similar terms, such as *capabilities* or *essential learnings*, definitions are also being provided. For example, in the slide presentation prepared by the New Zealand Educational Institute and Flockton (2009), competencies are defined as "integrated, holistic and complex. They include the knowledge, skills, attitudes and values needed to meet the demands of a task. Competencies are performance based and inferred from action, behaviours and choices of an individual in a particular context" (slide 3). Mexico's Ministry of Education (2011), in renewing curricula at the elementary level, is using the following definition: "A competency is the ability to respond to different situations and implies a knowing how to do (skills) with knowledge (understanding) as well as valuing the consequences of knowing how to do something (values and attitudes)" (translation from Spanish, p. 29). The ministry describes a competency as more than knowing, knowing how to do something and how to be; a competency is an action that integrates all three.

Alberta Education (2011b) defines a competency as "an interrelated set of attitudes, skills and knowledge that is drawn upon and applied to a particular context for successful learning and living. Competencies are developed over time and through a set of related learner outcomes … [and they] contribute to students becoming engaged thinkers and ethical citizens with an entrepreneurial spirit" (p. 3).

As can be seen by the above definitions, competencies are the capabilities that people need so they can live, learn and contribute as active members of their communities (Nelson Intermediate School, n.d.). Competencies are not something that can be learned in isolation; rather, they are demonstrated in the performance of tasks and are most effectively developed in contexts with embedded meaning and purpose. Competencies exist on a continuum from novice to expert and from micro to macro. They are developed throughout life; increased proficiency is the ability to combine and use key competencies appropriately in increasingly complex situations. Competencies are integrated, holistic and complex, and they include the knowledge, skills, attitudes and values needed to meet the demands of a task (Nelson Intermediate School, n.d.).

Haste (2008) further describes competence as "... not just a collection of skills; it is a way of approaching problems and issues, *with which* certain 'skills' are required" (p. 3). In her work, she has conceptualized "competences" that involve what she has termed "cognitively creative and ethically creative dimensions" required for functioning in the 21st century.

Competencies are far from simple. The Organisation for Economic Co-operation and Development's *Definition and Selection of Competencies* (DeSeCo) project suggests that attention should not be restricted to the cognitive components of a competency. Other aspects are also important. For example, the internal structure of a competency is also defined by motivation, demands and values. The internal structure of competencies involves knowledge, cognitive skills, practical skills, attitudes, emotions, values, ethics and evaluation (Organisation for Economic Co-operation and Development, 2002).

Goal of the Competencies Movement

There are considerable benefits to be gained, for and by all, from a well-educated population. Education policy makers, internationally, are now moving to ensure that people have the knowledge, skills, attitudes and values necessary to participate fully and meaningfully in society. As an educational philosophy, competency-based education and practice emphasizes skill attainment and proficiency. Developing objective standards to define *competent* and *proficient* is a central concern of competency-based education. The goal is to help students acquire skills to a level where they are deemed proficient. Indeed, the goal of any educational system will be to foster and develop proficiency in key competencies within each student. Education's major role within society is to create and sustain an environment where key competencies are taught and learned.

How Competencies Work

In competency-based educational models, criteria for success are set as external and objective goals. Progress toward these goals may take different forms and may advance at different rates for different students; however, standards that determine competency remain the same. For example, if the grade on an examination to determine proficiency is a score of 80, a student will not pass with anything lower than an 80, but he or she may retake the test multiple times until the proficiency is achieved. In competency-based learning, skill acquisition is deemed more important than student ranking; and, the system is designed to create opportunities for students to gain skill proficiency (Sullivan, n.d.).

A single competency can be used in many different ways. Voorhees (2001) provides an example involving measurement. The ability to measure distances is crucial to both professional golfers and surveyors. Obviously, different measuring skills are required to carry out the tasks of these different groups of people. The measuring required for the two tasks, however, regardless of technique or method, should produce the same results. "Competencies within different contexts require different bundles of skills and knowledge. The challenge is to determine which competencies can be bundled together to provide different learners with the optimal combination of skills and knowledge they need to perform specific tasks" (Voorhees, 2001, p. 9).

Key Competencies

Life involves an array of challenging demands—dealing with ambiguity, displaying tolerance and respect, and practising environmental awareness and social responsibility to name but a few. The word "key," as in critical or important, is often used in conjunction with competencies. Key competencies include the knowledge, skills, attitudes and values needed by all to function successfully in a variety of life contexts. Key competencies are important across multiple areas of life and contribute to both a successful life and a well-functioning society (Organisation for Economic Co-operation and Development, 2002). Rychen (2003) suggests that key competencies are not ends in themselves but rather resources that contribute to important outcomes. They should help people cope with the demands and challenges encountered in everyday work and play contexts.

The concept of *key competencies* is heavily influenced by what society values and what "individuals, groups and institutions within those societies consider important" (Rychen, 2003, p. 110). To be considered "key," competencies need to fit a multitude of different societal roles that individuals will be called upon to face throughout their lifetimes. These roles are influenced by societal values, contexts, and what individuals, groups and institutions within those societies feel is important (Organisation for Economic Co-operation and Development, 2002). Audigier (2000) affirms that, "[competencies] provide a theoretical framework which can be used to define, orient, incite and analyze activities" (p. 21).

Historical Overview

Historically, competency-based education (sometimes called the competencies movement) has been criticized by some for embracing narrow, educationally suspect practices.

Competency-based education has its roots in the behavioural objectives movement of the 1950s, which focused attention on learning outcomes. Teachers were encouraged to express their instructional objectives in observable student behaviours that were "directly observable behaviours which can be reliably recorded as either present or absent" (Bloom, Hastings & Madaus, 1971, p. 28).

Although competency-based education has been operationalized differently over time, its basic principles and intentions have remained unchanged. Bowden (n.d.) suggests these principles and intentions are as follows:

- a focus on outcomes
- greater workplace relevance
- outcomes as observable competencies
- assessments as judgements of competence
- improved skills recognition
- improved articulation and credit transfer (p. 3).

As with any educational "movements," some educators have seen competency-based education as *the* answer to improving education for the contemporary world (Harris, Guthrie, Hobart & Lundberg, 1995).

Others have perceived it less favourably. Competency-based education rose in popularity in the United States during the 1970s following its visibility and popularity in the performance-based vocational teacher education movement. Competency approaches reached new heights around the world in the 1990s with the National Vocational Qualifications system in England and Wales (begun in 1986), New Zealand's National Qualifications Framework, the competency standards endorsed by Australia's National Training Board, and the Secretary's Commission on Achieving Necessary Skills, and the National Skills Standards initiative in the United States.

Historically, competency approaches have been pushed forward by a strong political impetus. Many have seen competency-based education as a way to prepare a future work force for a competitive global economy. At the same time, others have argued that the approach is less than adequate for the needs of a learning society (Chappell, 1996; Ecclestone, 1997; Hyland, 1994). Competency-based education remained a contested idea well into the 1990s. Chappell (1996) believed the idea of competency-based education was ambiguous enough to be continually shaped and re-shaped by those who used it. Currently, competency-based education has become less problematic for a number of reasons: first, the definitions of competency, as used in educational settings, are becoming increasingly consistent throughout the world; second, these definitions are no longer always tied to specific observable behaviours and have come to include teachers' professional judgements as part of the assessment of competence.

Supporters of competency-based education see it as a way to improve relationships between education and life and workplace requirements. Competency approaches are attractive because they are individualized, emphasize outcomes and use flexible approaches to achieve these outcomes. Those less enamoured with competency-based education see it as a behaviouristic approach that is "excessively reductionist, narrow, rigid, atomized, and theoretically, empirically, and pedagogically unsound" (Kerka, 1998). They believe it ignores context and the effect of interpersonal and ethical aspects of performance (Gonczi, 1997; Hyland, 1994). Many critics do not believe that competencies are individual and value free, but rather are social constructions or cultural practices that can be used to "homogenize" learners (Collins, 1993; Harris, Guthrie, Hobart & Lundberg, 1995).

Behaviourism, once the ruling ethos of competency-based education, is now only one competency-based approach. In reality, newer approaches involve the inclusion of generic attributes that underlie competent performance (such as knowledge and understanding). Almost all countries now endorse a broader view of core competencies by including such things as communication, numeracy, information technology, interpersonal competence and problem solving. Countries moving in this direction have established a broad view of competency-based education that includes integrated or relational learning. Kerka (1998) states that "an integrated view sees competence as a complex combination of knowledge, attitudes, skills, and values displayed in the context of task performance" (p. 1). This approach recognizes levels of growth toward competence (novice, experienced, expert) rather than a single attainment, and it also acknowledges that a competency may be demonstrated in a variety of contexts. A relational view acknowledges "the cultural context and social practices involved in competent performance" (p. 1).

QUALITATIVE AND QUANTITATIVE STUDIES

At the time of this literature review, there were no qualitative or quantitative studies that had been carried out in the K–12 system in terms of competencies. However, a number of school authorities in Alberta are undertaking research projects under the auspices of the Alberta Initiative for School Improvement within Cycle 4. At the time of the writing of this chapter, these projects were in the second year of the three-year cycle, and, as such, no research findings are currently available.

IN PRACTICE

Competencies for the 21st Century

Various discussions and debates surrounding education for 21st century competencies have led many to uphold the belief that the 21st century will need individuals who possess a very different set of skills and competencies if they are to function well in their work and personal lives. Over the last few decades a multitude of briefs, reports and surveys have focused on what these competencies might look like. Many Canadian jurisdictions and other countries are well on their way to identifying the competencies that will form the foundation of their ever-evolving educational systems. What is important to note, however, is that the term *competency* continues to be described, defined and categorized differently in different jurisdictions.

The DeSeCo Project

The Organisation for Economic Co-operation and Development's *Definition and Selection of Competencies* (DeSeCo) project began in 1997. Its primary objectives were to create a conceptual framework that would identify and convey the key competencies individuals should acquire and to strengthen international surveys that measure the competency level of young people and adults. DeSeCo's conceptual framework (Organisation for Economic Co-operation and Development, 2005) includes three broad categories of key competencies, each having separate sub-categories:

1. Using tools interactively – includes the ability to use language, symbols and text interactively; the ability to use knowledge and information interactively; and the ability to use technology interactively.

2. Interacting in heterogeneous groups – includes the ability to relate well to others; the ability to cooperate; and the ability to manage and resolve conflicts.

3. Acting autonomously – includes the ability to act within the big picture; the ability to form and conduct life plans and personal projects; and the ability to assert rights, interests, limits and needs.

Competencies in Canada

Saskatchewan

The Saskatchewan Ministry of Education (2010) has identified the following cross-curricular competencies: Thinking, Identity and Interdependence, Literacies, and Social Responsibility. These cross-curricular competencies are viewed as interrelated and "are addressed through all areas of study and through school and classroom routines, relationships and environments" (p. 1). Although these competencies are identified as separate entities, they are aligned with Saskatchewan's Common Essential Learnings and with the province's Goals of Education.

Québec

In 1996, the Québec Ministry of Education established the main direction for curriculum reform by identifying one overriding objective: success for all, with no lowering of requirements. The statement called for a curriculum based on the learning essentials for students in the 21st century. It stressed the importance of meeting the individual needs and interests of each student, and underlined the need for differentiated educational practices within the framework of a common curriculum. It also recommended a more flexible organizational model that would respect the autonomy of educational institutions and their professional staff. The ministry embarked on the development of nine cross-curricular competencies to be developed across all subject areas. These competencies are: uses information, solves problems, exercises critical judgement, uses creativity, communicates appropriately, achieves his or her potential, cooperates with others, uses information and communication technology, and adopts effective work methods. These competencies were implemented in 2004, but by 2010, as can best be ascertained by a review of the government's website, the cross-curricular competencies were disaggregated into separate subject area/discipline competencies.

New Brunswick

In 2010, the New Brunswick Ministry of Education began work on student competencies. In preliminary work released in 2010, the government proposed the integration of the following competencies: 1) critical thinking and creative problem solving; 2) collaboration; 3) communication; 4) personal development and self-awareness; and 5) global citizenship. This work, however, has since stopped because of a change in government.

Nunavut

Nunavut's unique inclusion of Inuit values in its cross-curricular competencies is also noteworthy. To ensure a strong sense of Inuit identity and perspective, the Nunavut Department of Education identified, in 2007, eight core overarching cross-curricular competencies that relate to each of the *Inuit Qaujimajatuqangit* principles.

The cross-curricular competencies are:

- *Inuuqatigiitsiarniq*: respecting others, relationships and caring for people
- *Tunnganarniq*: fostering good spirit by being open, welcoming and inclusive
- *Pijitsirniq*: serving and providing for family and/or community
- *Aajiiqatigiingniq*: decision making through discussion and consensus

- *Pilimmaksarniq*: development of skills through practice, effort and action
- *Piliriqatigiingniq*: working together for a common cause
- *Qanuqtuurunnarniq*: being innovative and resourceful in seeking solutions
- *Avatimik Kamattiarniq*: respect and care for the land, animals and the environment (social, physical, psychological).

These competencies are viewed as foundational to Inuit ways of being and to strengthening the context within which the Inuit live.

Alberta

In 2008, the Government of Alberta was tasked with creating a long-term vision for education in Alberta. In 2010, a variety of engagement processes, involving thousands of Albertans, was used to create a transformational vision for Kindergarten to Grade 12 education: *All students are inspired to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit* (Alberta Education, 2011c, p. 6). During the Inspiring Education engagements, Albertans expressed the need for the education system to help students engage actively in a global, knowledge-based society so as to better prepare them for the rapid changes occurring at the local, national and international levels. To achieve this vision, Inspiring Education underlined the importance of competencies.

In the *Inspiring Action Steering Committee Report* (2010b) an initial list of competencies were identified: know how to learn; think critically; identify and solve problems; manage information; innovate; create opportunities; apply multiple literacies; communicate well and cooperate with others; demonstrate global and cultural understanding; and identify and apply career and life skills (p. 7). These categories of competencies were intended to develop an educated Albertan—an engaged thinker and ethical citizen with an entrepreneurial spirit.

Alberta Education (2011b) further refined the categories of competencies as a result of a review of educational literature, research on other provincial and international frameworks for learning, and face-to-face and online engagements with educators, parent groups, students, teachers, school administrators, researchers, employers and nongovernmental organizations. These activities confirmed a support for competencies and the intended goal of meeting the vision of an educated Albertan. These engagements also strengthened the descriptions of the competency groupings, described in the *Framework for Student Learning* (2011, p. 2). The grouping of competencies are:

- critical thinking, problem solving and decision making
- creativity and innovation
- social, cultural, global and environmental responsibility
- communication
- digital and technological fluency
- lifelong learning, personal management and well-being
- collaboration and leadership.

Post-secondary in Canada

At the post-secondary level in Canada, McMaster University has created a curriculum for their medical school based on 21st century competencies. The curriculum, called COMPASS—concept-oriented, multidisciplinary, problem-based, practice for transfer, simulations in clerkship, streaming—introduces professional competencies along with those 21st century competencies listed within the acronym (Neville & Norman, 2007).

Competencies Internationally

Internationally, several organizations and countries have investigated or implemented curricula that specifically focus on increasing competencies for successful living and learning. A survey carried out by the Asia-Pacific Economic Cooperation (2008) revealed four overarching competencies: 1) lifelong learning; 2) problem solving; 3) self-management; and 4) teamwork. These four competencies are similar to those identified as essential competencies by UNESCO's Commission on Education in the 21st Century: learning to know, learning to be, learning to learn, and learning to live together. In addition, countries have spoken to the critical need for students to have competencies, such as problem solving and technological savvy, in order to participate in today's work force and in the work force of the future (Asia-Pacific Economic Cooperation, 2008). The Asia-Pacific Economic Cooperation's report speaks to the importance of these competencies at the individual level, as they relate to educational and professional opportunities, and at the macro level where these competencies can impact the quality of the labour force and, ultimately, affect the stability of international economies.

Singapore

Singapore's Ministry of Education has developed a framework to increase 21st century competencies within the school system. The competencies, identified as core skills and values, are as follows: 1) character development; 2) self-management skills; 3) social and cooperative skills; 4) literacy and numeracy; 5) communication skills; 6) information skills; 7) thinking skills and creativity; and 8) knowledge application skills. In order to incorporate these competencies, schools will redesign their teaching and assessment approaches. Singapore's Ministry of Education will develop tools in order to enhance holistic feedback and assessment. Through co-curricular activities, 21st century competencies will hopefully be developed (Singapore Ministry of Education, 2010a).

New Zealand

New Zealand identified five key competencies: 1) thinking; 2) using language, symbols and texts; 3) managing self; 4) relating to others; and 5) participating and contributing. Operating in social groups (*relating to others, and participating and contributing*) includes all competencies relevant when interacting with other people, whether in a competitive or cooperative situation, and could involve such actions as managing and resolving conflicts, asserting and defending rights and responsibilities, supporting and fulfilling responsibilities, or motivating groups. *Managing self* includes the ability to identify and take action regarding one's interests, limits and needs while remembering the relationships within a wider social context. *Thinking* is a competency that encompasses the ability to think creatively and to use cognitive and metacognitive strategies (New Zealand Ministry of Education, 2010).

These competencies are important to the curriculum as they are considered to have an overall effect on living, learning, working and being active contributors to one's community. They are not considered to be separate entities, nor do they exist alone. In essence, they are believed to be the key to each learning area. These key competencies sit alongside eight learning areas (English, the arts, health and physical education, learning languages, mathematics and statistics, science, social sciences, and technology) and are designed to encourage enjoyment of learning and the ability to think critically, manage self, set goals, overcome obstacles and get along with others—the attributes students need to succeed as adults (New Zealand Ministry of Education, n.d.). Students develop key knowledge, skills and concepts in each area and learn how to apply them in their lives. In order to incorporate key competencies into the curriculum, New Zealand schools were encouraged to review the delivery of curriculum, develop leadership capabilities within school staff, and develop a universal competency vocabulary and assessment procedures within school (Boyd & Watson, 2006).

Australia

The development of a new national curriculum in Australia began in 2008 when various states felt that a national curriculum would be key in delivering quality education. One tenet for change was the development of a necessary set of skills, behaviours, dispositions and general capabilities (competencies) that could be applied across discipline content. Australian educational leaders believed that these competencies would equip Australian students to be lifelong learners who are able to function confidently in a complex, information-rich, globalized world. The Australian curriculum focuses on seven general capabilities: 1) literacy; 2) numeracy; 3) information and communication technology competence; 4) critical and creative thinking; 5) ethical behaviour; 6) personal and social competence; and 7) intercultural understanding (Australian Curriculum Assessment and Reporting Authority, n.d.).

European Communities

The *Key Competences for Lifelong Learning: European Reference Framework* (European Communities, 2007) set out the following eight key competences:

1. communication in the mother tongue
2. communication in foreign languages
3. mathematical competence and basic competences in science and technology
4. digital competence
5. learning to learn
6. social and civic competences
7. sense of initiative and entrepreneurship
8. cultural awareness and expression.

These key competences are all considered equally important, because each can contribute to a successful life within a knowledge-based society. Many competences overlap and interlock, and aspects essential to one domain support competence in another. An example of this thinking is as follows:

> Competence in the fundamental basic skills of language, literacy, numeracy and in information and communication technology is an essential foundation for learning, and learning to learn supports all learning activities. There are a number of themes that are applied throughout the Reference Framework: critical thinking, creativity, initiative, problem-solving, risk assessment, decision-taking, and constructive management of feelings play a role in all eight key competences (European Communities, 2007, p. 3).

Finland

In Finland, the following key competencies have been taken into account in the aims and content of both subjects and cross-curricular themes:

> growth as a person; cultural identity and internationalism; media skills and communication; participatory citizenship and entrepreneurship; responsibility for the environment; well-being and a sustainable future; safety and traffic; and technology and the individual. The following competencies have been identified for general upper secondary education: active citizenship and entrepreneurship; well-being and safety; sustainable development; cultural identity and knowledge of cultures; technology and society; and media skills and communication (Finland Ministry of Education, 2009, pp. 5–6).

Switzerland

Switzerland has identified the following competencies: 1) lifelong learning; 2) holistic personal development; 3) integrated thinking; 4) open-mindedness; 5) displaying curiosity; 6) the ability to search and find new knowledge; 7) capacity for research work; 8) ability to make autonomous judgements; 9) sensitivity to ethical and aesthetic issues; 10) ability to master complex social tasks; 11) ability to communicate; 12) ability to work alone and in groups; 13) development of physical capabilities; and 14) willingness to take responsibility for oneself, others, society and the environment (Trier, 2002).

Norway

Norway produced a comprehensive curriculum for primary, secondary and adult education that identified the spiritual, creative, working, liberally educated, social, and environmentally aware human being. A spiritual human being was to be familiar with Christian and humanistic values, cultural heritage, local traditions, and a variety of religions and faiths, and was to have an ability to meet other cultures openly. A creative human being exhibited the ability to find new solutions, invent and test new explanations and use the scientific method. A working human being learns to learn, takes responsibility for his or her own learning and is able to plan and organize his or her own work and learning (Trier, 2002). A liberally educated human being has a sound foundation of knowledge, the ability to organize knowledge, methodological skills, respect for facts and sound argument, familiarity in using information technology, an understanding of internationalization, an appreciation of tradition, the ability to acquire new knowledge, and entrepreneurial skills. A social human being exhibits trust in personal abilities, communication skills, conflict resolution skills, social responsibility, concern for others, knowledge of rights and duties, the ability to take responsibility, and the development of an independent and autonomous personality. An environmentally aware human being has an awareness of nature and the natural environment and the ability to experience joy in nature and physical activity (Trier, 2002).

Sweden

The Swedish National Agency for Education considered the following competency areas to be particularly appropriate for developing and assessing in schools: 1) to see connections; 2) to find one's way in the outside world; 3) to make conscious ethical decisions; 4) to understand and apply democracy; 5) to display creative ability; and 6) to demonstrate communicative skills (Trier, 2002).

Austria

Austria developed a curriculum aimed at enhancing "personality-driven" competencies and reinforcing a *real-life orientation* without giving up the existing science orientation. This curriculum identified the following five competency areas: 1) language and communication; 2) mankind and society; 3) nature and technology; 4) creativity and design; and 5) health and physical ability. Austrian educational leaders hoped this framework would encourage a closer interrelation among the subject areas and serve as a basis for cross-disciplinary and interdisciplinary cooperation (Trier, 2002).

Germany

Germany identified the following as competencies: 1) German language; 2) foreign language; 3) the competent use of mathematical symbols and models; 4) understanding the structure of knowledge; 5) self-directed learning; 6) reflecting on one's own learning; 7) thinking, judging and acting; 8) metacognitive evaluation of one's own capacities; 9) cognitive flexibility; 10) creativity; 11) concentration; 12) precision and perseverance; 13) ability to apply knowledge in different contexts; 14) communicative competence; 15) ability to cooperate; and 16) ability to take decisions (Trier, 2002).

A German initiative drawing on the DeSeCo work was outlined in Weinert's (1999) paper, titled *Concepts of Competence*. The initiative was a joint venture between the German Federal and Länder (states) ministers of education. Six fundamental competency areas for general and vocational education were proposed. Intelligent knowledge was linked to: 1) lifelong learning; 2) deep understanding; 3) problem solving; and 4) facilitating transfer across domains.

- Intelligent knowledge includes transfer and linkage to lifelong learning, deep understanding and problem solving (mostly acquired in domain-specific settings but also facilitating transfer across domains).
- Applicable knowledge emphasizes authentic experience in real situations, project-based learning, horizontal transfer, and flexible planning schemata.
- Learning competency includes conscious expertise on one's own learning processes, the integration of vertical and horizontal transfer in variable situations and contexts, and both conscious and highly routine learning strategies.
- Method-related/instrumental key competencies include multiple, flexible, variable and highly routine applications, such as mother tongue, foreign language, mathematics, media and information technology.

- Social competencies include social comprehension, the ability to resolve conflicts and reflection on social experiences.

- Value orientation competencies are norm-based patterns of action involving social, democratic and individual values. They comprise not only universal moral norms but also such individual competencies as acting autonomously, reliably and responsibly while displaying tolerance, socially acceptable behaviour and cultural engagement.

United Kingdom

In the United Kingdom, the research conducted by the Royal Society for the Encouragement of Arts, Manufactures and Commerce (2010) resulted in the creation of Opening Minds—a competence-based curriculum focusing on managing information, situations and citizenship to meet education needs for the new century. Implementation of this curriculum, Opening Minds, has shown increased motivation and enjoyment of students, increased transition from primary to secondary grade levels, increased literary skills and increased standards of teaching and learning (Boyle, 2010).

European Union

The European Union has established a new skill set necessary for the new jobs of the 21st century. This skill set was established to better anticipate job requirements in Europe. The European Centre for the Development of Vocational Training, Cedefop, reviews systems designed to anticipate 21st century skills, provides comprehensive information on future skills, and offers a variety of examples of good practices in order to achieve the skill set necessary for the new jobs (European Centre for the Development of Vocational Training, 2008).

United States

Beyond the assessment of reading, mathematics and science, the United States does not assess other essential skills that are in demand in the 21st century. All Americans, not just an elite few, need 21st century skills to increase their marketability, employability and readiness for citizenship. The competencies identified by the Partnership for 21st Century Skills (2008) include: 1) thinking critically and making judgements about the barrage of information that comes one's way every day; 2) solving complex, multidisciplinary, open-ended problems that all workers, in every kind of workplace, encounter routinely; 3) creativity and entrepreneurial thinking; 4) communicating and collaborating with teams of people across culture, geography and language; 5) making innovative use of knowledge, information and opportunities to create new services, processes and products; and 6) taking charge of financial, health and civic responsibilities and making wise choices.

The enGauge 21st Century Skills build on extensive bodies of research—as well as on calls from government, business and industry for higher levels of workplace readiness—to define clearly what students need if they are to thrive in today's digital age. The skills identified are: 1) digital literacy; 2) inventive thinking; 3) effective communication; and 4) high productivity. Digital literacy includes basic (language and numeracy), scientific, economic, technological, visual, information, multicultural and global awareness literacy. Inventive thinking includes adaptability, managing complexity, self-direction, curiosity, creativity, risk taking, higher-order thinking and sound reasoning. Effective communication

includes teaming, collaboration, interpersonal skills, personal responsibility, social responsibility, civic responsibility and interactive communication. High productivity includes prioritizing, planning and managing for results, the effective use of real-world tools, and the ability to produce relevant, high-quality products (Metiri Group, 2003).

Other Work on Competencies for the 21st Century

Trier (2002) examined a wide variety of countries to see how often competencies were mentioned in curriculum documents and the importance given to them. Competencies mentioned in all countries included: 1) learning/lifelong learning; 2) mother tongue literacy; 3) social competencies/cooperation/ teamwork; 4) communication competencies; 5) information/problem solving/IT-media competencies; 6) numeracy/mathematical literacy; 7) value education/ethics; and (8) autonomy/self-management/ action orientation/taking decisions. The following were included only in some countries' documents: 1) creativity/expression/aesthetic competencies; 2) foreign languages/internationalization; 3) cultural identity and tradition/intellectual competencies; 4) religion; 5) political competencies/democracy; and 6) ecological awareness/value nature/physical ability/health.

The Assessment & Teaching of 21st Century Skills report (Binkley, Erstad, Herman, Raizen, Ripley & Rumble, 2010) outlines what has been called the KSAVE framework, which is described as an overall conceptual diagram that amalgamates numerous frameworks found worldwide. The KSAVE framework comprises four main categories and defines 10 skills. These are as follows:

Ways of Thinking

- Creativity and innovation
- Critical thinking, problem solving, decision making
- Learning to learn, metacognition

Ways of Working

- Communication
- Collaboration (teamwork)

Tools for Working

- Information literacy (includes research on sources, evidence, biases, etc.)
- Information and communication technology literacy

Living in the World

- Citizenship; e.g., local and global
- Life and career
- Personal and social responsibility, including cultural awareness and competence (p. 15)

What is important to note from the work done by this group is the following statement, "… the model does not resolve the issue of subject-embedded knowledge, skills and attitudes versus their generalizability across domains" (Binkley, Erstad, Herman, Raizen, Ripley & Rumble, 2010, p. 15).

In addition, a number of individual researchers have advanced what they consider to be important competencies for the 21st century. Creativity expert, Sir Ken Robinson, makes a case for creativity. Although Robinson believes creativity has been maligned, neglected and misunderstood, he feels creativity is finally coming into its own as a crucial 21st century competency needed for solving today's pressing problems (Azzam, 2009).

Trilling and Fadel (2009) introduced a framework for 21st century learning that maps the skills needed to survive and thrive in a complex and connected world. Their version of a 21st century education includes knowledge of traditional core subjects, such as reading, writing and arithmetic, but also emphasizes contemporary themes, such as global awareness and financial/economic, health and environmental literacies. They also advanced the idea of the "7 Cs" as basic competencies: 1) critical thinking; 2) creativity and innovation; 3) collaboration (teamwork and leadership); 4) cross-cultural understanding; 5) communication and media literacy; 6) computing (information and communication technology literacy); and 7) career and self-reliance.

Wagner's book *The Global Achievement Gap* (2008) recommends those *survival skills* he feels are important competencies for 21st century learners. They are as follows: 1) critical thinking and problem solving; 2) collaboration across networks and leading by influence; 3) agility and adaptability; 4) initiative and entrepreneurialism; 5) effective oral and written communication; 6) accessing and analyzing information; and 7) curiosity and imagination.

Technology and Competencies

According to Kellner (n.d.) the continuing technological revolution will have a greater impact on society than the transition from oral to print culture. Globalization and modernization are leading to an increasingly diverse yet interconnected world. To understand and fully function in such a world, individuals need to make sense of the large amounts of information available and master rapidly changing technology. In New Zealand, technology is viewed as an essential learning area that must work with all other learning areas to mediate key competencies into the classroom curriculum. New Zealand feels that broad, deep and critical technological literacy will result in increasing student empowerment for future citizens (Compton, 2011).

Using data from the 2006 Programme for International Student Assessment, an examination was carried out to determine to what extent investments in technology enhanced educational outcomes. One of the most striking findings of this study was that education's digital divide goes beyond the issue of access to technology. A new second form of digital divide has been identified: the one existing between those who have the right competencies to benefit from computer use and those who do not. These competencies and skills are closely linked to student's economic, cultural and social capital. This finding has important implications for policy and practice. The work surrounding the Programme for International Student Assessment 2006 updates the findings of the 2006 Organisation for Economic Co-Operation and Development report and seeks to go deeper into the determinants of technology use, both in frequency and in purpose, and into the impact on educational performance (Organisation for Economic Co-Operation and Development, 2010).

Competency-based Education Programs

Spady is widely regarded as the leading advocate of competency-based education (outcome-based education as he calls it). He defines it as a:

> comprehensive approach to organizing and operating an education system that is focused on and defined by the successful demonstrations of learning sought from each student. Outcomes are … clear learning results that we want students to demonstrate at the end of significant learning experiences … and … are actions and performances that embody and reflect learner competence in using content, information, ideas and tools successfully (Spady, 1994, p. 2).

According to Van der Horst and McDonald (1997), competency-based education is based on six critical components: 1) explicit learning outcomes with respect to the required skills and concomitant proficiency (standards for assessment); 2) a flexible time frame to master these skills; 3) a variety of instructional activities to facilitate learning; 4) criterion-referenced testing of the required outcomes; 5) certification based on demonstrated learning outcomes; and 6) adaptable programs to ensure optimum learner guidance (pp. 10–11).

In *Enriched Learning Projects: A Practical Pathway to 21st Century Skills,* Bellanca (2010) makes a compelling statement about the current state of education as it relates to the manner in which curriculum is developed. He states that if schools continue to follow a factory model in which curriculum is broken into isolated boxes, and what students learn is that

> English is not math, math is not science, science is not social studies, and so forth, then 21st century skills will simply become more little boxes. Critical thinking and creative thinking will become separate topics to be mastered and tested, but not necessarily used; communication and collaboration will become separate courses; and problem solving will be another separate elective—another little box. Each skill will have a separate syllabus added to the day or taught in summer school (p. 13).

Curriculum and instruction are at the heart of any educational endeavour, because they determine what is taught and how. There is no "one best system" to achieve a 21st century education. Every district, school, classroom and learner is unique; thus, curricula and pedagogies must be crafted for unique circumstances. A 21st century education depends upon an integrative approach to curriculum that unites core academic subjects, interdisciplinary themes and essential skills with instruction in which modern pedagogies, technologies, resources and contexts work together to prepare students for modern life (Partnership for 21st Century Skills, 2007).

The Partnership for 21st Century Skills (2011, pp. 1–2) believes that implementation of every 21st century skill requires the development of core academic subject knowledge and understanding among all students. Those who can think critically and communicate effectively must build a base of core academic subject knowledge. Within the context of core knowledge instruction, students must also learn the essential skills for success in today's world, such as critical thinking, problem solving,

communication and collaboration. Although the mastery of core subjects and 21st century themes is essential to student success, "schools must promote an understanding of academic content at much higher levels by weaving 21st century interdisciplinary themes, such as global awareness and financial, economic, business and entrepreneurial, civic, health and environmental literacy into core subjects" (p. 2).

A number of successful competency-based curricula are reported in the literature. For example, Boyle (2010) describes the Opening Minds curriculum and its competency-based approach to learning and lists the benefits of implementing this curriculum. This competency-based curriculum focuses on learning, managing information, relating to people, managing situations, and citizenship. It uses project-based learning, where a variety of subjects are combined and taught by one teacher and where students are together for a majority of the time.

The Royal Society for the Encouragement of Arts, Manufactures and Commerce (2010) in the United Kingdom supports a competency-based curriculum in more than 200 schools. The curriculum framework comprises five broad competencies, or competences as they call them: 1) learning, 2) citizenship, 3) relating to people, 4) managing situations, and 5) managing information. The competencies are developed through a blend of classroom instruction and experiential activities. Students are required to plan their work, organize their time and explore their own learning preferences/styles. Learning occurs through the integration of several subjects into topics or themes, and it is through these modules that the competencies are developed.

Weddel (2006) presents the following set of characteristics to describe competency-based education programs:

1. Specific, measurable competency statements.
2. Content based on learner goals (outcomes/competencies).
3. Continuous learner involvement in program until mastery is demonstrated.
4. The use of a variety of instructional techniques and group activities.
5. A focus on what the learner needs to learn, which is the application of basic skills in a life skills context.
6. The use of texts, media and real-life materials geared to targeted competencies.
7. Providing learners with immediate feedback on assessment performance.
8. Pacing instruction to learner needs.
9. Having learners demonstrate mastery of specified competency statements (p. 4).

In a traditional approach, students progress through various time-based subject areas. At any given time, teachers are expected to cover given curriculum content. Although every student may not move at the same rate, the schedule typically requires everyone to do so. Competency-based programs differ from traditional programming in that skill attainment and learning are emphasized, and time and class rank are de-emphasized. In this model, all students have an opportunity to gain proficiency at their own rate, in their own way. The setting of clear standards helps students of all ages know where they are in the process of gaining competency and allows them to monitor their own progress, which can be highly

motivating. When a school or district builds a system that combines a competency-based framework with the necessary support systems—standards, assessments, curriculum and instruction, professional development and learning environments—students are more engaged in the learning process and graduate better prepared to thrive in today's global economy (Partnership for 21st Century Skills, 2011).

Competency-based Educators and Learners

The Québec Ministry of Education (2007) suggests that today's

> educators have to deal with the difficulty of providing guidance and support for an increasingly diverse group of students: those who are highly motivated and those who want to drop out, those who live in stable, intellectually stimulating families and those who have experienced frequent readjustments or very difficult times (p. 3).

Teachers who teach from a competency-based educational perspective must become more attuned to planning and managing learning environments and must be committed to the ideal of valid and reliable assessment (Malan, 2000). They must be familiar with goal setting and equipping students with the tools and support to reach those goals. In a competency-based classroom, the student and the teacher are equal partners in a student's learning process. Differentiation of instruction—tailoring curriculum and instruction to various learning preferences and modalities so that all students have equal opportunities to learn to the best of their abilities—is a skill necessary for effective competency-based instruction (Sullivan, n.d.).

Learners must assume greater responsibility and actively participate in the learning process. They are core participants, and their active engagement leads to a better understanding of their own learner needs and styles (Dumont & Istance, 2010). Today's competency-based curriculum and pedagogy is built upon a vision where young people will become confident, connected, actively involved and lifelong learners. A competency-based approach allows schools the flexibility to develop learning programs that work for all students. It provides broad principles, values and key competencies to be explored and adopted (New Zealand Ministry of Education, n.d.).

CONSIDERATIONS FOR CURRICULUM

According to Bowden (n.d.), because the future that today's learners will deal with cannot be fully prescribed, these learners must learn in ways that develop their capacities to discern and react to novel situations. Such learning will necessitate that contextual variation is common to their learning experiences. Dealing with an unpredictable future necessitates that any competency-based educational approach must move from "prescriptiveness" and embrace the principle of diversity and variation. When diversity in teaching and learning is established and celebrated, students can be better guided toward increased competency in attitudes, skills and knowledge.

The three general assumptions about competencies that follow are important to consider when one explores the development or use of competencies within educational programs:

- Basic skills are important. Delors and Draxler (2001) remind us that sound foundations, such as the capacity to read, write, communicate and compute, are required of everyone and should be a part of everyone's schooling. Rychen (2003) has suggested, however, that, while important, "subject-related competencies and basic skills do not capture the full range of relevant outcomes needed for a successful life for the individual and for well-functioning institutions and societies" (p. 109).
- The ability for learners to develop competencies has as much to do with the world they live in as it does with their personal qualities (Canto-Sperber & Dupuy, 2001). Acquiring and maintaining competencies is not only dependent on personal effort but upon a favourable institutional and social environment.
- Competencies are acquired and developed throughout a lifetime and can be learned in many settings, assuming a favourable environment is available (Organisation for Economic Co-Operation and Development, 2002; Québec Ministry of Education, 2007).

Kern, Thomas and Hughes (2009) have developed a six-step process for developing competency-based curricula for medical schools. There appear to be things in this process that would be helpful for K–12 schools. The six steps they recommend are as follows:

1. Problem identification and general needs assessment – an examination of current approaches and ideal approaches.
2. Targeted needs assessment – an examination of the learners and the learning environment.
3. Goals and objectives – an examination of possible broad goals and specific measurable goals.
4. Educational strategies – an examination of possible content and teaching and learning methods.
5. Implementation – an examination of public support, resources, barriers, introducing the curriculum, and administering the curriculum.
6. Evaluation and feedback – an examination of the learners and program (pp. 6–8).

Kern, Thomas and Hughes (2009) further provide excellent advice to curriculum developers when they observe that:

> In practice curriculum development does not usually proceed in a sequence, one step at a time. Rather, it is a dynamic, interactive process. Progress is often made on two or more steps simultaneously. Progress on one step influences progress on another .... For example, limited resources (Step 5) may limit the number and nature of objectives (Step 3), as well as the extent of evaluation (Step 6) that is possible. Evaluation strategies (Step 6) may result in a refinement of objectives (Step 3). Evaluation (Step 6) may also provide information that serves as a needs assessment of targeted learners (Step 2). Time pressures, or the presence of an existing curriculum, may result in the development of goals, educational methods, and implementation strategies (Steps 3, 4, and 5) before a formal problem identification and needs assessment (Steps 1 and 2), so that Steps 1 and 2 are used to refine and improve an existing curriculum rather than develop a new one. For a successful curriculum, curriculum development never really ends .... Rather, the curriculum evolves, based on evaluation results, changes in resources, changes in targeted learners, and changes in the material requiring mastery (p. 8).

BIBLIOGRAPHY

Alberta Education. (2010a). *AISI cycle 4 project thumbnails*. Retrieved from http://education.alberta.ca/admin/aisi/researchers/projects.aspx

Alberta Education. (2010b). *Inspiring education: A dialogue with Albertans*. Retrieved from http://www.inspiringeducation.alberta.ca/LinkClick.aspx?fileticket=BjGiTVRiuD8%3d&tabid=37

Alberta Education. (2010c). *Inspiring action on education*. Retrieved from http://ideas.education.alberta.ca/media/2905/inspiringaction%20eng.pdf

Alberta Education. (2011a). *Action on curriculum: Why competencies matter*. Retrieved from http://www.gpcsd.ca/sections/educators/files/2011/march/14/Competencies%20Matter%20-%20Revised%20Feb%2028.pdf

Alberta Education. (2011b). *Framework for student learning: Competencies for engaged thinkers and ethical citizens with an entrepreneurial spirit*. Retrieved from http://education.alberta.ca/media/6581166/framework.pdf

Alberta Education. (2011c). *Alberta Education Action Agenda 2011–14*. Retrieved from http://education.alberta.ca/media/6432073/actionagenda.pdf

Ananiadou, K., & Claro, M. (2009). *21st century skills and competences for new millennium learners in OECD countries*. OECD Education Working Papers, No. 41. Retrieved from http://www.oecd-ilibrary.org/education/21st-century-skills-and-competences-for-new-millennium-learners-in-oecd-countries_218525261154

Asia-Pacific Economic Cooperation. (2008). *Education to achieve 21st century competencies for all*. 4th APEC Education Ministerial Meeting, Lima, Peru. Retrieved from http://www.apecknowledgebank.org/file.aspx?id=1976

Asia-Pacific Economic Cooperation Human Resources Development Working Group. (n.d.). 21st century competencies. Retrieved September 14, 2011, from http://hrd.apec.org/index.php/21st_Century_Competencies

Audigier, F. (2000). *Basic concepts and core competencies for education for democratic citizenship.* Strasbourg, France: Council for Cultural Co-operation, Education for Democratic Citizenship Project.

Australian Curriculum Assessment and Reporting Authority. (n.d.). Overview: The Australian curriculum. Retrieved September 14, 2011, from http://www.australiancurriculum.edu.au/Curriculum/Overview

Azemikhah, H. (n.d.). *The 21st century, the competency era and competency theory*. Retrieved from http://www.avetra.org.au/ABSTRACTS2006/PA%200058.pdf

Azzam, A. (2009). Why creativity now? A conversation with Sir Ken Robinson. *Educational Leadership, 67*(1), 22–26. Retrieved from http://www.ascd.org/publications/educational-leadership/sept09/vol67/num01/Why-Creativity-Now¢-A-Conversation-with-Sir-Ken-Robinson.aspx

Bellanca, J. (2010). *Enriched learning projects: A practical pathway to 21st century skills*. Bloomington, IN: Solution Tree Press.

Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., & Rumble, M. (2010). *Defining twenty-first century skills*. In P. Griffith, B. McGaw & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 17–66). New York, NY: Springer.

Bloom, B. S., Hastings, J. T., & Madaus, G. F. (1971). *Handbook on formative and summative evaluation of student learning*. New York, NY: McGraw-Hill.

Bowden, J. A. (n.d.). *Competency-based education—Neither a panacea nor a pariah*. Retrieved from http://crm.hct.ac.ae/events/archive/tend/018bowden.html

Boyd, S., & Watson, V. (2006). *Shifting the frame: Exploring integration of the key competencies at six normal schools*. Wellington, New Zealand: New Zealand Council for Educational Research. Retrieved from http://nzcurriculum.tki.org.nz/curriculum-stories/case-studies/key-competencies-exploratory-studies-2006/key-competencies-case-studies

Boyle, H. (2010). 21st century tools for a 21st century education? Opening minds: Research section. Retrieved September 14, 2011, from http://www.openingminds.org.uk/Site/Opening_Minds_Research.html

Canto-Sperber, M., & Dupuy, J. P. (2001). Competencies for the good life and good society. In D. S. Rychen & L. H. Salganik (Eds.), *Defining and selecting key competencies* (pp. 67–92). Gottingen, Germany: Hogrefe & Huber.

Chappell, C. (1996). Quality and competency based education and training. In *The literacy equation: Competency=capability?* (pp. 71–79). Red Hill, Australia: Queensland Council for Adult Literacy.

Collins, C. (Ed.). (1993). C*ompetencies: The competencies debate in Australian education and training*. Canberra, Australia: Australian College of Education. Retrieved from http://eric.ed.gov/PDFS/ED361833.pdf

Compton, V. (2011). Technology and key competencies. Retrieved September 14, 2011, from http://www.techlink.org.nz/curriculum-support/tech-key/index.htm

Council of Ministers of Education, Canada. (2010). *Ministers of education mark international education week* (press release). Toronto, ON: Council of Ministers of Education, Canada. Retrieved from http://www.cmec.ca/Press/2010/Pages/2010-11-15.aspx

Delors, J., & Draxler, A. (2001). From unity of purpose to diversity of expression and needs: A perspective from UNESCO. In D. S. Rychen & L. H. Salganik (Eds.), *Defining and selecting key competencies* (pp. 214–221). Gottingen, Germany: Hogrefe & Huber.

Dumont, H., & Istance, D. (2010). Analyzing and designing learning environments for the 21st century. In H. Dumont, D. Istance & F. Benavides (Eds.), *The nature of learning: Using research to inspire practice* (pp. 19–34). Paris, France: OECD Publishing.

Ecclestone, K. (1997). Energising or enervating: Implications of national vocational qualifications in professional development. *Journal of Vocational Education and Training, 49*(1), 65–79. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/13636829700200006

European Centre for the Development of Vocational Training. (2008). *Systems for anticipation of skill needs in the EU member states*. Retrieved from http://www.cedefop.europa.eu/EN/Files/WorkingPaper01_Oct2008.pdf

European Communities. (2007). *Key competences for lifelong learning: European reference framework*. Luxembourg: Office for Official Publications of the European Communities. Retrieved from http://ec.europa.eu/dgs/education_culture/publ/pdf/ll-learning/keycomp_en.pdf

Finland Ministry of Education. (2009). *Key competences for lifelong learning in Finland: Education 2010 –Interim report*. Retrieved from http://ec.europa.eu/education/lifelong-learning-policy/doc/natreport09/finland_en.pdf

Gonczi, A. (1997). Future directions for vocational education in Australian secondary schools. *Australian and New Zealand Journal of Vocational Education Research*, *5*(1), 77–108.

Harris, R., Guthrie, H., Hobart, B. & Lundberg, D. (1995). *Competency-based education and training: Between a rock and a whirlpool*. South Melbourne, Australia: Macmillan Education Australia.

Haste, H. (2008). Good thinking: The creative and competent mind. In A. Craft, H. Gardner & G. Claxton (Eds.), *Creativity, wisdom, and trusteeship: Exploring the role of education* (pp. 96–104). Thousand Oaks, CA: Corwin Press.

Hoffmann T. (1999). The meanings of competency. *Journal of European Industrial Training*, *23*(6), 275–286.

Hyland, T. (1994). *Competence, education and NVQs: Dissenting perspectives*. London, England: Cassell.

Jonnaert, P., Barrette, J., Masciotra, D., Morel, D., & Mane, Y. (2006). *Revisiting the concept of competence as an organizing principle for programs of study: From competence to competent action*. Observatoire des Réformes en Éducation, International Bureau of Education: UNESCO.

Jonnaert, P., Masciotra, D., Barrette, J., Morel, D., & Mane, Y. (2007). From competence in the curriculum to competence in action. *Prospects: Quarterly Review of Comparative Education*, *37*(2), 187–203.

Kellner, D. (n.d.). *New media and new literacies: Reconstructing education for the new millennium*. Retrieved from http://gseis.ucla.edu/faculty/kellner/essays/newmedianewliteracies.pdf

Kerka, S. (1998). *Competency-based education and training: Myths and realities*. Retrieved from http://www.calpro-online.org/eric/textonly/docgen.asp?tbl=mr&ID=65

Kern, D., Thomas, P., & Hughes, M. (Eds.). (2009). *Curriculum development for medical education: A six-step approach* (2nd edition). Baltimore, MD: The Johns Hopkins University Press. Retrieved from http://books.google.ca/books?hl=en&lr=&id=yEd7XsJbYwwC&oi=fnd&pg=PR7&dq=curriculum+development+competency+based&ots=hGLbrjIJEt&sig=7W3uiRMCxKqjSlmD8vSwbIV4lFo#v=onepage&q=curriculum%20development%20competency%20based&f=false

Malan, S. P. T. (2000). The "new paradigm" of outcomes-based education in perspective. *Journal of Family Ecology and Consumer Sciences, 28*, 22–28.

Metiri Group. (2003). *enGauge 21st century skills for 21st century learners*. Retrieved from http://www.metiri.com/21/Metiri-NCREL21stSkills.pdf

Mexico Ministry of Education. (2011). *Plan de estudios 2011–Educación básica*. Retrieved from http://basica.sep.gob.mx/dgdc/sitio/pdf/PlanEdu2011.pdf

Nelson Intermediate School. (n.d.). *Key competencies powerpoint presentation*. Retrieved from http://www.slideshare.net/mungo13/nis-key-competencies

Neville, A. J., & Norman, G. R. (2007). PBL in the undergraduate MD program at McMaster University: Three iterations in three decades. *Academic Medicine, 82*(4), 370–374.

New Brunswick Department of Education. (2010). *NB3-21C: Creating a 21st century learning model of public education three-year plan 2010–2013*. Retrieved from http://www.district6.nbed.nb.ca/PDF/NB3-21Cconsultationdocument2nd2edition.pdf

New Zealand Educational Institute & Flockton, L. (2009). *The New Zealand curriculum, dimension 4: Key competencies*. Retrieved from http://www.nzei.org.nz/connectedcurriculum

New Zealand Ministry of Education. (2010). *National standards and key competencies*. Wellington, New Zealand: New Zealand Ministry of Education. Retrieved from http://keycompetencies.tki.org.nz/National-Standards-and-KCs#diagrams

New Zealand Ministry of Education. (n.d.). *The school curriculum: Design and review*. Retrieved from http://nzcurriculum.tki.org.nz/Curriculum-documents/The-New-Zealand-Curriculum/The-school-curriculum-Design-and-review

Nunavut Department of Education. (2007). *Inuit Quajimajatuquangit education framework*. Iqaluit, NU: Department of Education.

Organisation for Economic Co-operation and Development. (2002). *Definition and selection of competences (DeSeCo): Theoretical and conceptual foundations*. Retrieved from http://mt.educarchile.cl/MT/jjbrunner/archives/libros/Competencias/Estrategia.pdf

Organisation for Economic Co-operation and Development. (2005). *The definition and selection of key competencies: Executive summary*. Retrieved from http://www.oecd.org/dataoecd/47/61/35070367.pdf

Organisation for Economic Co-operation and Development. (2010). *Are the new millennium learners making the grade? Technology use and educational performance in PISA 2006*. Retrieved from http://www.oecd.org/document/57/0,3746,en_2649_35845581_45000313_1_1_1_1,00.html

Partnership for 21st Century Skills. (2007). *21st century curriculum and instruction*. Retrieved from http://www.p21.org/documents/21st_century_skills_curriculum_and_instruction.pdf

Partnership for 21st Century Skills. (2008). *21st century skills, education and competitiveness: A resource and policy guide*. Retrieved from http://www.p21.org/documents/21st_century_skills_education_and_competitiveness_guide.pdf

Partnership for 21st Century Skills. (2011). *Framework for 21st century learning*. Retrieved from http://p21.org/documents/1.__p21_framework_2-pager.pdf

Peter, L. J. (n.d.). Retrieved September 14, 2011, from http://www.quotationspage.com/quotes/Laurence_J._Peter/

Québec Ministry of Education. (2007). *Québec education program: Secondary school education, cycle two*. Retrieved from http://www.mels.gouv.qc.ca/sections/programmeFormation/secondaire2/index_en.asp?page=introduction

Royal Society for the Encouragement of Arts, Manufactures and Commerce. (2010). RSA opening minds competence framework. Retrieved September 14, 2011, from http://www.rsaopeningminds.org.uk/about-rsa-openingminds/competences/

Rubio, E. (n.d.). *Education to achieve 21st century competencies and skills for all: Respecting the past to move toward the future*. Retrieved from http://www.sociedadytecnologia.org/pg/pages/view/94024/education-to-achieve-21st-century-competencies-and-skills-for-all-respecting-the-past-to-move-toward-the-future

Rychen, D. S. (2003). A frame of reference for defining and selecting key competencies in an international context. In D. S. Rychen, L. H. Salganik & M. E. McLaughlin (Eds.), *Definition and selection of key competencies: Contributions to the second DeSeCo symposium, Geneva, Switzerland, February 2002* (pp. 109–116). Neuchâtel, Switzerland: Swiss Federal Statistical Office. Retrieved from http://www.oecd.org/dataoecd/48/20/41529505.pdf

Saskatchewan Ministry of Education. (2010). Cross-curricular competencies. Retrieved September 14, 2011,from http://www.education.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=522,523,127,107,81,1,Documents&MediaID=15291&Filename=Cross-curricular+Competencies

Singapore Ministry of Education. (2010a). *MOE to enhance learning of 21st century competencies and strengthen art, music and physical education* (press release). Retrieved from http://www.moe.gov.sg/media/press/2010/03/moe-to-enhance-learning-of-21s.php

Singapore Ministry of Education. (2010b). *Nurturing our young for the future: Competencies for the 21st century*. Retrieved from http://www.moe.gov.sg/committee-of-supply-debate/files/nurturing-our-young.pdf

Spady, W. G. (1994). *Outcome-based education: Critical issues and answers*. Arlington, VA: American Association of School Administrators.

Sullivan, J. (n.d.). Competency based education training. Retrieved September 14, 2011, from http://www.ehow.com/about_6563726_competency_based-education-_amp_-training.html

Tardif, J. (2006). *L'évaluation des compétences: Documenter le parcours de développement.* Montreal, QE: Chenelière Éducation.

Trier, U. P. (2002). Twelve countries contributing to DeSeCo: A summary report. In D. S. Rychen, L. H. Salganik & M. E. McLaughlin (Eds.), *Definition and selection of key competencies: Contributions to the second DeSeCo symposium, Geneva, Switzerland, February 2002* (pp. 27–64). Neuchâtel, Switzerland: Swiss Federal Statistical Office. Retrieved from http://www.oecd.org/dataoecd/48/20/41529505.pdf

Trilling, B. (2010). 21st century middle schools: What does success really mean? *Middle Ground (The Magazine of Middle Level Education), 13*(4), 8–11.

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. San Francisco, CA: Jossey-Bass.

UNESCO. (1996). *Learning: The treasure within*, *report to UNESCO of the International Commission on Education for the Twenty-First Century.* Chapter 4: The four pillars of education. Paris, France: UNESCO Publishing. Retrieved from http://www.unesco.org/delors/fourpil.htm

Van der Horst, H., & McDonald, R. (1997). OBE. A teacher's manual. Pretoria. Kagiso. As quoted in Malan, S. P. T. (2000). The "new paradigm" of outcomes-based education in perspective. *Journal of Family Ecology and Consumer Sciences*, *28*, 22–28.

Voorhees, R. (2001). Competency-based learning models: A necessary future. *New Directions for Institutional Research*, *110*, 5–13. Retrieved from http://www.medbev.umontreal.ca/gtea/Competency-Based%20Learning%20Models.pdf

Wagner, T. (2008). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need—and what we can do about it*. New York, NY: Basic Books.

Weddel, K. S. (2006). *Competency based education and content standards: Definitions, components, characteristics, integrating competencies and content standards, mapping competencies, resources*. Retrieved from http://www.cde.state.co.us/cdeadult/download/pdf/CompetencyBasedEducation.pdf

Weinert, F. E. (1999). *Concepts of competence: DeSeCo expert report*. Neuchâtel, Switzerland: Swiss Federal Statistical Office.

CHAPTER 3: WAYS OF KNOWING

"There is no logical way to the discovery of these elemental laws. There is only the way of intuition."
Albert Einstein (in Plank, 1932)

The concept of *ways of knowing* is one that has, only of late, received increased attention in the academic literature as students of all cultures, especially First Nations, Métis and Inuit students, demonstrate learning that is occurring in sometimes difficult and challenging situations within the current predominately Eurocentric-based conventional schooling system. There is recognition in the literature that "… despite our varied place-based cultures and knowledge systems, we live in the world together with others and must constantly think and act with reference to these relationships. Any knowledge we gain about the world interweaves us more deeply with these relationships and gives us life" (Donald, 2009, p. 7). As Donald implies, curriculum designers need to have a better understanding of what *ways of knowing* means and what it means for curriculum.

While the literature found on this concept examines primarily Aboriginal or Indigenous *ways of knowing*, it is important to note that there is research that looks at other *ways of knowing*; e.g., gender-related; subject/discipline, embodied and intuitive, as well as cultural beliefs not associated with Indigenous epistemologies. What follows is an exploration of this concept through the available literature at this time.

THEORETICAL FOUNDATIONS

Inherent in the understanding of *ways of knowing* is the notion of epistemology and ontology. Epistemology relates to what *is* knowledge and is believed to be true about a given body of knowledge. Epistemologies are often equated with rationality and intellect, while ontology is the classification system used to categorize the concepts that form that body of knowledge. Both are used to describe thought processes on an individual basis and cultural beliefs and practices on a larger scale.

The understanding of what it is meant by *ways of knowing* rests mostly within literature that is theoretical in nature. These epistemological paradigms focus largely around the tension that exists between Western society and Indigenous peoples, such as the First Nations, Métis and Inuit peoples of Canada.

Discipline-specific Ways of Knowing

It is recognized that each discipline has what is called a *body of knowledge*–content knowledge that is specific to that domain of study. Within each discipline there also lies the notion of *knowing about* the discipline (conceptual knowledge) and *knowing* how, which represents what Carter (2007) calls "active ways of knowing" or procedural knowledge related to the discipline. According to Carter, the notion of

disciplinary ways of doing is the link to discipline-specific *ways of knowing* and the skill of writing[9] within and across disciplines. He calls this "bridging the outside/in gap" (p. 387). To contextualize this notion of the gap, Carter (2007) states:

> It is this relationship among knowing, doing, and writing that is concealed by the disciplinary focus on conceptual knowledge. Doing is the middle term that links writing and knowing in the disciplines, thus the challenge in reframing the disciplines as ways of knowing, doing and writing is to find a means of describing in convincing terms the ways of doing that characterize the disciplines" (p. 389).

In his work with university faculty members, it became clear that, in identifying what students should know and be able to do through the use of outcome-based statements, "certain ways of doing were repeated in general terms across a variety of disciplines: responses to academic learning situations that call for problem solving, for empirical inquiry, for research sources, and for performance" (Carter, 2007, p. 394). It was also evident that even though these *ways of knowing* appeared to be similar across disciplines, there were enough differences to identify discipline-specific *ways of knowing* through the types of written activities that students were required to produce.

Embodied Knowing

This area is growing as researchers and philosophers question the notion of what knowledge is and how it is that one comes to know. According to Dall'Alba and Barnacle (2005):

> … the notion of knowledge as foundational and absolute has been extensively challenged. A transformation and pluralisation has occurred, such that knowledge has come to be seen as situated and localized into various 'knowledges.' At the same time, the status of the body has taken on renewed significance in epistemological debates. Rather than thinking of knowledge as transcending the body, the embodiment of knowledge has become a key factor in understanding the nature of knowledge and what is means to know (pp. 719–720).

From a phenomenological point of view (Merleau-Ponty, 1962/1945, 1998/1964 as cited in Dall'Alba & Barnacle, 2005) the meaning of coming to know involves the body as a whole that is not disassociated from the brain, as is often the view affirmed by the Cartesian model of knowledge acquisition. Instead the body perceives not only what is perceivable on the outside but also within. As is stated by Dall'Alba and Barnacle (2005), "Meaning making and the associated production of knowledge are essential features of meaningful learning. Regarding learning merely as something to be managed overlooks its potentially transformative nature whereby learners engage with, and embody what they learn" (p. 730).

[9] Carter's paper is specifically about the writing process and the difference between writing as a universal skill versus writing that is specific to the disciplines. He purports that writing as a general skill can be used to develop the ways of writing that are specific to a discipline.

This is now more prevalent than ever, as technology becomes ubiquitous in today's society. Examples of embodied *ways of knowing* are being discussed in the literature, as it relates to mobility and spatiality—"embodied ways of knowing and learning by 'being mobile' in physical and mediated spaces" (Enriquez, 2011, p. 39). Enriquez (2011) states that "Strictly segregated spaces and social organizations of everyday life are increasingly undermined and re-ordered by the permeability and fluid modalities of emerging network and mobile technologies" (p. 39). In her view, the concepts of mobility and spatiality are in the midst of being deconstructed and the notion that there is more than one type of "presence" that exists in today's technological environments shrouds society with the feeling of omnipresence more than any other time in history. Enriquez suggests that technology, including the Internet, has given individuals an "exit option" and that mobile technologies in particular have shifted one's sense of "place, home, self, identity and bodies" (p. 40). She goes on to say that by using a mobile phone, for example, people can "exit" their physical spaces, avoid those who are physically "present" around them and be elsewhere with those who are "absent" in that same space.

Enriquez (2011) presents two perspectives on mobility—interaction and context—within a framework that examines embodied users and owners of mobile devices and the Internet. Within each perspective of mobility, she outlines the different dimensions of human interactions, including:

> *Spatial* mobility: refers to the physical movement of people, objects, symbols and space itself.
>
> *Temporal* mobility: refers to the non-linear coordination that media technologies afford in human activities beyond clock-time slices and allocations.
>
> *Contextual* mobility: refers to the mediated situation in which individuals are considered to be relatively free of the contextual constraints of computer-mediated interactions in largely different contexts (p. 41).

In her closing, Enriquez (2011) states that "how we learn is not just an encounter of intellects mediated by tools, but a bumping into of bodies in spaces as part of the ways of knowing in motion" (p. 50). She reiterates the importance of learning from the various perspectives of mobility that knowledge is not constructed solely from travelling from place to place but also from staying still. Thus, the era of the digital age brings with it a "new" notion of time, space and place. As such, this new *way of knowing* is increasing the "distance" between generations, as each generation comes to know these new realities and learns new knowledge in different ways and within their personal realm of experience.

Indigenous Knowledge and Ways of Knowing

Donald (2009) discusses the need for First Nations, Métis and Inuit people to come to recognize their own epistemological roots. He describes what is the typical state of learning for First Nations, Métis and Inuit people as the colonial frontier logics that stem from "fort teachings," an artifact from the past which "represents a particular four-cornered version of imperial geography that has been transplanted on lands perceived as empty and unused ... adhering to the myth that forts facilitated the civilization of the land and brought civilization to the Indians ..." (p. 3). This history that he refers to has had and

continues to have a dramatic influence on the educational contexts that both Aboriginal and non-Aboriginal students find themselves in and on the stories they are told about Aboriginal-Canadian relations. This colonial frontier logic continues to perpetuate the notion that Canadians and Aboriginal peoples live in separate social and spatial realities, even though they live on the same land and within the same space. He states that the "historical, social and cultural understandings of the fort and frontier have become conflated with ways of organizing and separating people according to race, culture and civilization" (p. 4).

Battiste (2010) speaks to learning (as Aboriginal people have come to know it) as holistic, lifelong, purposeful, experiential, communal, spiritual and alive with language and culture. First Nations, Métis and Inuit peoples' *ways of coming to know* and *coming to be* occurs through learning spirits who travel with and guide people along their earth walks, offering inspiration that helps them realize the potential to be who they are. In the current educational system, however, Aboriginal peoples across Canada are either marginalized by or assimilated into the English language and predominately Eurocentric culture that constitutes Canadian schools today. Battiste (2010) indicates that:

> Today, Indigenous peoples around the world continue to feel the tensions created by a Eurocentric educational system that has taught them not to trust Indigenous knowledge, but to rely on science and technology for tools for their future, although those same sciences and technologies have increasingly created the fragile environmental base that requires us to rethink how we interact with the earth and with each other (p. 16).

In this vein, Battiste continues to speak about the importance of conserving Indigenous knowledge and the role it can play in helping to solve problems in today's world, rather than just conserving the stereotypical view of Aboriginal peoples—their dances, food and cultural practices. Rather, national and international studies are revealing the significance of Indigenous knowledge and the inherent value that lies within these knowledge systems, not just for Aboriginal students but for all students.

McKnight, Hoban and Nielsen (2011) also describe this *knowing* as coming from experience and being transmitted through storytelling. These *ways of knowing* are, however, very particular to the place from which they came and cannot simply be transplanted to another place without losing meaning. According to Birrell (2006, as cited by McKnight, Hoban & Nielsen, p. 42), "the land holds stories and Aboriginal *ways of knowing* that involve less emphasis on the intellectualization of the stories, and rather more emphasis on the emotional feeling and observed nature of the story." Thus, Indigenous knowledge lies in the individual's learning journey in relation to the land and in relations to other entities: story, dance, art, respect and lore.

This notion is further illustrated by Snively and Williams (2008) as they describe the current state of Aboriginal students in British Columbia. According to their study, using data from the British Columbia Ministry of Education (2002), "… in British Columbia schools the majority of students of Aboriginal ancestry are underrepresented in science courses and underrepresented in the sciences" (Snively & Williams, 2008, p. 112). They identify the source of the problem as being related to "a type of science education in which Aboriginal science knowledge is rarely acknowledged and Aboriginal content is

considered a token addition or is seldom, if ever, legitimatized" (Snively & Williams, 2008, p. 112). Battiste (2002, as cited in Snively & Williams, 2008) states that Aboriginal knowledge is structured through the various Aboriginal languages and to understand Aboriginal knowledge one cannot be an outsider looking in.

Literacy from an Aboriginal perspective means learning that covers a lifespan and goes beyond the typical Western notion of literacy (reading, writing and numeracy, especially in print form) to include oral speaking, storytelling, singing, dancing, symbols, artwork and ceremonies (Snively & Williams, 2008). Different forms of literacy will also affect knowledge that is acquired and shared. In Aboriginal cultures, the knowledge gained from observing the land is shared orally. This transmission of knowledge permits other members of the culture to develop "an intimate and current knowledge of the land … building up a collective database and updating traditional stories of the environment" (p. 114). The researchers go on to further state that "Indigenous languages have their own schema and categorization systems that reflect what they value in their world; for example, Indigenous taxonomies may use function, colour, significant feature … These taxonomies are constructed as a result of a deep, observant, and intimate relationship with the environment" (p. 115). As such, learners coming into the traditional school system bring their previously acquired knowledge from the home culture and use it as a way to make sense of what they are coming to learn. When students have an opportunity to share this knowledge in the context of the learning they are involved in, they become recognized and validated.

Scientific literacy from a Western cultures' viewpoint is defined as "the traditional sense of being knowledgeable about science and the fundamental sense of being literate in the discourse of science" (Norris & Phillips, 2003, as cited in Snively & Williams, 2008, p. 115). This means, in essence, that students are able to use the typical discourse forms of scientific inquiry that are prominent in traditional science classrooms (e.g., questioning, describing, explaining, hypothesizing, debating, clarifying, elaborating, verifying, sharing results), which are in direct conflict with social discourse patterns in many Aboriginal cultures. From an Aboriginal perspective, scientific literacy involves applying Aboriginal scientific knowledge that is found in a wide range of examples and using it with what is known in Western science, while maintaining the values and ethics required to sustain communities and the environment (Snively & Williams, 2008, pp. 115–116).

To add further complexity to worldviews of science, the nature of language plays a significant role, as languages set the manner in which meaning is shared. In Western science, for example, the notion of observation occurs through the five senses; for Aboriginal peoples, "observation" views the relationship of the human mind and nature as one. Therefore, to ask Aboriginal students to "observe" a natural phenomenon would be to bring out notions that would be different from what a student of Western science would "see." The manner in which nature is viewed by Aboriginal peoples comes through "thousands of seemingly unrelated pieces of information … organized through complex webs and levels of metaphor that are utterly alien to Western taxonomies" (Snively & Williams, 2008, p. 117), whereas Western science students would describe what they "see" through the lens of a knowledge system that is compartmentalized.

Auger (1997) adds further support to the notion of Indigenous knowledge and *ways of knowing* as he discusses the Sakaw Cree worldview that describes speaking of the power of unspoken communication, learning without spoken words and learning in the crossing and sharing of knowledge, both old and new. According to Auger, knowledge comes from many sources. He states:

> A Sakaw Cree worldview acknowledges the Elders, the Animals, the Land and the Spiritual dimension as primary sources of knowledge. These sources do not exist in isolation of each other but are deeply intertwined or interrelated. To 'educate' a child using these sources of knowledge involves a process that interweaves, or interrelates, the child in among all these sources. Such an educational system is not foreign to the child, for the child comes into our world already able to tap into these sources of knowledge (p. 339).

Lightening (1992) continues this notion of knowledge as he addresses the nature of the mind, as expressed by the late Elder Louis Sunchild. The mind exemplifies humility and respect in engagement with Elders, knowledge and learning and describes holistic learning as an important *way of knowing*. Lightening further describes this learning as intellectual and emotional learning and states that there is a need for people to understand the mind; that great care should be offered to it and that the source of existence is directly associated with it. He suggests that all Elders are saying the same thing—from generation to generation, the people have taught human truths and principles for the holistic survival of everyone. He contends that the message is one and the same, but is expressed from many different perspectives and multiple angles. He stresses the importance of protocol in the transfer of knowledge between peoples, noting that with that transfer comes the responsibility to honour the *ways of knowing* delivered from the Elder. The transfer of knowledge (Lightening's suggested *ways of knowing*) from generation to generation is the key to ensuring people's survival and, according to the author, "what we do today will affect generations to come" (p. 251).

Henry Lickers' speech (2010) given at the Fresh Water Summit provides a powerful example of how Indigenous knowledge can provide insight into a world problem:

> As the leaders of the world meet to discuss water and the world, the human and spiritual aspects of water can be forgotten. To the native people of the world, water is sacred. The rivers and lakes are a place of spiritual contemplation and reverence. … These understandings of water come in direct conflict with economical, political and structural aspects of the modern world. Dams, river modification, dredging and filling in the water of the world are seen as progress to some. Water to the modern world is only important when we can assign a monetary value or make it a commodity for world market. As a result, we are losing our understanding of our place on Mother Earth. … Unless we begin to understand water and use the knowledge that was given to us by the Earth and the Creator, we will be dooming our children to a bleak and dry future. There is hope. Now let us talk about our responsibilities to the Water and all Creation.

Whether or not the beliefs of many men and women in a specific culture constitutes a particular *way of knowing*, as well as whether or not those beliefs "can (and should) be taught as 'African *knowledge*'" (Horsthemke, 2010, p. 30), are questions Horsthemke asks. The idea of *African ways of knowing* constitutes a part of the challenge for occidental belief systems and, therefore, the traditional account of the terms *knowing* or *knowledge* is not only a complex concept, it is also one that is rarely without controversy. Horsthemke states that these terms are "commonly coupled with 'traditional,' 'local,' and the like, and are contrasted with 'universal,' 'global,' 'world,' 'Western,' 'Eurocentric,' etc." (Horsthemke, 2010, p. 32). This leads to the term *African ways of knowing* to be "something of a misnomer" (Horsthemke, 2010, p. 32). Ruitenberg (2008, as cited in Horsthemke, 2010, p. 33) explains that "claims about 'ways of knowing' often mask claims about and in favour of particular worldviews and 'issues far beyond epistemology.'" He explains that various ideas are covered by the phrase *ways of knowing*, including various types of beliefs. For example, spiritual beliefs, beliefs about human beings as well as beliefs about the relation between reason and emotion could all be misrepresented by the phrase *ways of knowing* when, in fact, these beliefs signal a "concern with the broader ontological and metaphysical beliefs of worldviews" (Ruitenberg, 2008 as cited in Horsthemke, 2010, p. 33).

Horsthemke (2010) states that the use of the term *knowledge* in educationally relevant situations must be distinguished between "theoretical" and "practical" knowledge. He believes that there is often a difference made in such situations between "knowledge" of "that" or of "how" to do something "compared to 'knowing-that' and 'knowing-how'" (pp. 37–38). Having the skills and abilities to accomplish a task is considered to be *practical knowledge*, whereas the "'real stuff' of epistemology, concerning not only what I can know but also … under what circumstances or conditions I can claim to know that something is or is not the case" (p. 38). The author concludes that in order to know what is true, one must have a complete understanding of what is considered to be *knowledge*, *knowing* and *truth* and that this understanding must be as dependable as it is coherent. It is only then that society can "learn to avoid falsehoods and error and, in so doing, get closer to [knowing] the way things really are—or were, for that matter" (p. 47).

Intuition and Estimation as Ways of Knowing

Immordino-Yang and Faeth (2010) describe intuition as a part of the emotional signals received by the brain that informs cognitive processes. A growing body of neuroscience research is demonstrating the importance of emotions and learning. The authors state that:

> students' accumulation of subtle emotional signals guides meaningful learning, helping them to build a set of academic intuitions about how, when, and why to use their knowledge. ... As students learn to notice and refine these signals, learning will become more relevant and meaningful to them ... (p. 82).

Güven (2010) identifies intuition as a *way of knowing* that plays a key role in thinking and learning (citing Bruner, 1960). According to Cappon (1994, as cited by Güven), intuition is viewed as a key element to discovery, problem solving and gaining understanding. In the initial stages of inquiry, intuition can be "considered as a basic source of evidence to support a theory and also during the justification

procedure" (p. 75). Fischbein (1987, as cited by Güven) theorizes that intuition plays an important role in the development of students' mathematical thinking. He identified two types of intuitive knowledge: primary intuitions, developed through personal experience in informal settings, and secondary intuitions, knowledge acquired through a schooled experience that is intentional in nature (p. 75).

Galdwell (2005, as cited by Hartesis, Koch & Morgenthaler, 2008) explains that intuition is the first spontaneous impression that derives from implicit knowledge, which is developed and enriched through years of experience. To add to this explanation, Harteis, Koch and Morgenthaler (2008) point out that the capability to act or decide on any given situation in an appropriate way without first consciously evaluating the alternatives, weighing the various options and, perhaps, without any awareness at all, is the definition of *intuition*. In essence, it is the "rapid responses to developing situations based on the tacit application of tacit rules" (Harteis, Koch & Morgenthaler, 2008).

The notion of intuition as a *way of knowing* is further exemplified in the world of business where intuition and rationality play key roles in finding success in business. According to Sadler-Smith and Shefy (2004), "Executive intuition is the skill of focusing on those potentially important but sometimes faint signals that fuel imagination, creativity and innovation and feed corporate success" (p. 76). They go on to say that "Intuition is a capacity for attaining direct knowledge or understanding without the apparent intrusion of rational thought or logical inference" (p. 77).

Many philosophers and psychologists recognize that intuition is a unique and valuable *way of knowing*. Although it is very difficult to describe, it is easily recognizable by all as that "gut feeling" that is not necessarily entrenched in what is perceived to be rational or logical thought. As research develops in this field, two forms of intuition are emerging "as a form of cognition that operates in two ways: 'knowing' (… intuition-as-expertise and the related notion of intuition as an aspect of sense-making) and in a way that connects mind and body through 'feeling' (… intuition-as-feeling)" (Sadler-Smith & Shefy, 2004, p. 81). Intuition-as-expertise involves the acquisition of knowledge that is gained passively, most often incidentally, and is stored in long-term memory. This knowledge comes to the surface seamlessly when a person is confronted with a complex problem and this tacit knowledge assists in quickly assembling the gathering of facts in a meaningful way to come to a decision. Intuition-as-feeling, on the other hand, is what most people recognize as the "gut" feeling or, as Sadler-Smith and Shefy (2004) indicate, as the "intuitive signals that manifest themselves as automatic somatic alarm bells" (p. 84), the notion that "something tells me that this is just not right." Sadler-Smith and Shefy (2004) best sum up intuition in this manner:

Intuition is a composite phenomenon that incorporates expertise and feeling, and as such is linked to mental processes both in the cerebellum and the limbic system and to bodily felt senses. It is not simply educated ('smart') guessing; it is more than 'flight or fight' (instinct) and is distinct from 'eureka' experiences (insight). It resides at a level below consciousness, arises cognitively, affectedly and somatically and is manifested as a 'hunch' or 'gut feel.' … When used intelligently, intuition has the potential to enhance executive judgement and decision making (p. 87).

Estimation, another *way of knowing*, involves approximating "the worth, size, or amount of an object, or quantity that is present in a given situation" (Mitchell et al., 1991, as cited in Güven, 2010, p. 75). The process is carried out quickly and is also often used to make rapid decisions. According to educators and researchers, it is a highly important skill that supports understanding and development of number relationships and many other mathematical concepts (Güven, 2010, p. 75). Coburn and Shulte (1986, as cited by Güven, 2010) indicate that those students who are good at estimating also tend to have a deeper understanding of number sense.

This is further illustrated by the work occurring in the neurosciences. Dehaene (2010) cites the study of Gilmore, McCarthy and Spelke (2007) in which preschoolers were asked to indicate, through the use of word problems, which person had more of something. Even though the students had no instruction in addition or subtraction, they were able to identify, through approximation, the correct answer. Thus, as stated by Dehaene (2010), "the ability to approximate gives students an 'intuition' for problems they have never experienced before and therefore a head start in arithmetic" (p. 183).

QUALITATIVE AND QUANTITATIVE STUDIES

Each of the studies described in this section is preceded by the theoretical underpinnings that support the work carried out by the researchers. Further forms of *ways of knowing* are presented here.

Connected and Separated Ways of Knowing

Khine and Hayes (2010) undertook a study to determine if young college women in the United Arab Emirates preferred to be connected knowers or separated knowers as a *way of knowing*. The researchers indicated that in order to understand the importance of connected or separated knowledge, it is important to understand the personal epistemological beliefs to ascertain how this *way of knowing* can influence learning. They state that "Research in personal epistemology looks into ways of knowing, focusing on the nature of knowledge (certainty, structure and source of knowledge) and beliefs about learning (speed and ability to learn)" (p. 105). As such, they state that:

> Women's Ways of Knowing (WWK) proposed five epistemological perspectives by which women know and view the world. These are [i] silence, [ii] subjective knowing, [iii] received knowing, [iv] procedural knowing, and [v] constructed knowing. Procedural knowledge as an epistemological position indicates that knowing does not rely on intuition or information gathered from the content but requires conscious, systematic thinking (Brownlee, Boulton-Lewis, & Purdie, 2002, as cited in Khine & Hayes, 2010, p. 106).

Connected knowing and separate knowing are a part of procedural knowledge. Connected knowers seek to understand another person's point of view while not passing judgement. They also have difficulty in separating feelings from thought and, according to Schommer-Aikens and Easter (2009), they often tend to adopt the position of the other person. Separated knowers, on the other hand, tend to detach themselves and look to analyze critically another's point of view by often arguing, debating or "shooting holes in another's position" (Schommer-Aikens & Easter, 2009). The researchers cite the work of Belenkly et al. (1986) and Gallotti et al. (1999) whose studies have shown that neither connected

knowing or separated knowing have significant effects on cognitive performance; rather, the learner's epistemological approach will more likely affect how the learner learns than the amount of what is learned. Both forms of knowing support critical thinking. What is different, however, is the approach taken to understand the content.

Schommer-Aikens and Easter (2006, as cited in Schommer-Aikens & Easter, 2009) show that gender can make a difference in terms of connected knowing and separated knowing, but it is not the only factor that dictates a preference. Their studies demonstrated that men are more likely to be separated knowers and women connected knowers and, as such, "... can contribute to different patterns in women's and men's knowledge and approaches to learning" (Hayes, 2001, as cited by Khine & Hayes, 2010, p. 107). However, the researchers reiterated that neither approach was better than the other in terms of acquiring knowledge.

Schommer-Aikens and Easter (2009) delved deeper into the study of connected knowing and separated knowing. They hypothesized that the more students ascribe to separated knowing the more likely they were to willingly engage in argumentation (p. 122); that is to say, separated knowers view argumentation as a positive form of communication. They also affirmed the flip side of the coin, that connected knowers where less likely to engage in argumentation, because they tend to show more empathy toward the other person and often even take on that person's position. The researchers also wanted to test out two other hypotheses: 1) students with high scores in both connected knowing and separate knowing may be more willing to argue; and 2) students with high scores in both connected knowing and separate knowing may be more likely to define the word *argument* as a constructive form of communication.

The study showed, through two survey instruments and an open-ended question relating to the definition of *argument*, that if a student leans more toward separated knowing, he or she is more willing to engage in argumentation. They further confirmed findings from other demographic studies as follows: male students are more willing to argue than female students (consistent with the 1994 findings of Nicotera & Rancer); students from the west coast of the United States are more willing to engage in argumentation than those from the midwest (consistent with the 1996 findings of Infante & Rancer) and there are also differences noted by age—younger students show more willingness to argue than older students (consistent with the 2003 findings of Schullery & Schullery). They further noted that connected knowing was not a good predictor of a student's lack of willingness to argue, showing that connected knowing and separated knowing are not direct opposites (p. 129). The results also indicated that if students demonstrated high scores in both connected knowledge and separated knowledge, there was a higher correlation in their willingness to argue. When students provided their definition for *argument*, those who were more willing to argue defined it as a constructive means of communication, whereas those who defined it is as verbal aggression and saw argumentation as a destructive form of communication (emotionally charged with the view of causing psychological harm) were less willing to engage in argumentation.

Embodiment as a Way of Knowing

Freiler (2008) describes *embodiment* as a *way of knowing* that essentially involves "being attentive to the body and its experiences" (p. 40) as a way of constructing knowledge. Freiler describes embodied learning as being related to body–place relations. She cites the Sommerville (2004) study, which describes miners' "pit sense" as occurring when the senses are highly engaged, while depending on fellow miners to provide further evidence of changes in the workplace, creating a heightened sensitivity for survival purposes. She also describes the Mokens in Thailand, who seemingly went unscathed in the 2004 tsunami, by being perceptually attuned to their environment and reading the warning signs of the impending disaster. As Freiler (2008) explains, "embodiment needs to be viewed within a broader movement toward holistic, integrative learning approaches wherein the body is made more visible as a source of knowledge and site for learning through objective and subjective realms of knowing" (p. 44). Context and sociocultural factors need to be considered and valued, while bringing together the various other *ways of knowing* that coexist within an individual.

A research study by Johnson-Glenberg, Birchfield and Usyal (2009) describes the use of the Situated Multimedia Arts Learning Laboratory (*SMALLab*) that allows the learner's body to become actively engaged in learning by moving freely in space while interacting with the environment. This environment allows student to "immediately SEE how their actions affect the space and are projected on the floor, FEEL the results, HEAR feedback, and be interactive and manipulative with projected imagery on the floor" (p. 269). The researchers hypothesized that students' learning could be optimized and retention increased when exposed to learning in a multiple modalities environment that encourages collaboration between students and the teacher.

They carried out two studies to test their hypothesis, using geology scenarios (one related to layers of rock formations and the other related to mapping contours). In one study, the Grade 9 students were pretested for knowledge of the subject matter, received a lecture from the teacher and then spent time in the *SMALLab.* The second study involved students in understanding map contouring, following a similar structure. In both studies, in the post-testing stage, students with different learning profiles showed increases in retention. One of the groups, identified as students not maximizing their learning potential, however, showed significant increases in retention. The researchers felt that the use of sound, visual stimuli and auditory feedback, which are not typically stimulated in a traditional learning environment, can contribute to significant gains in sustaining student engagement and optimizing learning. As further research in embodiment is carried out, a better understanding of cerebral connections will guide better learning in virtual and traditional learning environments.

Indigenous Ways of Knowing

Barnhardt and Kawagley (2005) identify three interrelated themes of study in which research in Indigenous knowledge systems have been undertaken. These themes are: 1) Indigenous knowledge systems are beginning to be articulated and documented; 2) epistemological structures and learning/cognitive processes that are associated with *ways of knowing* are being defined; and 3) strategies for integrating Western and Indigenous *ways of knowing* are being developed and assessed. Barnhardt and Kawagley discuss the following major research initiatives on Indigenous *ways of knowing*:

Native Ways of Knowing or Indigenous Epistemologies speak to research that is being done in identifying the inner workings of various Indigenous knowledge systems and the need for better understanding of these knowledge systems. It is hoped that by attempting to find common ground these knowledge systems can be better understood on a worldwide basis.

Culturally Responsive Pedagogy or Contextual Learning looks at how Indigenous knowledge and *ways of knowing* can be integrated into curriculum, citing the 1998 work of the Alaska Native Educators (*Alaska Standards for Culturally Responsive Schools* and *Guidelines for Respecting Cultural Knowledge*, as cited in Barnhardt & Kawagley, 2005, p. 18) as a promising innovation in integration.

Ethno-mathematics is a new area of research that has done a cross-analysis of the mathematical sciences to gain a better understanding of what is mathematical knowledge and how it is constructed. Again, Barnhardt and Kawagley (2005, p. 18) cite the work done in Alaska where educators have taken Indigenous constructs, such as the construction of a fish rack, and tied it to mathematical knowledge, in order to contextualize this knowledge for Indigenous students. The results could have significant impact on learning and performance on state assessments.

Indigenous Language Learning is seen as an integral part of understanding Indigenous knowledge systems. Barnhardt and Kawagley (2005) urge researchers to delve into not only the language system itself, but to gain a deeper understanding of Indigenous languages so as to better understand Indigenous students' thought processes.

Cross-generational Learning/Role of Elders/Camps is being viewed as an important and valuable aspect of developing the knowledge system of young Aboriginal students. However, there is very limited research in this area with regard to the types of strategies, both pedagogical and curricular, that can support student learning in a cross-generational context.

Place-based Education is viewed as being of important significance for Indigenous students. Barnhardt and Kawagley (2005) cite the research work carried out by Cajete (2000) who describes local environments as an essential ingredient for developing an interdisciplinary pedagogy of place.

Native-Science or Sense-making looks at the way in which knowledge is constructed, organized, used and communicated in both Indigenous populations and in Western science. There is some convergence conceptually, but the divergence occurs in how knowledge is learned and applied.

Two other themes are *Cultural systems*, *Complexity and Learning* and *Indigenizing Research in Education*. Both areas of research relate to how a better understanding of knowledge systems within these domains can benefit learning for Aboriginal and non-Aboriginal students. Their feeling is that Indigenous scholars can devise their own research methodologies when they better understand the context in which the research needs to be carried out.

The following studies, although not carried out by Indigenous scholars, do provide insight into Indigenous *ways of knowing*.

Yunkaporta and McGinty (2009) describe a participatory action research project in an Indigenous community in western New South Wales, Australia, which is in keeping with the way in which Indigenous peoples observe and reflect on the world. The study involved the introduction of Aboriginal perspectives into the curriculum, with the view of strengthening relationships between the community and school, and with the goal of increasing literacy, attendance and Aboriginal student engagement. The research focused on how to operationalize the interface between Western curriculum knowledge and Indigenous knowledge, which involved participants being engaged in "negotiating a space where common ground could be determined and built upon in culturally safe, yet challenging ways" (Yunkaporta & McGinty, 2009, p. 56). The project centred on Aboriginal knowledge of land and place at the juncture of a river, which then became a metaphor for the "overlap between multiple social realities and ways of knowing" (Yunkaporta & McGinty, 2009, p. 56). This overlap presented itself in a challenge between accepting local Indigenous knowledge as valuable and trustworthy and dismissing it as limited to the "levies that enclose the town." The researchers sought to use the theory of cultural interface to bring together Western and traditional knowledge to create a juncture of new knowledge, identified by the researchers as "contemporary local knowledge." The research project involved three spirals or phases. The first phase involved the Indigenous facilitator working with the community, organizations, students and teachers to identify local knowledge, protocols and relationships to develop learning units. These units were then shared with students to gauge their reactions and choices to inform the next phase, which involved a similar process, only larger in scope and with students being more involved in the decision-making process. The final stage involved observations and reflections on the process as well as a presentation of student work and findings.

Yuckaporta and McGinty (2009) identified teacher conflict, student/community conflict and curriculum/organization conflict as three key themes emanating from their findings. The first theme, teacher conflict, involved cultural discomfort and perceived deficits in the Aboriginal students, such as their inability to learn without the presence of the Aboriginal facilitator and the notion that the units were "slack" in content when in fact they contained deep Indigenous knowledge and pedagogies. The researchers ascertained that teachers' negativity related to their discomfort with the content and student behaviour. However, when teachers were persistent in following the unit and believed in the interface concept, the results were more positive. Students showed more self-direction and self-regulation as teachers came to realize that what they had initially perceived as knowledge "lacking logic" now showed structure that maintained a "balance between direction and autonomy" (p. 65).

The second theme, student conflict, came between what was perceived by teachers as having already been attained in the community and the reality that this Indigenous knowledge had not necessarily been transferred. Another source of conflict, much to the surprise of the researchers, was that poor behaviour ensued when the cultural interface content and pedagogy were abandoned or when the move from activities that involved deep knowledge used for higher-order thinking was replaced with shallow knowledge. Community conflict revolved around the keepers of local Aboriginal knowledge and what was considered to be pertinent knowledge, whether from the past or present, with the past being viewed (even amongst certain Aboriginal members) as being primitive and confined to "the softer areas of curriculum" (Yuckaporta & McGinty, 2009 p. 67). However, the researchers in the study indicated that the Indigenous knowledge presented to the students involved higher-order thinking skills and was grounded in, what they termed as, "Indigenised learning protocols." The deep knowledge activities helped students gain confidence and a sense of well-being in learning, while decreasing behaviour problems and increasing student engagement.

The final theme related to the perceived notion of rigour. Teachers in the study felt that "low expectations were communicated informally through the curriculum, the school design and the organizational structure ... [yet] participants agreed that the curriculum was something within their sphere of influence that could be both observed and changed, particularly at the level of the classroom organization and pedagogy" (p. 70). As a result of observations and reflections, the following six teaching pedagogies were identified as having the most in common with Aboriginal epistemologies: self-direction, self-regulation, social support, connectedness to the world, narrative, and cultural knowledge (p. 71). From the students' perspective, they developed a joint definition for their local "way of learning" as being able to observe first, being a participant for small portions of the activity (social support) and then being able to take on larger parts when they felt ready (self-direction).

Chandler (2010) believes that educational gaps between Indigenous and non-Indigenous learners in Canada are a result of the "different ways of knowing that set Indigenous knowers apart from their non-Indigenous counterparts" (p. 1). He states that those who are raised in different cultures and with different belief systems from the economically dominant ones are constantly told to "frame and defend" their understandings of truth, thereby implying that said truths are not accepted by the dominant culture. This mistrust often causes a collision between the two cultures and continually promotes the misunderstandings, tensions and conflicts. Ironically, these differences are seen more readily in schools—the very places citizens should celebrate diversity and learn to live and work together. The unquestioned dominance of Eurocentric *ways of knowing* results in lost opportunities for Canadian children and society.

According to Chandler (2010), there are three "steps" required to close the gaps between Indigenous and non-Indigenous learners. The notion of epistemology is the first of the three steps. The author explains that to "better understand the distinctive 'ways of knowing' characteristic of Canada's … [Indigenous peoples] requires first getting clear about what, exactly, is 'epistemology'" (p. 3). Chandler further argues that there is a need to ask some difficult, yet vital questions about the acquisition of knowledge to begin to address the conflicts that exist between the cultures. He asks, for example, "how, in this culture versus that, is it to be decided what constitutes bona fide knowledge?" and "Is truth context-specific or is 'real' knowledge universal, equally true in all places and for all times?" (p. 2).

The second step compares what constitutes the current thinking about Indigenous epistemologies with the non-Indigenous ones. It articulates the following unique claims of Indigenous epistemologies:

> Indigenous epistemologies tend to be holistic rather than analytic; are context-sensitive and responsive to lived experiences and the social reality of Indigenous authenticity and voice; view knowledge as ecologically situated and unique to specific settings; employ physical geography as a foundation stone of Indigenous knowledge building; … regard, not just individuals, but whole communities as 'epistemological agents' and, consequently, view true knowledge as the result of a process that can only be validated by cultural groups (p. 4).

The third step explains that the tensions and collisions between cultures are first and most often felt in the schools. This is because schools are responsible for the "cultivation of new knowledge" (Chandler, 2010, p. 4) and if Indigenous students are forced to assimilate to foreign epistemologies then "trouble is automatically afoot, and school failures and lost opportunities are sure to follow" (Chandler, 2010, p. 4).

Chandler (2010) concludes by citing an example from the First Nations researcher Stephany Fryberg. Fryberg's work examines two different accounts of learning: "incremental" and "entity-based." In the "entity-based" learning model, competencies in students are assumed to be fixed and academic successes are considered "proof" of a student's abilities. By contrast, according to Fryberg, Canada's Indigenous communities maintain an "incremental" view of learning and "assign success to effort, and treat failure as a signal that still more effort is required" (Chandler, 2010, p. 5). He proposes that Fryberg's work be used as template for future studies and have curriculum documents that commit to an incremental view of learning so that students, both Aboriginal and non-Aboriginal, do not "find themselves out of step with the pedagogic models favoured by their teachers" (p. 5). He suggests that by following some of the studies of Indigenous scholars, curriculum designers could be better able to "accommodate demonstrated differences" in the two epistemologies.

In Saskatchewan, a group of Aboriginal and non-Aboriginal stakeholders came together to research the importance of Indigenous knowledge in school science as a way of understanding the natural world and a way of including different perspectives and worldviews of Indigenous knowledge into the curriculum (Michell, Vizina, Augustus & Sawyer, 2008). The research examined how educators and education systems viewed place-based Indigenous science and its incorporation into the already established Saskatchewan science curriculum. The perspectives of Aboriginal peoples have been previously marginalized in the development of curriculum, and this research showed that changes in the content of

the science curriculum, in particular, were necessary to accurately reflect and respect the community's Indigenous knowledge.

The authors explain the notion of Multiple Domains of First Nations Knowledge as being of particular interest because First Nations knowledge systems and perspectives emerge from multiple domains and, as such, certain types of knowledge have been found to connect to certain places of origin. For example, one domain from which knowledge is said to originate is tied to the natural world. The First Nations *ways of knowing* are related to geographical differences with relationships with certain animals and those relationships can be incorporated into science curricula as "a start based in exploring the diversity of life in particular ecosystems" (Michell, Vizina, Augustus & Sawyer, 2008, p. 78). Their research suggests that if Indigenous knowledge is included in the science curriculum, the stories and relationships of animals and plants that occupy a particular place will enhance scientific learning while reinforcing and promoting the cultural heritage of First Nations peoples.

Wishart's (2009) study examines the policies related to a disenfranchised urban population of Aboriginal students in an Alberta inner city high school with a high Aboriginal student population. According to the researcher, "Greater integration of policies, and of policy with practice, would lead to increased academic successes for Aboriginal youth" (p. 480). She explains that the majority of disenfranchised youth in today's urban school settings are of Aboriginal background and that despite some significant attempts to meet the educational needs of these youth, there has been little improvement in terms of high school completion rates. Shor (1987, as cited in Wishart, 2009, p. 470), "points to a need to situate formal learning in students' cultures." The study finds that this notion has not been happening in public schools in Alberta, as both Aboriginal and non-Aboriginal youth, alike, report that they experience the same lack of attention from both their peers as well as their teachers.

The results of Wishart's study (2009) show that the tensions between policy and educational practice still exist and that more pedagogy should include the lived experiences of students, both Aboriginal and non-Aboriginal, in order to tap into the "important insights about how students define their own success" (p. 477). Those who are at risk of leaving school early will continue to do so unless there is a translation between what the policy documents are telling teachers is important for student success and what is actually happening in schools, not just in Alberta but nationally and internationally. Wotherspoon (2002, as cited in Wishart, 2009, p. 477) explains that, until now, little attention "has been paid by educators, policy makers and researchers to the hidden reserves of knowledge and capabilities that students possess."

While this work does not directly speak to *ways of knowing* in its purest form, it does speak to the implication for curriculum that supports the inclusion of various *ways of knowing* into future curricular documents to see high school completion rates improve among disenfranchised Aboriginal youth.

IN PRACTICE

The following section describes practices that are being used to consider or incorporate multiple *ways of knowing*.

Mitchie (2002) describes his participation in the development of a science program of studies and compatible learning resources in Australia. The intent was to make the curriculum inclusive of both Aboriginal and non-Aboriginal perspectives; however, he stipulates that the approach used needs to be non-tokenistic and culturally sensitive, demonstrating that Indigenous knowledge is valued and is valuable.

Aikenhead and Elliott (2010) cite a number of practical situations in which Indigenous knowledge has been a part of curriculum change. Of note are projects in Africa that speak to the collaboration between science educators and local African communities in integrating local knowledge into school science. This collaboration has led to the involvement of the community in developing activities that unite aspects of Eurocentric science with Indigenous knowledge, as has occurred in post-Apartheid South Africa (Keane, 2008, as cited in Aikenhead & Elliott, 2010, p. 327). They also identified practices in Canadian jurisdictions that have attempted to recognize Indigenous *ways of knowing*, such as the Saskatchewan science curriculum with its 2005 renewal project that focused on the integration of Indigenous content, perspectives, *ways of knowing* and place-based learning, and the Nunavut program of studies that promotes bringing together the Inuit ways of living with nature with Eurocentric science.

Learning resource development has also been successful in bringing Indigenous knowledge to the classroom (e.g., *Forest and Oceans for the Future Project* in British Columbia and the *Rekindling Traditions* in Saskatchewan) and actual textbook development with a Canadian publisher. The latter involved a process that melded traditional textbook development with input from Elders and Knowledge Keepers. The process produced "knowledge *about* Indigenous perspectives on nature because specific Indigenous knowledge is mostly gained experientially on a holistic pathway toward wisdom-in-action—the process or journey known as coming to know" (Cajete, 1999, 2000, as cited in Aikenhead & Elliott, 2010, p. 333).

CONSIDERATIONS FOR CURRICULUM

Battiste (2010) affirms the need to look at curriculum to "... examine the connections between—and the framework of meanings behind—what is being taught, who is being excluded, and who is benefiting from public education" (p. 17). This requires viewing things from a different lens, one that removes curriculum designers from Eurocentric perspectives to one which allows an immersion into meaning systems that go beyond those already preconditioned and preconceived. Battiste refers to this as the untangling of the knowledge knots that currently exist in people's minds and the reweaving of this knowledge into diverse patterns of coherent thought; in other words, there is a need to rethink what is knowledge. Finally, she refers to what Elder Albert Marshall called, "Two Eyed Seeing: that is to normalize Indigenous knowledge in the curriculum so that both Indigenous and conventional perspectives and knowledge will be available—not just for Aboriginal peoples, who would be enriched

by that effort, but for all peoples" (Battiste, 2010, p. 17). To achieve this means having to unlearn things (that are an inherent part of society), such as racism and the sense of Eurocentric superiority, and instead learning to value and respect new *ways of knowing*, to accept diversity and to lay, as a foundational part of education, the notions of equity and inclusion.

Donald (2009) proposes the following solution to curriculum change:

> What are [*sic*] required are curricular and pedagogical engagements that traverse the divides of the past and present. Such work must contest this denial of historic, social and curricular relationality by asserting that the perceived civilizational frontiers are actually permeable and that perspectives on history, memory and experience are connected. To do so would foster the creation of an 'ethical space' ... [that can] help colonize curriculum and foster the creation of a transactional sphere of public memory ... (p. 5).

He speaks to a philosophy of curriculum sensibility that he has termed *Indigenous Métissage*, which involves juxtaposing mythic historical perspectives (viewed as common sense) with Aboriginal historical perspectives that are woven together to create a new "braid." To achieve this means recognizing the biases that one has and the willingness to see the connection these biases have with the relationships that are espoused to create a new ecology—one that "relies on collaboration and collective authorship." These texts represent a combination of perspective texts that are not exclusive of one in favour of another, but are rather a narrative that seeks to create a new collective whole. Indigenous Métissage is a place-based approach to curriculum reform through an ecological and rational understanding of the world. It attempts to illustrate a different *way of knowing* than has previously been examined.

The choice of "decolonizing," as a concept by Aikenhead and Elliot (2010), is a call for a "considerate" curriculum—both for all students (in this case Aboriginal students) and for educators, who the authors believe should themselves become more self-critical. The authors imply that, if educators are not self-critical about the unconsidered Western biases within curriculum and pedagogy, they are neither engaging in full curriculum reform nor acting out opportunities for social justice. They gently encourage educators to disrupt colonizing ideas embedded deeply in curricula, citing the work of Saskatchewan as an example (pp. 329–332). A cross-cultural science curriculum not only improves science instruction for Indigenous students but also for non-Indigenous students. The authors, nonetheless, suggest that further study is required by other education departments.

Snively and Williams (2008) state that, "epistemological and ontological positions have substantial implications for curriculum, instruction, societies and cultures. Science educators need to understand deeply the consequences that the philosophical view of knowledge prevalent in curriculum and pedagogy have on the relevance of their teaching for their students and for society" (p. 121). To achieve a balance between the two knowledge systems, science educators need to recognize that Aboriginal science (Indigenous knowledge) can provide an integration model for viewing and understanding the world through one's relationship with the natural world, both animate and inanimate.

To this end, Snively and Williams (2008, pp. 124–125) recommend the following principles to better understand Indigenous knowledge:

1. *Context of Scientific Study* – Placed-based knowledge represents the interconnectivity of knowledge with the place in which it is embedded; "nothing exists in isolation" (pp. 124–125).
2. *Multiple Perspectives* – The Elders teach that the more viewpoints involved in the gathering of data and construction of knowledge, the deeper and more meaningful the understanding will be.
3. *Everything in the Universe Lives* – According to Aboriginal beliefs, all creatures of the universe, including inanimate objects, possess a spirit.
4. *Focus on Balance* – It is important to recognize the balance between nature and human life. In the Aboriginal world, there is a kinship between humans and plants, animals and the elements. Learning from the plants, animals and elements teaches balance and harmony in the web of life.

They propose that educators contemplate a science curriculum that promotes a two-way knowing system, referred to by Aikenhead (2001, as cited by Snively & Williams, 2008) as border crossing. This type of educational model entails teaching Indigenous knowledge in parallel with Western science knowledge, with neither knowledge system deemed more important than the other. Rather, this process allows students to come to know about natural phenomena from various perspectives, respecting each knowledge system accordingly, and critically thinking about the values inherent in a particular culture's view of the world. By coming to know from another perspective, students are able to explore and test their own assumptions of the world as they have come to know it and to create a new knowledge base, without compromising their cultural beliefs.

Michie (2002) reinforces this notion in work that he has done with Aboriginal people in Australia. He states that "the aim of the science curriculum should be to promote consideration of the differing worldviews, not solely to enrich Western science but to facilitate a two-way exchange of knowledge and cultural understanding" (p. 37). Further, Michie provides insight into the way in which knowledge has been created in a Western world in comparison to an Indigenous world. According to Michie, Western knowledge has been divided into its various disciplines, creating the disadvantage of being separate and then requiring it to be reconstructed from the various disciplines for differing purposes. In contrast, Indigenous knowledge is holistic, with the whole being greater than the sum of its parts.

Aikenhead and Elliott (2010) also support this same notion through a view of learning science that moves away from learning *about* science to one that involves coming *to know* science in a manner that views scientific knowledge as wisdom for living and not just as an acquisition. They explain that the majority of students, including Aboriginal students, are unable to take on the conventional persona in the science classroom of thinking like a scientist, behaving like a scientist and believing like a scientist (Aikenhead & Elliott, 2010, p. 323). Rather, most students come to science class with "worldviews [that] differ, to varying degrees, from the Eurocentric science worldviews conveyed by conventional school science" (Cobern & Aikenhead, 1998, as cited in Aikenhead & Elliott, 2010, p. 323).

The research cited by Aikenhead and Elliott (2010) shows that many students are keenly interested in learning about science in the early school years, but by the time they reach high school, they are alienated by the foreignness of the scientific language used and the lack of relevance and meaning of concepts to their daily lives. Only a small proportion of high school students are able to relate to science and go on to study the various disciplines in post-secondary settings. This dissociation with Eurocentric science is even more prevalent with Aboriginal students who "must suppress such [Indigenous] knowledge to meet the conventional goal of thinking, behaving and believing like a scientist … Values, assumptions and ideologies embedded in Eurocentric science content can conflict with values, assumptions and ideologies of Indigenous ways of living in nature … Knowledge in Eurocentric science expresses an *intellectual tradition* of thinking, whereas Indigenous knowledge expresses *a wisdom tradition* of thinking, living and being" (pp. 324–325). There is also an implied cultural shift in the two ways of thinking: intellectual thinking places more emphasis on an individual's cognition, whereas wisdom traditionally focuses on a collective way of being and living in the world.

To achieve better results in science, especially at the higher levels, Aikenhead and Elliott (2010) suggest that cross-cultural science programs be developed that respect multiple worldviews and provide students with access to conventional science, in conjunction with Indigenous knowledge to permit students to "gain access to Indigenous cultural capital essential for wisdom-in-action for their country's sustainable growth" (Glasson, Mhango, Phri & Lanier, 2010, as cited in Aikenhead & Elliott, 2010, p. 326). The goal of a cross-cultural science program would be to help students better understand scientists' thinking, behaving and believing without the expectation that they do so themselves. In this way, students gain a deeper understanding of scientific *ways of knowing* while developing respect for two knowledge systems that complement each other, rather than being considered mutually exclusive of each other.

This is further reinforced in an Alberta Initiative for School Improvement provincial research review, where it was recommended that to improve curricula the inclusion and celebration of the contributions of Aboriginal history and culture and the approach used by professionals in the classroom should be a reflection of Aboriginal learning styles and *ways of knowing*. According to Gunn, Pomahac, Good Striker and Tailfeathers (2009), the involvement of stakeholders from the First Nations, Métis and Inuit community in curriculum consultation and its development is key to ensuring that it is an accurate representation of their cultures and that an "adding-on" approach is not used. This strategy, also known as the "beads and feathers approach," should be avoided in future curriculum development as it is regarded as a "mildly placating, status quo approach to Aboriginal education" (Gunn, Pomahac, Good Striker & Tailfeathers, 2009, p. 13). The importance of providing First Nations, Métis and Inuit students with accurate portrayals of their historical knowledge and permitting the acquisition of Aboriginal languages was also pointed out in this research as vital for these students to gain a sense of pride and an increased respect for and understanding of their own culture.

The review also highlighted that changes in curriculum need to occur in order for First Nations, Métis and Inuit students' needs to be addressed and ultimately met. It found that for the students to be more interested in achieving higher results academically, they had to feel that First Nations, Métis and Inuit history, worldviews and culture were meaningfully incorporated into the daily curriculum. Student

attendance was said to be better when these needs were met and they were more successful than previously recorded because of the opportunity to "walk in both worlds; in other words, carry the knowledge of both worlds" (Gunn, Pomahac, Good Striker & Tailfeathers, 2009, p. 25).

To coincide with this research, according to McKnight, Hoban and Nielsen (2011), an important part of any preservice teacher education program is the "fostering of an appreciation for cultural diversity and different ways of knowing" (p. 51). They mention that although this notion of appreciation for diversity is "taught," there is greater challenge in coming to understand different *ways of knowing*, especially as it pertains to Indigenous populations. Their research on the creation of an animated story through the use of slowmation, permitted the preservice teachers to "look deeper into aspects of the exploration of their special place" (a place of special meaning) to reflect on their own journeys as learners. Their two-day excursion with an Indigenous Elder also had an impact on gaining a better understanding of Indigenous peoples' connections to the land, and of the importance of storytelling and the relational approach to learning. Changes in curriculum, then, will need to reflect these diverse *ways of knowing*, while taking into consideration preservice and inservice teacher training.

This is further supported by the *Guiding Principles for WNCP Curriculum Framework Projects* (2011) that call for all Western and Northern Canadian Protocol curriculum frameworks to respect, include and maintain the distinctiveness of the cultures of western and northern Canada, for "knowledge itself is multicultural, not monocultural. This cultural diversity is inherent in the living character of knowledge itself and there is no culturally, historically or linguistically neutral landscape in which learning occurs" (p. 10).

Therefore, curriculum needs to:

- take into account the "living knowledge of the world to the functioning and well-being of a democratic, diverse, multicultural and First Nations, Métis and Inuit society" (p. 13)
- reflect the "linguistic and social origins, and reflect the multicultural and First Nations, Métis and Inuit realities of western and northern Canadian culture itself" (p. 10)
- "embrace and sustain multiple ways of knowing and learning, including Indigenous ways of knowing; multiple modes of evidence; assessment; design and presentation" (p. 9).

Sadler-Smith and Shefy (2004) and Immordino-Yang and Faeth (2010) all agree that intuition as a *way of knowing* can be taught and further developed. Rational thinking (a conscious state) and intuition (an unconscious state) are parallel *ways of knowing*, tied strongly to emotion and feelings. What will be important for curriculum designers is to find ways through curriculum to "weave the two together and integrate intuition with rationality in order to make *intelligent* use of intuitive judgements" (Sadler-Smith & Shefy, 2004, p. 88). Immordino-Yang and Faeth (2010) iterate a similar thought by stating, "neuroscience suggests that in the long run, learning may be more effective if teachers judiciously build into their curricula opportunities for students to develop skilled intuition. Without the development of sound intuitions, students likely will not remember the material over the long term" (p. 81).

The research clearly demonstrates that *ways of knowing* is tied to both individual and cultural epistemologies and belief systems. This means that curriculum designers will need to be cognizant of the implications for content choice, as it will be affiliated with a particular personal or worldview as well as the relationship this content selection has to the *ways of knowing* the disciplines. Further, it will be important to consider the fine balance between acquiring discipline-specific *ways of knowing*, which can lead to in-depth knowledge of the discipline (e.g., the writing processes used within a specific discipline) and broad skills (e.g., the writing process which can cross over disciplines). It will also be critical for designers to ensure that students develop these active *ways of knowing* in a concerted fashion within and across disciplines so as to solidify development of broad skills (e.g., reading and writing process) and skills specific to the discipline (e.g., laboratory reports in science and expository writing in English language arts). As well, designers will need to consider the ubiquitous nature of technology and how embodied knowing can be further developed through and with emerging technologies.

The challenge, then, will be to develop curricula which meet these diverse worldviews and the multiple *ways of knowing* and coming to know. Possibly, Aikenhead and Elliott's (2010) notion of a "third space"—a metaphor for describing the place where people from diverse communities come together to negotiate common or new understandings on a particular topic—may be the first place to begin.

BIBLIOGRAPHY

Aikenhead, G., & Elliott, D. (2010*).* An emerging decolonizing science education in Canada. *Canadian Journal of Science, Mathematics, and Technology Education, 10*(4), 321–338.

Auger, D. F. (1997). Empowerment through First Nation control of education: A Sakaw Cree philosophy of education. In J. R. Ponting (Ed.), *First Nations in Canada: Perspectives on opportunity, empowerment, and self-determination* (pp. 326–351). Toronto, ON: McGraw-Hill Ryerson.

Barnhardt, R., & Kawagley, A. O. (2005). Indigenous knowledge systems and Alaska native ways of knowing. *Anthropology and Education Quarterly, 36*(1), 8–23.

Battiste, M. (2010). Nourishing the learning spirit: Living our way to new thinking. *Education Canada, 50*(1), 14–18.

Carter, M. (2007). Ways of knowing, doing, and writing in the disciplines. *College Composition and Communication*, *58*(3), 385–418.

Chandler, M. (2010). Indigenous education and epistemic violence*. Education Canada, 50*(5), 63–67.

Dall'Alba, G., & Barnacle, R. (2005). Embodied knowing in online environments. *Educational Philosophy and Theory, 37*(5), 719–744.

Dehaene, S. (2010). The calculating brain. In D. Sousa (Ed.), *Mind, brain, & education: Neuroscience implications for the classroom* (pp. 179–200). Bloomington, IN: Solution Tree Press.

Donald, D. T. (2009*).* Forts, curriculum, and Indigenous métissage: Imagining decolonization of Aboriginal-Canadian relations in educational contexts*. First Nations Perspectives, 2*(1), 1–24.

Enriquez, J. G. (2011). Tug-o-where: Situating mobilities of learning (t)here. *Learning, Media and Technology, 36*(1), 39–53.

Freiler, T. J. (2008). Learning through the body. *New Directions for Adult and Continuing Education*, *119*, 37–47.

Gunn, T., Pomahac, G., Good Striker, E., & Tailfeathers, J. (2009). *First Nations, Métis, and Inuit education—AISI provincial research review*. Lethbridge, AB: University of Lethbridge; Edmonton, AB: Alberta Education (Alberta Initiative for School Improvement).

Güven, Y. (2010). Teacher views about intuition and estimation as ways of informal mathematics. *Gifted Education International*, *26*(1), 74–86.

Harteis, C., Koch, T., & Morgenthaler, B. (2008). How intuition contributes to high performance: An educational perspective. *US-China Education Review, 5*(1), 68–80.

Horsthemke, K. (2010). African and Afrikaner 'ways of knowing': Truth and the problems of superstition and 'blood knowledge.' *Theoria: A Journal of Social and Political Theory, 57*(123), 28–51.

Immordino-Yang, M. H., & Faeth, M. (2010). The role of emotion and skilled intuition in learning. In D. Sousa (Ed.), *Mind, brain, & education: Neuroscience implications for the classroom* (pp. 69–84). Bloomington, IN: Solution Tree Press.

Johnson-Glenberg, M. C., Birchfield, D., & Usyal, S. (2009). SMALLab: Virtual geology studies using embodied learning with motion, sound and graphics. *Educational Media International*, *46*(4), 267–280.

Khine, M. S., & Hayes, B. (2010*).* Investigating women's ways of knowing: An exploratory study in the UAE. *Issues in Educational Research*, *20*(2), 105–117.

Lickers, H. (2010). First Nations perspective on water. Speech presented at the Fresh Water Summit 2010, Ontario, Canada. Retrieved from http://2010freshwatersummit.org/docs/lickers_abstract.pdf

Lightening, W. (1992). Compassionate mind: Implications of a text written by Elder Louis Sunchild. *Canadian Journal of Native Education, 19*(2), 215–252.

McKnight, A. D., Hoban, G. F., & Nielsen, W. S. (2011). Using Slowmation for animated storytelling to represent non-Aboriginal preservice teachers' awareness of "relatedness to country." *Australasian Journal of Educational Technology, 27*(1), 41–54.

Michell, H., Vizina, Y., Augustus, C., & Sawyer, J. (2008). *Learning Indigenous science from place: Research study examining Indigenous-based science perspectives in Saskatchewan First Nations and Métis community contexts*. Saskatoon, SK: University of Saskatchewan.

Michie, M. (2002). Why Indigenous science should be included in the school science curriculum. *Australian Science Teachers' Journal*, *48*(2), 36–40.

Plank, M. (1932). Where is science going? Prologue. New York, NY: W. W. Norton & Company, Inc.

Sadler-Smith, E., & Shefy, E. (2004). The intuitive executive: Understanding and applying 'gut feel' in decision making. *Academy of Management Executive, 18*(4), 76–91.

Schommer-Aikins, M. M., & Easter, M. M. (2009). Ways of knowing and willingness to argue. *The Journal of Psychology*, *143*(2), 117–132.

Snively, G. J., & Williams, L. B. (2008). "Coming to know": Weaving Aboriginal and Western science knowledge, language, and literacy into the science classroom. *L1–Educational Studies in Language and Literature*, *8*(1), 109–133.

Western and Northern Canadian Protocol. (2011). *Guiding principles for WNCP curriculum framework projects*. Retrieved February 23, 2012, from http://www.education.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=7413,1429,107,81,1,Documents&MediaID=15800&Filename=Guiding_Principles_FEB2011.pdf

Wishart, D. (2009*).* Dynamics of education policy and practice for urban Aboriginal early school leavers*.* *The Alberta Journal of Educational Research, 55*(4), 468–481.

Yunkaporta, T., & McGinty, S. (2009). Reclaiming Aboriginal knowledge at the cultural interface. *Australian Educational Researcher, 36*(2), 55–72.

CHAPTER 4: BREADTH AND DEPTH

> "A person who is a mile wide and an inch deep is not an educated person.
> But a person who is a mile deep and an inch wide is not an educated person either."
> Mike Edmiston (Breadth and Depth, n.d.)

Depth or breadth or breadth and depth? Indeed a question that has many possibilities for curriculum development and learning and not an easy one to answer as the debate around breadth and depth has been a long and arduous one. In Philadelphia, the University of the Sciences (2011) adapted from Biggs (1999) an interesting concept for examining curriculum breadth and depth. They suggest that, while planning courses, one should think of the curriculum to be learned as a rectangle, with the horizontal sides representing breadth and the vertical sides representing depth. Within this image, the area of the rectangle remains constant regardless of how the rectangle is constructed. The question now becomes: What is needed for a particular course or subject area, greater breadth or greater depth? Choosing one over the other still leaves a rectangle. Mathematically, the maximum area of a rectangle with the smallest parameter is a square. Perhaps, a curriculum needs to be more of a square than a very narrow but long rectangle as it appears to be today, allowing for both depth and breadth to be equally present.

Breadth and depth can also be explored as it applies to deep and surface learning. What is deep learning? It is an approach to learning where learners routinely make use of higher-order cognitive skills, such as the ability to analyze, synthesize, problem solve and think metacognitively in an effort to construct long-term understanding. Unfamiliar ideas are analyzed critically in an effort to link them to known concepts and principles in order that new understandings can be generated and used to problem solve in unfamiliar contexts. Deep learners reflect on the personal significance of their learning, which in turn, promotes understanding and application for life. What is surface learning? It is the tacit acceptance of information as isolated and unlinked facts, often leading to superficial retention of material. Surface learning, therefore, does not promote understanding or long-term retention of information or knowledge.

THEORETICAL FOUNDATIONS

What follows is a selected examination of foundational literature regarding breadth and depth as it applies to curriculum, deep learning, knowledge and understanding, and the mind. The latter two areas are included to help understand the roots and continued growth of deep learning as an important 21st century skill.

Curriculum

According to the Cambridge Primary Review (2011) of the national urriculum for the United Kingdom, a broad and balanced curriculum is an entitlement for all. Alexander (2002), while expressing impatience with those who think that the way to raise standards in the basics is by cutting back the rest of the curriculum, speaks of the importance of breadth in the primary school curriculum:

> a broad, rich and diverse primary curriculum is not only possible but essential. The primary curriculum, as currently conceived, is not inherently overloaded. The problem, when it happens—and clearly in many schools there is indeed a problem—is not the curriculum as such but the way it is planned, managed and delivered, and it's therefore with curriculum planning, management and delivery that we should be concerned. Meanwhile, please protect absolutely the principle of breadth and balance. Do not compromise it one jot. Do not sacrifice children's entitlement to a broad and balanced education on the altar of political expediency. The problem, I repeat, is not the curriculum, but what schools do with it (p. 3).

Pearcy and Duplass (2011) in speaking about American history note that "... modes of reasoning have come to the forefront as an element to be emphasized as part of the social studies curricula that is arguably part of the broader trend in all disciplines to emphasize critical thinking skills ... a kind of knowledge equally important as content knowledge and the belief that the two should be taught hand in hand" (p. 111).

Brady (2000) in her critique, in general, of the education system, however, does not fully support this notion. She indicates that:

> we [sic] need to study in great depth a relatively few really powerful ideas, ideas that encompass and explain major aspects of human experience (Whitehead). ... For example, concepts such as 'pattern,' 'structure,' and 'system' are central to all disciplines, including those not yet developed. By focusing on these kinds of large-scale mental organizers students will be equipped to expand existing fields of study and to explore intellectual territory of which we currently have little or no knowledge (p. 650).

Irwin (2011), quoting from her research at a presentation in Calgary (Research Roundtable No. 2. May, 2011), provides another perspective. She states that:

> … [B]readth is about being broad in scope … a source for a variety of experiences, content, materials, etc. … breadth of understanding demonstrates the ability to work across disciplinary boundaries in productive ways and ideally, with principles from several disciplines. Depth is about intensity, and through that intensity, being a resource for understanding a set of ideas in a profound way. Depth of understanding depends upon mastery of a body of knowledge. Bodies of knowledge are focused on specific dimensions. … Depth and breadth of understanding contribute to independence of thought and a love of

> learning. … Depth and breadth, at its greatest point of tension-seeking balance, allow students to interpret and comprehend different disciplines with a view toward new understandings.

Knowledge and Understanding

Egan (2010) believes that real education consists of both general knowledge and detailed understanding and that an educated person must have both depth and breadth of knowledge. Graduates from current school systems may have a certain breadth of knowledge, but there is a question as to how many actually graduate with depth of knowledge, as teachers and students struggle to meet the many learner outcomes of current curricula. If there is general agreement that an important goal of any education system is to produce educated people and that an educated person is someone with both breadth and depth of knowledge, then it is important that students have not only some breadth of knowledge but also some depth of knowledge by the time they graduate.

Bereiter (2002), in his book, *Education and Mind in the Knowledge Age*, suggests the best preparation that schools can provide for future learning is the broadest and deepest possible understanding of the world. He feels that the deeper the understanding, the more likely it is to be helpful in understanding the next new concept. Formal education should help students learn how to work with knowledge by enculturating them into a knowledge society and helping them join the ranks of those who are familiar with, understand, create, and work with the "conceptual artifacts" of their culture.

He defines *conceptual artifacts* as theories, factual assertions, problem statements, histories, interpretations and many other products of human thought. They are not limited to "accepted" knowledge and can include discredited theories, unsolved problems and new ideas. Ideas created by students should be considered together with ideas handed down from authoritative sources. The author suggests it would be advantageous to move beyond referent-centred learning to learning that advances students' understanding of their world. The progression is not from the home out into a wider and wider world; it starts with the whole world and the progression is toward deeper and deeper levels of understanding. For example, Bereiter (2002) suggests that, if one wants the teenager's world to include the history of the Norman conquest and knowledge of the Periodic Table, understanding of where languages and customs come from and what the physical world is made of has to start before the teen years.

Bereiter (2002) further advocates for a knowledge-building metaphor for education that suggests a need to move beyond the "foundation" metaphor (i.e., something is taught initially to facilitate future learning and its value becomes important in later life). He prefers a hill as a new metaphor for education, to represent endless advancement, which requires effort and is rewarded by the progress that is made. In this metaphor, each hill represents a new challenge and a new perspective to engage knowledge. Creative work requires building up of knowledge and skills over time. With experience and engagement in inquiry work, individuals learn to think like experts and recognize promising directions when they venture beyond the familiar.

Wineburg (2008) also makes some interesting observations concerning breadth and depth. He reports that too often a view of breadth and depth is the problem of seeing knowledge as one of amount rather than kind. He suggests that there is also a built-in assumption in most notions of breadth and depth that all parts of knowledge are equal and, therefore, that one part of a given knowledge base is as important as another. He uses history as an example to refute this when he argues that relying upon the traditional notions of breadth and depth in measuring historical knowledge misses the essential nature of history–that, "History … is about connection, integration, motivation, and significance. History without high points and low points is no longer history but chronicle" (p. 122). Instead, he proposes that teachers need to think about depth and breadth in new ways that better capture the essence of historical knowledge beyond facts.

Wineburg (1997) contends that in-depth knowledge implies that a person "can separate the peripheral from the central, can see the forest for the trees, and possesses knowledge organized in interconnecting networks of meaning and significance" (p. 257). In proposing an alternative approach for examining and assessing depth of knowledge, Wineburg (2008) advocates the use of four categories originally created by Wilson (1988). He defines depth of knowledge in this way:

- *Differentiation* – refers to an individual's understanding of multiple facets of a concept or an event
- *Elaboration* – addresses knowledge of detail about these events and concepts
- *Qualification* – locates this knowledge within an epistemological framework
- *Integration* – addresses causal and thematic linkages.

Wineburg (2008) adds to these categories with the notion of "generativity," which he characterizes as subject matter knowledge that has created major shifts in a discipline. These ideas, concepts, or findings have great potential for changing what was known to be true in the past. The categories described above add to the complex notion of depth and breadth and go beyond what Schwab (1978) had termed *substantive knowledge*—knowledge about major facts, concepts, events, growth points, and interpretive schools that give shape to the body of knowledge of a discipline. Wineburg (1997) concludes that educators need to question what knowledge matters most rather than to "become enamoured with the architecture of assessment …" (p. 256). Wineburg (2008) further adds that, "In place of two perpendicular lines, one representing breadth, the other depth, we have loops between ideas, boldfaced labels that mark importance and significance, dotted lines that indicate uncertainty and qualifications, vectors reaching outward toward new knowledge" (p. 126).

Miller and Seller (1990) define three types of learning according to learner role. *Transmissive learning*, also called assimilative learning, assumes knowledge is content and is a transferrable commodity gained by demonstration, telling or modelling. *Transmissive learning* is the hallmark of instruction. *Transactional learning* assumes knowledge is constructed by learners and characterized by experiential activities, student-to-student collaboration, and discovery through active learning and team-based projects. This learner-centred approach sees the educator as a designer, who facilitates learning. *Transformative learning* asks learners to assess new knowledge in relation to existing knowledge—this action requires considerable reflection upon the assumptions and biases the learner has accepted as

part of his or her existing knowledge. The three types of learning: 1) transmissive (current paradigm); 2) transactional (co-learning); and 3) transformative (from novice to expert; sum is greater than its parts) cannot be fully integrated because they arise from opposing philosophies of learning; i.e., 1) in transmissive learning knowledge is a transferable commodity; 2) in transactional learning knowledge is constructed by the learner; and 3) in transformative learning knowledge is a deep, structural shift in thought, feeling, action and overall consciousness that alters a learner's way of being in the world. Transformative learning, as defined by Miller and Seller (1990), would appear to be an extension of Säljö's (1979) work that was the genesis for much of the more recent research on deep learning.

Mind

Moldoveanu and Martin (2009) offer a new conception of successful intelligence—the "diamind" (or dialogical mind). The following are characteristics of the *diamind*:

- *bi-stability* – simultaneously holding opposite plans, models, courses of action in mind while retaining the ability to act;
- *meliorism* – increasing the logical depth and informational breadth of one's thinking processes;
- *choicefulness* – retaining the ability to chose among various representations of the world, the self and others; and,
- *polyphony* – thinking about the way one formulates and solves a problem while at the same time thinking about the problem itself.

Moldoveanu and Martin (2010, p. 6) use a business metaphor in their examination of breadth and depth of mind when they refer to "marketing people" and "engineering people." Marketing people are "informationally" broad in their thinking—they forage for new bits of information but are logically shallower in their approach. Engineering people are "informationally" narrower but logically deeper in their thinking—they look for logical and causal connections and decide what new beliefs to hold out for testing. The authors provide definitions of breadth and depth of mind that can be paraphrased as follows:

- Breadth of mind refers to how much one can take into account (number of facts, variables) when thinking, without either panicking or losing interest.
- Depth of mind refers to the amount of pure thinking one can or is willing to do (number of operations, tasks) without panicking or losing interest.

According to Moldoveanu and Martin (2010, p. 8), these definitions, both depth (the "mile-deep, inch-wide" mind) and breadth (the "inch-deep, mile-wide" mind) are insufficient to deal with today's complex environment. The authors suggest that a mind's window on the world can be illustrated by plotting breadth on a horizontal axis and depth on a vertical axis. A chasm results if the two minds are held in dichotomy. Instead, there is a need to stretch the mind—to build a "diamind." The mind needs to "go wide" (try to see and observe as much as possible) when it is faced with deep thoughts and to "go deep" (try to explain a lot by a little) when faced with wide thoughts. The "diamind" can switch between thinking deeply and broadly and can integrate the two as required. This suggests that the mind

has the ability to handle curricula that is both deep and wide and learning that can be categorized as deep and/or surface learning.

Gardener's (2007) book, *Five Minds for the Future*, describes five kinds of minds, or ways of thinking and acting. Three—the disciplined, synthesizing and creative minds—are related to intellect; the other two—the respectful and ethical minds—emphasize character. Gardener believes that the tools from any given discipline are insufficient for solving real-world problems and that future workers and citizens will have to demonstrate "out-of-the-box" and non-linear thinking in order to be able to live and work successfully. He feels students should master information within the major disciplines (the disciplined mind) and cautions that, in this age of digital media, students who are knowledgeable within a discipline must also be able to distinguish what is most important from the massive amount of available information (the synthesizing mind). A student with a synthesizing mind can make sense of what has been learned and can convey this information to others when necessary. Understanding of breadth is a product of the synthesizing mind.

Following the learning and synthesizing of knowledge in a discipline, people need to be prepared to think outside the box of that discipline (the creative mind) and allow for innovation or meaningful change in how a given problem is approached. According to Gardener, the motivation to be creative comes before developing understanding of depth and breadth. Education needs to avoid squashing creativity while developing literacy, discipline and synthesis skills. Stretch, or the ability to generate creative options, emerges both through honing a discipline and developing expertise (depth) and through synthesizing multiple representations of the same entity (breadth).

Two additional minds that Gardener sees as being cultivated in school emphasize the human sphere or personal character. Gardener suggests that educators recognize the importance of fostering respect (the respectful mind). He feels that a respectful mind is particularly important in a world where diversity of perspectives is a prevalent fact of life. Although respect is something even elementary school students can practise, ethics (the ethical mind) requires more reflective and abstract thinking about one's behaviour. Gardener believes that no matter what work a person eventually undertakes, one should be able ask what is needed to ensure that this work is of excellent quality and ethical in conduct. The person should then follow through with those responsibilities.

Gardener also believes that the future will require individuals who have specialized in being generalists—people trained to participate effectively in interdisciplinary groups and able to foster understanding and cooperation among masters of different disciplines. Interdisciplinary work in education requires a person to hold multiple perspectives. People must recognize that different analytical perspectives can bring light to an issue or problem. Individuals of most any age or specialization can reasonably be expected to appreciate the complementary strengths of different perspectives, and also contribute their individual perspective. This is particularly true for those who practice deep learning because they are prone to hold multiple perspectives, continually reinterpret knowledge, and relate different subject matters to each other and the real world (Säljö, 1979).

Deep Learning

Learning means different things to different people. In an early study by Säljö (1979), he explored different meanings of learning. He classified conceptions of learning into the following five categories:

1. Learning as acquiring information and as a quantitative increase in knowledge.
2. Learning as memorizing and storing information that can be reproduced.
3. Learning as the acquisition of facts, skills and methods that can be retained and used when necessary.
4. Learning as abstract meaning or sense-making and relating parts of different subject matters to each other and the real world.
5. Learning as interpreting and understanding reality in a different way by continually re-interpreting knowledge.

Atherton (2011) in his review of Säljö's categories reports a clear qualitative shift between conceptions 3 and 4. He also argues that that 1, 2 and 3 are views that underpin surface learning strategies, while 4 and 5 relate to deep learning. Atherton provides a summary of the features of deep and surface approaches to learning. He (p. 1) summarizes features of deep learning approaches as follows:

- focus on "what is signified"
- relate previous knowledge to new knowledge
- relate knowledge from different sources
- relate theoretical ideas to everyday experience
- relate and distinguish evidence and argument
- organize and structure content into coherent whole
- place emphasis on internal, from within the student.

Atherton (2011, p. 1) summarizes features of surface approaches as follows:

- focus is on the "signs" (or on the learning as a signifier of something else)
- focus is on unrelated parts of the task
- information is simply memorized
- facts and concepts are associated unreflectively
- principles are not distinguished from examples
- task is treated as an external imposition
- emphasis is external, from demands of assessment.

Atherton (2011) feels that although individuals may be classified as "deep" or "surface" learners, these approaches are not necessarily attributes of individuals. Individuals may prefer one or the other, or an individual may use both or either at different times. He goes on to suggest that these approaches correlate quite closely with motivation—deep learners are often driven by intrinsic motivation (i.e., interest, enjoyment) while surface learners are moved by extrinsic motivation (i.e., grades).

QUALITATIVE AND QUANTITATIVE STUDIES

Curriculum

Murdock (2008) carried out a study involving a secondary analysis of data from the 1995 administration of the Third International Mathematics and Science Study (TIMSS). The purpose of the study was to compare the breadth ["… the number of topics or concepts … covered in a particular course over a finite time" (p. 11)], depth ["… is defined simply as being profound in insight of full of knowledge" (p. 12)], and recurrence ["… the number of years that a topic remained in the curriculum" (p. 13)] of the typical American physics curriculum with the typical physics curricula in a variety of countries. The study also attempted to determine whether there are associations between these three curricular constructs and physics achievement. The first data analysis involved descriptive statistics (means, standard deviations, and standardized scores) for each of the three curricular variables. The second data analysis consisted of correlations relating the three curricular variables with achievement. The results revealed that the United States physics curriculum has low breadth, low depth, and high recurrence. The only statistically significant correlation was between achievement and depth. Surprisingly enough, recurrence did not impact achievement when either depth or breadth was high.

Murdock (2008) further explains that the current United States physics course is one year in length and covers 17 topics. He argues that it is difficult to cover all of these topics in one year, especially when students are being exposed to these topics for the very first time and in-depth study of any one topic becomes unmanageable. He recommends that curriculum developers looking at maximizing both breadth and depth so as not to have to choose one over the other. For breadth, he states that as many topics as possible be covered over a longer period of time; that is, the physics course needs to be offered over a longer period of time and with the topics being covered earlier and with more frequency. To increase depth, he suggests that fundamental topics, such as mechanics, electricity, magnetism and heat be studied at younger ages and over many more years. Once these concepts are solidified, subsequent topics can be added to show how selected phenomena and concepts relate to modern physics. As a result of the study, his final recommendation is that the United States physics curriculum needs to be changed with regards to depth of study and to reconsider the notion of breadth.

Qian's (1999) empirical study explored relationships between depth and breadth of vocabulary knowledge and reading comprehension in English as a second language learners. Using multivariate analyses, the study examined the roles of depth and breadth of vocabulary knowledge in assessing the performance of a group of young adult English as a second language learners with minimum vocabulary sizes of 3000-word families in carrying out general academic reading comprehension tasks. The results support the hypotheses that: 1) scores on vocabulary size, depth of vocabulary knowledge and reading comprehension are highly and positively correlated; and 2) scores on depth of vocabulary knowledge can make a unique contribution to the prediction of reading comprehension levels, in addition to the prediction afforded by vocabulary size scores. The findings from this study call for a recognition of the importance of improving depth of vocabulary knowledge in learners' English as a second language learning processes.

Schwartz, Sadler and Tai (2005) carried out a study relating the performance of college students in introductory science courses to the amount of content covered in their high school science courses. In the literature review, the authors noted that many educators advocated for an in-depth focus to be applied to teaching. In the study portion of the article, data was collected from students in post-secondary introductory science courses. A survey was used to identify if high school science courses were based mostly on *breadth* ("At one extreme is the emphasis on 'full coverage' or 'breadth,' a view that students are best served by encountering a great number of topics relevant to a particular science discipline" [p. 2]) or *depth* ("The alternative view is typified by the terms 'deep coverage,' 'understanding at many levels,' or depth" [p. 2]). The sample included 8310 students in introductory biology, chemistry or physics courses in 55 randomly chosen colleges and universities in the United States. Students who reported covering at least one major topic in depth for a month or longer in high school were found to earn higher grades in college science than students who reported no coverage in depth. Students reporting breadth in their high school course, covering all major topics, did not appear to have any advantage in chemistry or physics and a significant disadvantage in biology. Care was taken to account for significant covariates: socioeconomic variables, English and mathematics proficiency and rigour of their preparatory high school science course. Alternative "operationalizations" of depth and breadth variables resulted in similar findings. Researchers concluded that teachers should use their judgement to reduce coverage in high school science courses and aim for mastery by extending at least one topic in depth. Over an extended period of time there was a positive association between high school science teaching that focuses on depth and better performance in introductory, post-secondary science courses (Schwartz, Sadler & Tai, 2005).

Lee and Olszewski-Kubilius (2006) studied 15 secondary-level teachers who taught fast-paced classes at a university-based summer program (three weeks) and similar regularly-paced classes (nine months) in their local schools to examine how teachers differentiate or modify instructional methods and content selections for fast-paced classes. Interviews and a brief survey were carried out. Teachers used a variety of instructional strategies for their fast-paced classes because of the shorter time frame and their students perceived academic abilities. Less repetition, more advanced-level readings and questions, and more independence in learning were found for the fast-paced classes. Interestingly, teachers were not likely to move beyond the textbook for enrichment materials or individualize homework or assignments for students in their fast-paced classes. They also expressed concerns regarding depth versus breadth of the material covered in the three-week courses.

Deep Learning

When Entwistle (2000) asked what they meant by learning, students had very different conceptions. Students initially reported seeing learning as memorizing and reproducing knowledge but later began to recognize that learning was most rewarding when they sought personal meaning and transformed ideas in relation to their own previous knowledge and understanding. Reproducing knowledge involved acquiring information and building up knowledge. Transforming information involved applying knowledge and skills, making sense of ideas and the real world, and developing as a person.

Entwistle (2000) reports on studies where students were asked to read an article and to later answer questions related to it. Their ability to answer questions about the meaning of the text depended on how they tackled the task. Some students tried to develop a thorough understanding of the text while others concentrated on "question-spotting" or learning information that they thought might come up in the text. This distinction was gradually refined through qualitative analysis to produce a descriptive concept with two categories—deep and surface approaches to learning—in which a specific intention brings into play learning processes that lead to qualitatively different learning outcomes (p. 3).

The deep approach produced learning processes that involved relating ideas, looking for patterns, looking for principles, using evidence, examining the logic from both sides of an argument, and monitoring one's own understanding. Learners using the surface approach limited themselves to using memorization just to cope with the task.

The Approaches and Study Skills Inventory for Students (ASSIST)(Tait, Entwistle & McCune, 1998) inventory was developed to assess predominant learning approaches. The successful student in this inventory is characterized as one who uses evidence to relate ideas, is interested in ideas and monitoring understanding, and intends to seek meaning for himself or herself. A deep approach to learning generally results in high levels of academic achievement. However, this is only true if the assessment procedures being used emphasize and reward personal understanding. Entwistle (2000), building on earlier research (Entwistle, 1995, 1998; Entwistle & Entwistle, 1997), describes levels of understanding as outcomes of learning. These levels of understanding are reported as follows:

- *Mentioning* – Incoherent bits of information without any obvious structure
- *Describing* – Brief descriptions of topics derived mainly from material provided
- *Relating* – Outline, personal explanations lacking detail or supporting argument
- *Explaining* – Relevant evidence used to develop structured, independent arguments
- *Conceiving* – Individual conceptions of topics developed through reflection (p. 5).

Chin and Brown (2000) studied a deep versus surface approach to learning science. Six, eighth grade students were taped during laboratory activities in a chemistry class. Before and after instruction, they were interviewed about science concepts. An analysis of their conversations and actions during the laboratory activities and their interview responses showed several differences in learning approaches. These differences fell into the following categories: generative thinking, nature of explanations, asking questions, metacognitive activity and approach to tasks. Students using a deep approach were: 1) more spontaneous in offering their ideas; 2) more elaborate with explanations; 3) focused on explanations, causes, and/or predictions; and (4) engaged in "online theorizing." Students using a surface approach to learning were more prone to explanations that merely reformulated questions that referred to more basic factual or procedural information. The findings also suggested that teachers who provided prompts and who encouraged learners to ask questions, predict and explain during learning activities could encourage deep learning.

A further explanation of deep learning is provided by the Alliance for Excellent Education (2011) where it is stated that, "Deeper learning is an imperative for all students ... [and involves] the delivery of rich, core content to students in innovative ways that allow them to learn and then apply what they have learned. ... true deeper learning is developing competencies that enable graduating high schools students to be college and career ready ..." (p. 1). This organization further cites the work from the Organisation of Economic Co-operation and Development whose work has been able to demonstrate through the Programme for International Student Assessment examinations that "deeper learning produces higher academic performance" (p. 2).

This notion of deeper learning is supported through project-based learning and inquiry. Trilling and Fadel (2009) describe two project-based student experiences: the Bacteria Lab and the SARS Project (a web challenge that requires students to design a website collaboratively with a team of students on a topic of interest). These types of projects involve students in carrying out and "completing complex tasks that result in a realistic product, event or presentation to an audience" (p. 109) and demonstrate that students who engage in this type of learning gain deeper understanding and retain information longer. They further state that a growing body of research is showing the following:

- Students learn more deeply when they can apply classroom-gathered knowledge to real-world problems and when they take part in projects that require sustained engagement and collaboration.
- Active and collaborative learning practices have more significant impact on student performance than any other variable, including student background and prior achievement.
- Students are most successful when they are taught *how to* learn as well as *what* to learn (pp. 107–108).

This is further exemplified in the research by Wurdinger and Enloe (2011) in which they surveyed students attending a charter school in St. Paul, Minnesota where project-based-learning is the mainstay of student learning. An online survey was replied to by 42 alumni regarding their experience in the school. Respondents indicated that project-based learning prepared them for the real world and helped them become more independent and self-reliant learners. They also learned that making mistakes was a part of the process and that this process is to be valued as is the motivation to improve learning. The researchers also indicated that the respondents felt that this type of learning gave them an advantage over their peers in that the skill sets that they were able to develop to a deeper degree better prepared them for post-secondary students.

IN PRACTICE

Curriculum

Alexander (2005), in a newspaper story, reports that in 1988, England introduced a national curriculum providing all primary pupils an entitlement to a reasonably broad foundation of knowledge, understanding and skill. The imposition of a national testing framework at the same time had a major impact on the intended curriculum. Outside of literacy and numeracy, which were protected zones,

most of the curriculum was squeezed out of existence. Reports showed that this was neither wise nor necessary, as schools that did better in literacy and numeracy tests were also those that sustained curriculum breadth and depth, while schools that did the worst failed to do so. It is obvious that basics cannot be taught in a vacuum. Had the government been more attentive to the relationship between breadth and standards, the standards (as measured by standardized test scores) would have benefited.

In England, a new national curriculum for primary schools was slated to be introduced in September 2011.[10] This curriculum was to be based on a solicitation of input concerning national and international best practices. The new curriculum was also to be based on the fact that every child is entitled to the essentials of literacy, numeracy, information and communication technology capability, and personal development as a part of a broad, balanced and well-rounded education. To quote from the final report of the *Independent Review of the Primary Curriculum* (Rose, 2009) that was to be the genesis of the new curriculum:

> Our best primary schools already demonstrate that, far from narrowing learning, these priorities—literacy, numeracy, information and communication technology skills and personal development—are crucial for enabling students to access a broad and balanced curriculum. Excellence in the basics supports the achievement of breadth and balance in primary education (p. 2).

Curriculum 2000 was developed to give British learners an opportunity to engage in an education experience providing both depth and flexibility. Curriculum 2000 was evaluated in a study involving more than 50 learning institutions. Each organization provided a case study. The case studies documented the successes that the institutions had in providing curricular breadth (more programmes and course offerings) and flexibility. Some of the more common approaches to providing breadth involved using information and communication technology and working in partnerships with other institutions to offer broader curriculums. Some institutions developed and offered enrichment programs in their curricula while others used tutors to increase breadth (Tait, Frankland, Moore & Smith, 2002).

Three primary curriculum reviews were examined: the Rose Review, the Commons Select Committee enquiry into the national curriculum, and the Cambridge Primary Review. The three reports share common agreements. For instance, all accepted the case for a national curriculum and a curriculum with breadth (Alexander, 2009). The Cambridge Primary Review (2011), while stressing the importance of literacy and numeracy, insists that both must be "embedded within a broad and rich primary education in which every aspect is taught with equal conviction and expertise, and to the highest possible standard, regardless of how much or how little time is allocated to it" (p. 1).

[10] With the election of a new government in June 2010, this curriculum document was pulled back in favour of a worldwide review.

The Office for Standards in Education, Children's Services and Skills (Ofsted) is the non-ministerial government department of Her Majesty's Chief Inspector of Schools in England. An Ofsted report completed in 2002 identified 31 schools that achieved high standards in *all* subjects, including standards well above average in English and mathematics. More importantly, the report went on to state that curriculum breadth and consistency actually contributed to the high rankings in English and mathematics, because "pupils applied the knowledge and skills learned in one subject to others thus reinforcing their learning and increasing their understanding and confidence" (Alexander, 2002, p. 4).

Following the original work by the Scottish Ministry of Education, the Aberdeen Education Council (2008, p. 2) adapted the original version and suggests the following regarding breadth and depth of school curricula:

> **Breadth**
> All children and young people should have opportunities for a wide range of activities so that they can learn and develop in a variety of ways. There should be sufficient breadth in each young person's overall experience to help them make choices as they move through school.
>
> **Depth**
> As well as having a broad range of experiences, children and young people should also have opportunities to work in depth. As they progress they should be able to draw different strands of learning together and explore and achieve more advanced levels of understanding.

The "Teach Less, Learn More" movement, launched in 2005, best sums up Singapore's strategy in the area of curricular reforms. "Teach Less, Learn More" is about teaching better in order to engage learners and prepare them for life, rather than teaching more for tests and examinations. It is about shifting the focus from "quantity" to "quality" in education. "More quality" in terms of classroom interaction, opportunities for expression, the learning of lifelong skills and the building of character through innovative and effective teaching approaches. "Less quantity" in terms of rote-learning, repetitive tests, and following prescribed answers and set formulae.

Deep Learning

To provide greater space for school-based flexibility in the Singapore curriculum, judicious content reduction was instituted across subjects so that 10 to 20 percent of curriculum time could be freed up as "white space." Teachers have the autonomy to use the "white space" to customize lessons, using a variety of teaching and assessment methods to better meet the needs of their students. Success stories of prototype schools were shared with the rest of the schools and the program expanded to another 100 schools in 2008. By 2011, all schools were expected to be on board the "Teach Less, Learn More" movement. Following the "Teach Less, Learn More" movement, the challenge will be to rebalance the emphasis on knowledge acquisition with the development of skills and the inculcation of values (Singapore Ministry of Education, 2010).

A pilot project in three schools in the United States, identified as Essential Schools, looked at the role of depth and breadth in the mathematics curriculum, following the notion of "less is more." However, in this view, the notion of "less is more" is not so much driven by content reduction but rather by identifying what it means to be "quantitatively literate" and being able to use mathematics reasoning as a tool for full participation in a democratic society. To develop the mathematics curriculum, content from the Massachusetts state curriculum frameworks was used to provide the basis for decision making as students were required to write the state final examinations. The curriculum developers then looked for connections between content items with the view of identifying unifying concepts that could be explored through essential questions related to the focus of thematic units. The curriculum was designed to spiral in a manner that would allow students to revisit "different mathematical concepts several times in increasing depth" (Roser & Kruse, 2007, p. 2) and by focusing on bigger questions that students would investigate in depth. The role of the teacher is to model techniques and procedures through direct instruction while consistently making space for students to explore the concepts in-depth. The mathematics curriculum in these schools, then, is designed for students to "use, explore, play around, discover, make connections, and problem solve" with the knowledge and skills they have gained so that "mathematics education is no longer skill development through routine tasks; rather, it is an effort to present students with complex situations where there is no set solutions, and the process of analysis, or breaking apart a phenomenon to understand its components and their effects on one another, takes precedence" (p. 2).

The three pilot schools approached the teaching of this mathematics curriculum in different ways. At the New Mission High School, an interdisciplinary approach was used, where the notion of Habits of Mind that was developed on a schoolwide basis in conjunction with a consistent set of assessment tools to set the foundation. A single, unique essential question was devised to frame the entire course, with the identification of corresponding quantitative skills and relevant topics that would aid students in answering the question. Students were then engaged in larger-scope projects that required them to find explanations for "relevant phenomena by simplifying a real-world situation using mathematical representations" (Roser & Kruse, 2007, p. 3).

At the second pilot school, North Central Charter Essential School, the Habits of Mind was replaced with the notion of learning levels to permit students to follow learning paths over six years. All other disciplines had already traced out their paths and mathematics was the last one to do so. The curriculum developers defined eight categories within five levels to allow students to work at their own pace. They used the course outlines from New Mission High School to develop the essential understandings for the levels while integrating the three mathematical goals—mathematical modelling, mathematical proof and problem solving.

At the third pilot school, Francis W. Parker Charter Essential School, mathematics was integrated with science and technology. The program is divided into Division 1, 2 and 3. Students move through the divisions when they indicate their readiness by demonstrating increased abilities in mathematical problem solving and mathematical communication, the crux of this program, while integrating content from the sciences. The expectation of students is that they are able to "demonstrate their ability to meet the standards, in these areas through their performance on messy, open-ended tasks that require

creative thinking, application of concepts explored in class, and clear communication of the process involved in solving the problem" (Roser & Kruse, 2007, p. 4). The authors conclude from all three pilot schools that they believe their students are able to:

1. transfer mathematical skills and knowledge to non-routine problem situations
2. develop metacognitive awareness that allows for conscious access of relevant information
3. internalize the process of justification
4. use the language of mathematics to communicate and build upon their ideas in a manner that engages them and allows them to deepen their understanding of mathematical concepts while gaining more out of their mathematical experience.

CONSIDERATIONS FOR CURRICULUM

While presenting a keynote address in Milwaukee, Wisconsin, in 2000, Pierce Hammond, Director of the Office of Reform Assistance and Dissemination, Office of Educational Research and Improvement, United States Department of Education stated:

> One of the slogans of the modern standards reform movement is less is more. Part of our country's overall culture is that we want more. We are covering more subjects in less depth and it's taking its toll on student achievement. There's a trade off between learning something in depth and learning lots of different things (Hammond, 2000, p. 8).

Nations that follow a common core curriculum in early grades (e.g., France and Japan) have higher achievement among their students than those jurisdictions that do not follow this curriculum structure; i.e., ones that cover several domains within a moderate number of specific topics based on building upon previous knowledge (Hirsch, 2001).

Barnes (2007), in his book, *Cross-Curricular Learning 3–14: Developing Primary School Practice*, cites a British report by Wilde et al. (2006) that suggests that university faculty are

> worried about students' lack of 'deep understanding' of the core ideas of individual subjects and the links between the subjects or themes. [The report] bemoans what he calls an 'instrumentalised and surface approach learning' which, they argue, has become dominant since increased accountability and assessment practices have impacted schools' curricula and administration (p. 165).

In curriculum development, consideration needs to be taken regarding deep surface learning approaches to the acquisition of knowledge and the development of skills. According to Barnes (2007), "research into deep learning suggests that those who strive or who are helped to make meaningful connections between themselves and new knowledge, retain and are able to transfer their understanding more effectively" (p. 166).

When discussing breadth and depth, Woolf (2001) suggests what he calls a "comb approach." The curriculum as a comb metaphor suggests that a curriculum and the courses comprising it should have some units of very deep (teeth of the comb) investigations and understanding while other units include general awareness (spine of the comb) of many topics, but not necessarily deep understanding. A similar metaphor for depth and breadth is the "table with legs" (Breadth and Depth, n.d.). The tabletop represents breadth, covering many topics, while the legs represent depth in a few selected topics. It is somewhat common for people to be exposed to an education that is broad without being deep. Having depth without breadth is not as common. It is important that all students be given an opportunity to carry out a deep investigation periodically throughout their education. This opportunity can be accomplished by having one or two themes in each course investigated in depth (Breadth and Depth, n.d.).

Hirsch (2001) believes schools should develop a sequence of topics at each different grade level in preparation for what will be learned in the following grade. He further believes that both breadth and depth should be implemented in curricula in an equal and balanced fashion. Hirsch (pp. 22–23) lays out four principles of learning as follows:

1. The ability to learn something new is not primarily a general, formal skill but is related to a discipline-specific skill; that is, "learning to learn entails acquiring relevant knowledge about specific domains."
2. The general ability to learn is highly correlated with general knowledge.
3. "The best way to learn a subject is to learn its general principles and to study an ample number of examples"; this does not mean, however, an infinite number, but rather a broad range that permits deep understanding.
4. "Broad general knowledge is the best entrée to deep knowledge."

Hirsch (2001) provides the example of showing students in the first grade a globe and getting them to understand that the world is made up of oceans and continents before specific places are studied. According to Hirsch, "Neither the deep understanding pole nor the lots-of-facts pole is an optimal approach to teaching and learning. … The four principles established that teaching either a single topic in depth or a great many topics is not optimal" (p. 23), thus there is a need for a balance between depth and breadth.

For generations, schools have aimed to introduce students to a broad range of topics through curriculum. Traditionally schools ensure that students will have, at least, some acquaintance with most areas of human knowledge by the time they graduate. Yet, such broad knowledge cannot help but be somewhat superficial and, as Egan (2010) argues, omit a crucial aspect of true education—deep knowledge.

In his book, *Learning in Depth: A Simple Innovation that Can Transform Schooling,* Egan (2010) outlines an ambitious yet practical plan to incorporate deep knowledge into basic education. All students will follow the usual curriculum and, in addition, will be assigned a particular topic to learn about through their whole school career and build personal portfolios on the topic that will grow with them as they

complete their journey through school (Learning in Depth Project, n.d.). Egan suggests that by the time students graduate, they will know as much about their topics as almost anyone in the world. In this process, students will have learned important, possibly life-changing lessons about the meaning of expertise, the value of dedication and the delight of knowing something in depth.

Why is depth of knowledge so important? Egan (2007) suggests that to have knowledge of something in depth allows one to know something about the nature of knowledge itself. Egan also argues that depth of knowledge is important for the development of the imagination when he states, "imagination can work only with what we know" (Conclusion, para. 1).

Emily White (White, n.d.), a practicing teacher and student of Egan, suggests that,

> in-depth knowledge gives an individual a perspective of their place in the universe and allows them a glimpse of the sublime greatness and interconnectedness of all things. Depth of knowledge is important because it overshadows utilitarian learning with learning for the sake of learning. Depth of knowledge encourages the acquisition of knowledge for the wonder of the knowledge itself rather than its practical implications (pp. 2–3).

Though Egan's (2007) program might be radical, from a curriculum point of view, it is strikingly simple to implement. This special topic would not replace any part of the regular curriculum; but, rather, it would be studied in addition to the existing curriculum. Egan suggests that approximately once a month students meet with their teacher to work on and discuss their portfolio. As students become independent learners and more accustomed to working on their portfolios, they control the direction of their learning according to their own interests.

Herrington and Oliver (2000) report that the instructional technology community is in the midst of a philosophical shift from a behaviourist to a constructivist framework, a move that might begin to address a growing rift between formal school learning and e-learning. One theory of learning, with the capacity to promote authentic learning, is *situated learning*. Lave and Wenger (1991) first proposed situated learning as a model of learning in a Community of Practice—learning that takes place in the same context in which it is applied. They argue that learning should not be viewed as abstract and decontextualized but rather as a social process, where knowledge is co-constructed and situated in a specific context and embedded within a particular social and physical environment. Herrington and Oliver (n.d.) suggest elements of situated learning:

1. Providing authentic contexts that reflect how knowledge will be used in real life – physical environment that reflects how that knowledge will be used.
2. Providing authentic activities – activities with real-world relevance.
3. Providing access to expert performances and the modelling of processes – access to learners with various levels of expertise.
4. Providing multiple roles and perspectives – different perspectives on the topics from various points of view and the opportunity to express different points of view through collaboration.
5. Supporting collaborative construction of knowledge – tasks addressed to a group rather than an individual.

6. Promoting reflection to enable abstractions to be formed – the opportunity for learners to compare themselves with experts.
7. Promoting articulation to enable tacit knowledge to be made explicit – public presentation of argument to enable articulation and defense of learning.
8. Providing coaching and scaffolding by teachers at critical times – recommendations that teachers implementing programs are available for coaching and scaffolding assistance for significant portions of time of use.
9. Providing authentic assessment of learning within tasks – multiple indicators of learning and opportunities for students to be effective performers of knowledge and to craft polished, performances or products.

How can educators adjust curriculum to cultivate Gardner's (2007) five minds? One of Gardner's suggestions is to talk with students about prominent examples from history or current events that illustrate these minds. An example provided suggests that history or science teachers might discuss with students how a scientist worked diligently and thought creatively to come up with and test an important discovery. On the other hand, students might also explore examples of where individuals fell short of exemplifying Gardner's minds. They might discuss the consequences of such behaviour. For example, *are there cases where the violation of ethical codes leads to harm for others? How can a fellow learner be criticized respectfully when one notices that the product of their creativity is flawed?*

Teachers can also use Gardner's (2007) notion that there is a developmental sequence among the minds throughout their curricular offerings. Rather than starting with an assignment that requires creativity, teachers might help students to first master some body of knowledge, synthesize it and only then consider ways to expand on and use it in out-of-the-box ways. In the 21st century, increasingly complicated issues will require solutions that cross disciplinary boundaries. Nurturing each of these minds will help ensure that the next generation is willing and able to meet the still unknown challenges of the future. Gardner feels strongly that although no one knows exactly how to create an education that will yield students with the five minds fully intact, trying to do so is critical.

Zimmerman (1990) claims that, "our understanding of the interdependence of these [metacognitive, motivational, behavioural] processes has now reached a point where systematic efforts can be launched to teach self-regulation to students who approach learning passively" (p. 14). A curriculum that facilitates transformation from novice toward expert achieves a balance between assimilation of new knowledge and practical application focused on deepening that knowledge through metacognitive ability. Such a curriculum is deep rather than broad and should promote deep learning. Deep learning requires learner investment to synthesize learning strategies, including discussions with peers, reflective writing, practical application, and reading to process fully the information and knowledge with the added benefit of retaining and transferring information at higher rates (Tagg 2003). The metacognitive abilities referred to by Zimmerman, so important to developing deep learning skills (as outlined by Tagg), are teachable as part of a curriculum containing depth.

Sims (2006) outlines the distinction between deep and surface approaches to learning. She suggests that the intention in the deep approach to learning is to understand ideas for oneself by:

- relating ideas to previous knowledge and experience
- looking for patterns and underlying principles
- checking evidence and relating it to conclusions
- examining logic and argument cautiously and critically
- becoming actively interested in course content (p. 3).

She suggests that the intention in the surface approach to learning is to cope with course requirements by:

- studying without reflecting on purpose or strategy
- treating the course as unrelated bits of knowledge
- memorizing facts and procedures routinely
- finding difficulty in making sense of new ideas presented
- feeling undue pressure and worry about work learning gateways (p. 3).

In a task force report on promoting deep learning, the University of Waterloo (2011) reports that "deep approaches to learning" and "deep learning" are used somewhat interchangeably in the research literature. Based on the research of Entwistle (2010), Lindblom-Ylanne (2010), Millis (2010) and Saroyan (2010), the University of Waterloo (2011, p. 6) suggests that students using deep approaches to learning do the following:

- retain knowledge and apply it in new and different contexts
- focus on relating ideas and making connections between new and prior knowledge
- come to see concepts, ideas, and/or the world differently
- engage in independent, critical and analytical thinking in a quest for personal meaning
- regulate themselves as learners
- rely on intrinsic motivation to learn
- engage in active learning by interacting with others and the course material in their learning.

Deep learning differs from a surface approach to learning, which is typically characterized by a focus on rote memorization, facts as discrete pieces of unquestioned knowledge, and a superficial understanding of concepts (Lindblom-Ylanne, 2010; Saroyan, 2010). Two important characteristics of deep learning are long-term retention and transfer of learning. Halpern and Hakel (2003) identified strategies that effective teachers can use to promote these two key characteristics:

- have students practise retrieving past learning to produce responses to new questions
- use different teaching approaches to vary the conditions in which learning occurs
- represent learnings in different formats when possible (e.g., make a concept map of a textbook reading)
- have students intentionally draw upon prior knowledge, experience and assumptions to influence knowledge and skills being learned

- uncover student learning beliefs that may hinder learning
- provide students with timely feedback about their learning
- use activities that require students to engage with the material or each other
- clearly identify and reinforce key concepts
- understand and make wise use of the trade-off between quantity and quality of learning
- match learning activities to course goals and learner outcomes
- accept that it is not what instructors do but what the students do that determines the amount and quality of learning.

Donham (2010) adds to this list by describing deep learning that can be achieved through concept-based inquiry. This type of an approach looks at framing learning experiences through the following attributes as described by Erickson (as cited by Donham, 2010, p. 9):

- *broad and abstract* which allows for the transfer of knowledge across disciplines through concrete examples of an abstract concept (e.g., immigration patterns allow for the study of different countries and historical movement of people)
- *universal in application* as concepts are universal in nature and can be applied to a variety of contexts (e.g., by studying immigration patterns, students gain insight into the universality of immigration and what that experience might have been over different time periods; the comparative analysis allows for deeper understanding to be gained)
- *timeless* in that the concept can carry through the ages where the only thing that changes are the examples which allows for more relevancy for students
- *represented by different examples* that share common attributes which allows students to analyze the characteristics of the examples and to derive and gain a deeper understanding of the concept.

Moving from surface learning, which tends to focus on fact finding and rote memorization, to concept-based inquiry allows students to develop abstract thinking which causes them to think more deeply and in an inductive fashion. The universality of conceptual learning also has value beyond school, as students can see the relevance it has to them personally, to their community, to their country and to the world as a whole.

The notions described above and throughout this chapter bring into focus the need to consider the delicate balance between surface knowledge/learning (breadth) and deep knowledge/learning (depth). Both play an inherent role in developing the *mile wide and inch deep* and the *mile deep and inch wide* educated person. Curriculum developers need to consider their subject area or discipline and the key concepts that are inherent to the development of both surface and deep knowledge/learning (breadth and depth). They also need to consider that in order for deep learning and depth of understanding to occur, the relationship between these concepts, within a subject or discipline and across subjects and disciplines, needs to be fully explored in order to ascertain what content will enable students to look for patterns, to synthesize and apply acquired knowledge to solve problems creatively or find ways to innovate existing ideas and to self-monitor their own depth of knowledge and understanding. By developing learner outcomes that permit students to know how to learn, as well as what to learn, and

by supporting them through assessments and learning materials that encourage sustained engagement with content and skill development, students will have the opportunity to be more successful in their learning.

Finally, as was so eloquently articulated by Ackerman (2003), the condition that sets the challenge for curriculum developers is when "the value (and limitations) of *both* 'depth' and 'coverage' are understood, and a balance among the trade-offs between scope and intensity has been artfully maintained" (p. 349). In so saying, it truly will be a work of art to find the fine balance between what is important to know on the surface and at a deeper level, in conjunction with the physical, emotional and cognitive skills required to be able to learn, live and work in the future.

BIBLIOGRAPHY

Aberdeen Education Council. (2008). A curriculum for excellence. Retrieved from www.aberdeen-education.org.uk/.../City%20Information%20Pack%2...

Ackerman, D. (2003). Taproots for a new century: Tapping the best of traditional and progressive education. *Phi Delta Kappan*, *84*(5), 344–349.

Alexander, R. (2002). The curriculum in successful primary schools: A response. A keynote address given to the HMI Invitation Conference on the 2002 Ofsted report, The Curriculum in Successful Primary Schools, Watermen's Hall, London, October 14, 2002. Retrieved October 17, 2011, from http://www.robinalexander.org.uk/docs/Ofsted_2002.pdf

Alexander, R. (2005). Primary schools. *The Guardian*, April 19, 2005. Retrieved October 17, 2011, from http://www.guardian.co.uk/education/2005/apr/19/schools.politics1

Alexander, R. (2009). *The primary curriculum: An alternative way forward*. A paper presented at the Westminster Education Forum Keynote Seminar: The Future of the Primary Curriculum, June 22, 2009. Retrieved from http://www.primaryreview.org.uk/Downloads/Westminster_Forum_22.6.09_RJ_Alexander_web.pdf

Alliance for Excellent Education. (2011). *A time for deeper learning: Preparing students for a changing world. Policy Brief, May 26, 2011*. Retrieved February 3, 2012, from http://www.all4ed.org/files/DeeperLearning.pdf

Atherton, J. S. (2011). Learning and teaching; Deep and surface learning [Online: UK]. Retrieved December 16, 2011, from http://www.learningandteaching.info/learning/deepsurf.htmhttp://www.learningandteaching.info/learning/deepsurf.htm

Barnes, J. (2007). *Cross-curricular learning 3–14: Developing primary school practice*. London, England: Sage Publications Ltd.

Bereiter, C. (2002). *Education and mind in the knowledge age*. London, England: Lawrence Erlbaum Associates.

Biggs, J. (1999). *Teaching for quality learning at university, What the student does*. Buckingham: Society for Research into Higher Education and Open University Press.

Brady, M. (2000). The standards juggernaut. *Phi Delta Kappan*, *81*(9), 649–651.

Breadth and Depth. (n.d.). Retrieved October 17, 2011, from http://www.av8n.com/physics/breadth-depth.htm

Cambridge Primary Review. (2011). National curriculum review–Curriculum in the balance: Entitlement or minimalism? Retrieved October 17, 2011, from http://www.primaryreview.org.uk/_UPDATES/news/newsarchive/homepagearticlesarchive/curriculum_in_the_balance.php

Chin, C., & Brown, D. E. (2000). Learning in science: A comparison of deep and surface approaches. *Journal of Research in Science Teaching*, *37*(2), 109–138.

Donham, J. (2010). Deep learning through concept-based Inquiry. *School Library Monthly*, *27*(1), 8–11.

Egan, K. (2007). Learning in depth: Knowledge and the imagination. Retrieved October 31, 2011, from http://www.educ.sfu.ca/kegan/Learningdepth.html

Egan, K. (2010). *Learning in depth: A simple innovation that can transform schools*. Chicago, IL: University of Chicago Press.

Entwistle, N. J. (1995). Frameworks for understanding as experienced in essay writing and in preparing for examinations. *Educational Psychologist*, *30*, 47–54.

Entwistle, N. J. (1998). Approaches to learning and forms of understanding. In B. Dart & G. Boulton-Lewis (Eds.), *Teaching and learning in higher education* (pp. 72–101). Melbourne, Australia: Australian Council for Educational Research.

Entwistle, N. J. (2000). Promoting deep learning through teaching and assessment: Conceptual frameworks and educational contexts. A paper presented at TLRP Conference, Leicester. Retrieved December 15, 2011, from http://www.tlrp.org/pub/acadpub/Entwistle2000.pdf

Entwistle, N. J. (2010). Taking stock: An overview of key research findings. In J. Christensen Hughes & J. Mighty (Eds.), *Taking stock: Research on teaching and learning in higher education* (pp. 15–51). Montreal, QC & Kingston, ON: McGill-Queen's University Press.

Entwistle, N. J., & Entwistle, A. C. (1997). Revision and the experience of understanding. In F. Marton, D. J. Hounsell & N. J. Entwistle (Eds.), *The experience of learning* (2nd edition) (pp. 145–158). Edinburgh, Scotland: Scottish Academic Press.

Gardner, H. (2007). *Five minds for the future*. Boston, MA: Harvard Business School Press.

Halpern, D. F., & Hakel, M. D. (2003). Applying the science of learning to the university and beyond. *Change*, *35*(4), 36–41.

Hammond, P. (2000). A keynote address delivered at the Educating Urban Indians: A Summit for the Future on March 10, 2000 in Milwaukee, Wisconsin. Retrieved from http://www.eric.ed.gov/PDFS/ED456976.pdf

Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development, 48*(3), 23–48. Retrieved from http://ro.uow.edu.au/edupapers/31/

Hirsch Jr., E. D. (2001). Seeking breadth and depth in the curriculum. *Educational Leadership*, *59*(2), 22–25. Retrieved from http://www.csun.edu/~kdm78513/coursework/625/assignments/documents/hirsch.pdf

Irwin, R. (2011). *Designing engagement: Breadth and depth through artistic inquiry.* Speaking notes from a presentation at the Alberta Education Research Roundtable 2, May 7, 2011, Calgary, Alberta.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, England: University of Cambridge Press.

Learning in Depth Project. (n.d). Learning in depth project. Retrieved October 31, 2011, from http://www.ierg.net/LiD/

Lee, S., & Olszewski-Kubilius, P. (2006). A study of instructional methods used in fast-paced classes. *Gifted Child Quarterly*, *50*(3), 216–237.

Lindblom-Ylanne, S. (2010). Chapter 3: Students' approaches to learning. In J. Christensen Hughes & J. Mighty (Eds.), *Taking stock: Research on teaching and learning in higher education* (pp. 63–80). Montreal, QC and Kingston, ON: McGill-Queen's University Press.

Miller, J. P., & Seller, W. (1990). Curriculum: Perspectives and practice. Toronto, ON: Copp Clark Pitman.

Millis, B. (2010). Promoting deep learning. (IDEA paper #47). Manhattan, KS: The IDEA Center.

Moldoveanu, M., & Martin, R. (2009). *Diaminds: Decoding the mental habits of successful thinkers*. Toronto, ON: University of Toronto Press.

Moldoveanu, M., & Martin, R. (2010). Stretching the mind: Developing an adaptive lens to deal with complexity. *Rotman Magazine*, Fall, 4–9. Retrieved from http://rogerlmartin.com/wp-content/uploads/2010/10/rotman_fall_2010_stretching_the_mind.pdf

Murdock, J. (2008). Comparison of curricular breadth, depth, and recurrence and physics achievement of TIMSS population 3 countries. *International Journal of Science Education, 30*(9), 1135–1157.

National Curriculum. (2010). *Introducing the new primary curriculum: Guidance for primary schools.* Retrieved from http://www.clusterweb.org.uk/UserFiles/ASK8/File/Whole_School_Issues/Curriculum_Design/21770_Design_Guidance_AW_web.pdf

Pearcy, M., & Duplass, J. A. (2011). Teaching history: Strategies for dealing with breadth and depth in the standards and accountability age. *The Social Studies, 102*(3), 110–116.

Qian, D. D. (1999). Assessing the roles of depth and breadth of vocabulary knowledge in reading comprehension. *The Canadian Modern Language Review/La Revue canadienne des langues vivantes*, *56*(2), 282–307.

Rose, J. (2009). *Independent review of the primary curriculum: Final report*. Nottingham, England: DCSF Publications. Retrieved from http://www.subjectassociation.org.uk/files/downloads/Primary_curriculum-report.pdf

Roser, G., & Kruse, D. (2007). What if less is just less? The role of depth over breadth in the secondary mathematics curriculum. *Horace, 23*(2). Retrieved from http://www.essentialschools.org/resources/383

Säljö, R. (1979). Learning in the learner's perspective: 1–some commonplace misconceptions. Reports from the Institute of Education, University of Gothenburg, 76.

Saroyan, A. (2010). Chapter 5: Research on student learning. In J. Christensen Hughes & J. Mighty (Eds.), *Taking stock: Research on teaching and learning in higher education* (pp. 95–109). Montreal, QC and Kingston, ON: McGill-Queen's University Press.

Schwab, J. J. (1978). Education and the structure of the discipline. In I. Westbury & N. J. Wilks (Eds.), *Science, curriculum, and liberal education* (pp. 229–272). Chicago, IL: University of Chicago Press.

Schwartz, M., Sadler, P. M., & Tai, R. H. (2008). Depth versus breadth: How content coverage in high school science courses relates to later success in college science coursework. *Science Education*, *93*(5), 798–826. Retrieved from http://www.cfa.harvard.edu/smg/ficss/research/articles/SE_Depth_versus.pdf

Sims, E. (2006). Deep learning–1: A new shape for schooling? Retrieved December 20, 2011, from http://www.sst-inet.net/PDF/Deep%20Learning%201%20-%20Chapter%201.pdf

Singapore Ministry of Education. (2010). *Building a national education system for the 21st century: The Singapore experience.* Paper presented at the Building Blocks for Education: Whole System Reform, Toronto, ON, September 2010. Retrieved from http://www.edu.gov.on.ca/bb4e/Singapore_CaseStudy2010.pdf

Tagg, J. (2003). *The learning paradigm college*. Boston, MA: Anker.

Tait, H., Entwistle, N. J., & McCune, V. (1998). ASSIST: A re-conceptualisation of the approaches to studying inventory. In C. Rust (Ed.), *Improving students as learners* (pp. 262–271). Oxford, England: Oxford Brookes University, Centre for Staff and Learning Development.

Tait, T., Frankland, G., Moore, S., & Smith, D. (2002). Curriculum 2000: Innovations, opportunity and change. Retrieved October 17, 2011, from http://www.eric.ed.gov/PDFS/ED465900.pdf

Trilling, B., & Fadel, C. (2009). 21st century skills: Learning for life in our times. San Francisco, CA: Jossey-Bass.

University of the Sciences. (2011). Course planning: Depth versus breadth. Retrieved October 6, 2011, from http://www.usciences.edu/teaching/tips/planning.shtml#department

University of Waterloo. (2011). The task force on innovative teaching practices to promote deep learning at the University of Waterloo: Final report. Retrieved December 19, 2011, from http://cte.uwaterloo.ca/teaching_resources/documents/Task%20Force%20Report%20on%20Deep%20Learning.pdf

White, E. (n.d.). No title. Retrieved October 31, 2011, from http://www.ierg.net/LiD/emily_lid.pdf

Wilde, S., Wright, S., Hayward, G., Johnson, J., & Skerrett, R. (2006). *Nuffield review higher education in focus groups preliminary report.* The Nuffield review of 14–19 Education and Training, Nuffield Foundation. Oxford, England: Oxford University Press.

Wilson, S. M. (1988). Understanding historical understanding: Subject-matter knowledge and the teaching of U.S. history. Unpublished doctoral dissertation. Stanford University.

Wineburg, S. (2008). The role of subject-matter knowledge in teacher assessment. In L. Ingvarson & J. Hattie (Eds.), *Assessing teachers for professional certification: The first decade of the National Board for Teaching Standards* (pp. 113–138). Oxford, England: Elsevier Ltd.

Wineburg, S. (1997). Beyond "breadth and depth": Subject matter knowledge and assessment. *Theory into Practice*, *36*(4), 255–261. Retrieved from http://pdfserve.informaworld.com/266764_750426827_916642942.pdf

Woolf, L. D. (2001). *It's a colorful life*. A presentation at the April 30, 2001 meeting of the American Physical Society, Washington, DC. Retrieved October 17, 2011, from http://www.sci-ed-ga.org/pdfs/apsclrpres042501.pdf

Wurdinger S., & Enloe, W. (2011). Cultivating life skills at a project-based charter school. *Improving Schools*, *14*(1), 84–96.

Zimmerman, M. A. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, *25*(1), 3–17.

CHAPTER 5: INTERDISCIPLINARY LEARNING AND INTERDISCIPLINARY CURRICULUM

Flower in the Crannied Wall

FLOWER in the crannied wall,
I pluck you out of the crannies,
I hold you here, root and all, in my hand,
Little flower—but *if* I could understand
What you are, root and all, and all in all,
I should know what God and man is.

By Alfred Tennyson, 1st Baron (1809–92)

It has been the Western way, perhaps since the Industrial Revolution, to break the world apart for study. Tennyson, in his desire to "understand" a flower, plucks it from its environment to see it. But, does he really see it? What is, after all, a flower outside its environment—a dead or dying thing? How better to understand flowers than to study them within the totality of their environments. To watch them grow in symbiotic relationships to other things. To see a flower's full blooming.

Thus is the world—a total entity not easily broken apart or best understood in its broken pieces. But, as school learning has been combined with the history and philosophy of industrialization, one comes to think of "schooling" (building learned citizens) in the same way as manufacturing (building automobiles). Today's schools are generally specialized in content and delivery and as specialization breaks a "total world" into efficient delivery for students, pieces of the broken world become subject area content suitable for easy sharing with students. The result is that North American children currently go to schools where days are broken into pieces (periods) and content delivered in separate chunks (school subjects) by content experts (English teachers, science teachers, mathematics teachers, etc.). This fact is less true in Canada's elementary schools but much more true in our nation's secondary schools; however, elementary schools are not entirely devoid of subject areas, which break the world into "bite-sized chunks" for easy academic digestion.

The first publicly supported secondary school in North America was the Boston Latin School (1635) with a specialized, esoteric and difficult curriculum (Latin obviously was studied). As the United States became a growing industrialized nation, the demand for skilled workers increased. Benjamin Franklin responded by starting a new kind of secondary school (The American Academy) in 1751. Cremin (1970) noted that early schools stressed traditional English family, church, community, and apprenticeship methods, rendering schools agents of socialization.

The historical use of textbooks also contributed to breaking the world into school subjects for easy study. In the 17th century, schoolbooks were imported from England. The first North American book was *The New England Primer* using pedagogy of rote memorization. The *Primer* was built to help

Puritan children relate to the authority of God and parents. The *Primer* was followed by Noah Webster's *Speller* (the most common textbook from the 1790s until 1836) then *McGuffey Readers*. Both series emphasized civic duty and morality, and sold millions of copies.

Webster's *Speller* became a model for textbooks. It was arranged for easy teaching, allowing students to progress by age. Webster believed students learned when complex problems were broken into parts and each student mastered one part before moving to the next (à la Piaget's theory of cognitive development). Webster's *Speller* was secular and factual and contained important dates in American history (e.g., Columbus sailed in 1492, the American Revolution ended with the battle of Yorktown in 1781). Bynack (1984) believed Webster was committed to a unified American national culture that would solidify national solidarity and believed a nation's linguistic thoughts correlated with individual behaviour. He believed his books would increase manners and social stability.

But, these curriculum ideas did not lack critique. In the 1920s and 1930s, "progressive education" worked to shift curriculum focus. Critiquing traditional teacher-centred and curriculum-centred educational approaches, progressive education promoted child-centred education, social reconstructionism, citizenship participation and democracy. It did not foster individualism, classroom control, management, obedience to authority, or memorization and rote skills. Progressive educators believed a new educational philosophy could be created that was not based upon memorizing "right" facts, but rather focused on developing cooperative social skills, critical thinking and democratic behaviour. Instead of homogenizing a generation using curriculum, curriculum could play a role by transforming society away from industrialization, consumerism, and individualism and, as such, might become more compassionate, humane and equal (Rippa, 1997).

The Progressive Movement came to the forefront of what Herbert Kliebard (2004) called *The Struggle for the American Curriculum*. It challenged traditional ideas about how schooling should be organized. Led by John Dewey, Progressive Education believed students should become independent, creative and expressive thinkers, which contrasted from prevalent educational approaches based on social efficiency that Callahan (1962) later titled *Education and the Cult of Efficiency*.

Instead, two organizing principles of the Progressive Movement were *continuity* (each learning experience should be nurtured by previous experience) and *interaction* (what was learned might need revision, adaptation or be discarded based upon further research). From a progressive standpoint, learning is gradual and assumptions must be challenged while continually searching for truth. Thus experimentalism, verification and reconstruction were encouraged.

This short history of curriculum helps set the stage for better understanding curriculum links to interdisciplinary learning and curriculum. Almost 20 years ago, Grady (1994) noted that poor achievement and low student motivation required educational leaders to seriously consider restructuring school and pedagogy. She noted that, for many years, content was taught in periods of isolated time units (Carnegie Units) but claims these units had become anachronistic and should be eliminated. As an alternative to the Carnegie Unit's assembly-line mentality for delivering knowledge and skills using isolated content areas, she encouraged interdisciplinary curriculum. Interdisciplinary

curricula provided patterns and connections for more complex reasoning and enhanced learning by meshing knowledge, skills, and information from different disciplines. She noted that classroom environment, content standards and assessment were essential components in developing interdisciplinary curricula. She noted building themes, issues, topics or problems as a way to structure such curriculum. She also noted that interdisciplinary curriculum was a way to organize school in ways antithetical to traditional methods.

THEORETICAL FOUNDATIONS

Mathison and Freeman's (1997) paper titled, "The Logic of Interdisciplinary Studies," outlined arguments for using interdisciplinary approaches in school curriculum. As they examined the history of interdisciplinary studies and how interdisciplinary studies were organized, they noted differences across content areas, assumptions made about teaching and learning, and ways interdisciplinary studies promised to improve school curriculum. Their review was broad, focusing both on empirical evidence and assumptions about teaching and learning that were not reduced to empirical facts.

This research report found consensus among researchers about the positive educational outcomes for students in an integrated studies program. These positive educational outcomes included:

1. increased understanding, retention and application of general concepts
2. better overall comprehension of global interdependencies, along with the development of multiple perspectives and points of view, as well as values
3. increased ability to make decisions, think critically and creatively, and synthesize knowledge beyond the disciplines
4. enhanced ability to identify, assess and transfer significant information needed for solving novel problems
5. promotion of cooperative learning and a better attitude toward oneself as a learner and as a meaningful member of a community
6. increased motivation.

All these positive outcomes suggest that interdisciplinary studies enhance student learning.

Such enhancements for student learning seem even more crucial in today's world. Connecting the dots between learning in school and learning in life has become a key educational goal. No longer is it assumed that anything learned in school will translate, somehow, into life learning. For example, the Edutopia (2008) suggests that today's global economy centres on developing and exchanging knowledge and information. It also suggests that those fluent in several disciplines and comfortable moving among them will prosper and assumes that prospering, in this sense, is economic.

No longer does knowledge for knowledge's sake suffice. Instead, knowledge facility has come to be judged as valuable when it is linked to practical needs. How might one reach such facility? Edutopia (2008) suggests that such key learning includes creativity, adaptability, critical reasoning, and collaboration that come from engaging in the highly valued area of interdisciplinary studies, which can

fuse together human knowledge in *comprehensive* ways that help students develop meaningful understandings and *complex* associations. These days, the complexity of the disciplines must match the complexity of life; but, often disciplines have changed little in years.

Although disciplinary knowledge is seen as crucial—probably because of its traditional carefulness in knowledge building—the disciplines alone have come to be viewed as narrow in terms of life's complexities. For example, Chandramohan and Fallows (2009) note that *traditional disciplines* are losing their appeal and that students are now enrolling in interdisciplinary programming, because it bridges to workforce relevance. Chandramohan and Fallows argue that academic disciplines also change—rising and falling in response to demands for specific skills. For example, the rapid expansion of communication technologies and access to information today makes boundary crossing between disciplines a global phenomenon. Such boundary crossing also has helped morph disciplines in new and broad ways.

Twenty years ago, Beane (1991) wrote that integrating curriculum (as opposed to separating knowledge into disciplines) brought a wholeness and unity that helped young people confront personally meaningful questions they experienced as they integrated knowledge with their own insights. Beane noted that, since the 1970s, few curriculum reforms had emerged. As a result, subject-centred curricula still dominated curriculum design. His work focused on the goals of middle school, but he believed debates about schooling should begin around three concepts: 1) school should be about general education and real-world problems rather than increasingly differentiated subject matter segregated into separate entities; 2) schools should serve the students who attend them and not the adults who designed them; and 3) adolescents are humans with real feelings and need to know themselves and their world. Years later, MacMath, Wallace, and Chi (2009) noted that when curriculum integration focuses on multidisciplinary projects it was both real-world relevant and lent itself to authentic assessment.

Further, Beane (1991) believed school curriculum should be organized around rich, provocative themes rather than abstract, artificial subject areas, because such themes engaged students' search for knowledge, skills, and self and social meaning. Skills carried by integrated study included communication, questioning, problem-solving, computation, researching, valuing and social action. Beane believed curriculum brought student voices to the table instead of being imposed on students. In this curriculum model, students posed questions of interest to them, which naturally evolved into a constructivist model of making meaning from what students already knew. The result was a knowledge-rich learning environment.

Beane (1991) was not alone in his critique of curriculum during the 1990s. Brophy and Alleman (1991) also believed too few student activities were of educational value; however, they landed differently than Beane. They believed that integrating content between subjects might distort learning and suggested that teachers carefully weigh the value of cross-curricular activities against the educational goals these activities intended to cover.

Brophy and Alleman (1991) seem to be the exception. At its least intrusive, interdisciplinary learning was seen to add insight to knowledge from the disciplines. For example, Abrantes (2001) noted that the Portuguese education system had moved from a rigid system to flexible management of curriculum as a way to allow teachers to both organize learning around disciplines and to enable interdisciplinary learning. Portugal engaged this change to offer teachers and schools more responsibility for students within a broader curriculum scope and to provide decision making related to student needs rather than simply focus on curricular content. Implicit in this policy decision was a belief that studies focused upon discipline knowledge might *distance* learners from knowledge they could create.

Portugal was not alone in establishing such policy. Scotland's Ministry of Education's (2008) document "A Summary of Building the Curriculum 3 – A Framework for Learning and Teaching" outlined interdisciplinary learning as a way to provide opportunities for learners to progress in skills and understandings, especially in literacy and numeracy. Again, such a policy decision was made because educators believed giving learners opportunities to apply skills and understandings within a range of contexts that connected different areas of learning was crucial to bridging knowledge and action.

Such policy decisions emerge from educational beliefs and values about what students need to learn and how they might engage future success. Educators almost always engage in speculation about future educational needs. For example, Gardner (2007) talked about the five minds needed for the future: 1) respectful; 2) ethical; 3) disciplined; 4) synthesizing ;and 5) creating. Gardner believed the *disciplined* mind was most familiar to educators with its focus on working to improve, developing expertise, and knowing more about increasingly narrow spheres (e.g., disciplines). For Gardner, disciplines are distinct ways of thinking and perspectives that are historical, artistic, scientific and mathematical. However, digital media challenges the idea of a disciplined mind. As a result, Gardner believes synthesizing minds will be valuable in the future because knowing what to attend to and what to ignore, coming to grips with what information to use, and how to synthesize information for others will become priorities. Gardner sees a future that challenges historically-created educational experiences. This future requires individuals, who specialize in being generalists, to be trained to participate effectively in interdisciplinary groups and to be able to encourage understanding and cooperation among different disciplines. For Gardner, interdisciplinary educational work requires *multi-perspectives* and recognition that different analytical perspectives can bring light to issues or problems.

Irwin (2003), like Gardner, recognized that curricular transformation and self-transformation caused uncomfortable instability in the education system. She saw complexity theory as a way to manage insecurity because it helped hold polarities in dialectical balance (diversity versus conformity) and held stability and instability within structures that connected individuals to each other. Irwin suggested understanding interdisciplinary curriculum by looking within a discipline while also balancing both possibilities and limitations. She proposed exploring alternative ways of knowing that included appreciative, aesthetic and artistic tacit knowledge, and revisiting curriculum from a perspective of beauty, and aesthetic inquiry as a way to unfold in/sights.

More recently, as curriculum has moved away from traditional discipline knowledge to engage relevancy, Kay (2011) created a framework to describe the skills, knowledge and expertise students must master to succeed in work and life. He believed schools should understand academic content that weaves 21st century interdisciplinary themes into core learnings. Some topics include: 1) global awareness; 2) financial, economic, business and entrepreneurial literacy; 3) civic literacy; 4) health literacy; and 5) environmental literacy as keys to interdisciplinary thinking.

Mishra, Koehler and Henriksen (2011) examined transformative learning and focused on the importance of transdisciplinary thinking (cognitive skills across disciplines) and new technologies to create 21st century learning and transformative teaching. They introduced a Technological Pedagogical Content Knowledge framework that develops the specialized knowledge, skills and understandings teachers need to effectively construct transformative learning. They also suggested how teachers might use digital technologies and thinking skills to build exciting transformative learning experiences, across a variety of subjects. Blevins (2011) believes neuroscience, as an interdisciplinary field, attained new heights at the end of the 20th century—the decade of the brain. These insights have influenced education and public policy, including the explosion of neuroscientific insights that help educators find opportunities for creativity in the midst of diverse issues.

Stein, Connell and Gardner (2008), like Kay (2011), envisioned key future needs and suggested that interdisciplinary work must account for discipline-specific analysis. They suggested both interdisciplinary knowledge and interdisciplinary pedagogy embraced methodological pluralism, and believe philosophical commitments must underpin educational methods so that educators might develop competencies that help them and their students create high-quality interdisciplinary syntheses. Drawing on Piaget and Habermas, both expert interdisciplinarians, Stein, Connell and Gardner suggested that a pluralistic attitude toward methodological perspectives promote openness toward relevant methods and help ensure that no perspectives are unduly highlighted or marginalized. They named this attitude *methodological pluralism*.

Stein, Connell, and Gardner (2008) believed disciplines had their own internal standards of quality control, which cannot be automatically applied to work that transcends discipline boundaries. They do believe, however, that interdisciplinary syntheses are distinct new ways to produce knowledge and suggest that interdisciplinary researchers, educators and students should adopt pluralistic attitudes toward methodological perspectives.

Finally, they note how the complexities of conversations rest upon two epistemological issues—*levels of analysis* and *basic viewpoints* (biases). When *basic viewpoints* remain unchanged, conversations are difficult. *Levels of analysis* are always present, and the authors believe interdisciplinary researchers and educators adopt these multi-perspectives of phenomena based upon unique interests. In other words, the views of disciplinary insiders cause one to see a phenomenon with different methodological or disciplinary *hats*. Once we see that we only know phenomena methodologically, there is an understanding of how new knowledge emerges from interdisciplinary syntheses across levels of analysis using new methods.

The authors note that understanding new phenomena requires finding ways to ensure dimensions are not overlooked. Basic viewpoints see differences between *what we think is the case* (research findings) and *what we think ought to be the case* (educational and cultural norms). These viewpoints differ between *what is possible* (research findings about effective interventions) and *what is preferable* (values held by communities about what are ethical interventions). In summary, the authors offer two organizing dimensions–*levels of analysis* and *basic viewpoints* to provide a base for creating a better understanding of interdisciplinary studies.

Knowing how to gain insight is a key to understanding knowledge. For example, philosophically, Miller (2010) argues for multidisciplinary quantitative literacy. She believes subjects are best taught in interdisciplinary ways because building expansive narratives helps students conceptualize objects (as in mathematics). Miller's work integrates expository writing, mathematical calculations, and substantive topics to help students acquire skills that help them face educational and everyday tasks. She argues that combining mathematics and writing puts problems into their original substantive contexts and believes that, to communicate well, students should be taught to use concepts and skills from all academic disciplines. She calls for teachers to collaborate with colleagues in other departments to build cross-disciplinary assignments that provide opportunities for students to learn to apply concepts and skills for quantitative literacy.

The Arts Education Partnership (2003) built on the understanding of interdisciplinary work in the arts in a position paper of the Consortium of National Arts Associations titled, "Authentic Connections." This partnership defined interdisciplinary education as education that helped students identify and apply authentic connections between disciplines and understand essential concepts that transcend individual disciplines. A university-established course titled, "Interdisciplinary Approaches to Middle School Education" was built to support teachers' capacities to integrate science, technology and literacy through the lens of arts education.

QUALITATIVE AND QUANTITATIVE STUDIES

A number of qualitative and quantitative studies have been done in the area of interdisciplinary learning and interdisciplinary studies. The goal of these studies, in total, has been to study how different ways of organizing the curriculum—and sometimes pedagogies—can shape and increase student learning.

For example, Zhou and Kim (2010) provided two groups of pre-service elementary teachers with extensive university-based instruction on the theory, methods and pedagogical practice of integrated curriculum. They argue that curriculum integration is important; however, they believe few teachers are prepared to do so. To help university-based students teach integrated curriculum in elementary schools, three faculty instructors with backgrounds in science, mathematics, and music collaborated to design and teach an integrated methods course in a public urban university in New York. The study investigated how this course influenced pre-service teachers' perspectives of integrated teaching.

For Zhou and Kim (2010), curriculum integration helps combat disconnection between discipline-based curricula and the real world. Contemporary professional work requires knowledge and skills that transcend single disciplines since life's issues (the environment, personal health and ethics) are multifaceted and interrelated. The authors believe that, as important as interdisciplinary studies might be, schools have a "grammar" (school administration, assessment practices, constructed teacher resources, parental influence and perceptions, and teacher ideas and histories) that presents obstacles for integration and causes teachers to worry about the loss of discipline structures they have come to know. The authors also believe *curriculum integration* is more about integrating thinking than disregarding disciplinary teaching. They believe curriculum integration connects topics and skills from different subject areas to create learning that transcends traditional disciplines. Findings from this study, conducted in an integrated methods course, suggest that teacher education programs can enhance future teachers' understandings and implementations of curriculum integration by offering integrated courses with practical components.

A study by Cordogon and Stanciak (2000) tracked students in interdisciplinary and discipline-based programs and measured academic performance and behaviours. Cordogon and Stanciak used Everett's definition that interdisciplinary curriculum encourages real-world learning and promotes both student-centred and subject-centred themes. The study supported interdisciplinary curriculum for both academic and behavioural measures. Spelt, Biemans, Tobi, Luning and Mulder (2009) noted that interdisciplinary higher education research explored and focused on defining and deepening understanding of the nature of interdisciplinary thinking.

Palinscar (1998) noted that social constructivist perspectives focus on the interdependence of social and individual processes to co-construct knowledge. Palinscar draws from Piaget and Vygotsky to hypothesize mechanisms that aid learning and reviews empirical research to illustrate: 1) the application of institutional analyses to investigate schooling as a cultural process; 2) the application of interpersonal analyses to examine how interactions promote cognition and learning; and 3) discursive analyses examining and manipulating the patterns and opportunities in instructional conversation. The study implies that discipline knowledge alone is not enough; good learning involves conversations that work to acquire expertise across domains.

Reed and Groth (2009) also believe teachers are ill-prepared to work in teams. Their study found that teachers who worked together were better able to integrate subject matter, improve classroom understanding of pedagogy and content, and create in-depth discussions about student learning. They found that, as teacher understanding and knowledge of standards increased, students' average scores increased as well. Their work highlights how teachers become more professionalized. Although the study is treated as practical (it attempts to discover what helps build skills and attitudes and includes specific recommendations), there is a powerful sub-text about the cultural expectations of teachers and leaders that for years have created situations where teachers do *not* see themselves capable of professional action or insight. Perhaps, one concomitant implication of heavily disciplined knowledge is that teachers become less professionalized in the shadow of knowledge from disciplines that they cannot access or interpret, for their students or themselves, in effective ways.

In another qualitative study on team teaching, Boyer and Bishop (2004) looked at the results of interdisciplinary teaming in middle schools to analyze students' perceptions of its effectiveness. Their work defines interdisciplinary teaming as two or more teachers sharing instruction, curriculum and assessment responsibility for a common group of students for one or more years. Such teams share classroom space, common times and common planning. The study addressed an identified research gap that involved students in describing and analyzing effective interdisciplinary teaming. Previous findings reported that, when schools supported multi-year teams and students collaborated in their learning, positive personal growth resulted.

The study illuminates benefits of effective teams, including long-term relationships, and of democratic learning environments that honour student voices and empower their learning. These tolerant environments facilitated student confidence and leadership skills. Boyer and Bishop (2004) believe, however, that teams have power but suggest that some lack discipline, will and vision. They believe middle schools represent unique student needs and that ignoring these unique needs results in poor learning.

CONSIDERATIONS FOR CURRICULUM

Coming to Understand the Notion of Interdisciplinary Learning

How does work in the area of interdisciplinary learning inform curriculum? In short, theoretical work and qualitative and quantitative studies suggest that interdisciplinary learning works to enhance student engagement, enhance student learning, and enhance bridges between knowledge and meaning making and 21st century skills and attitudes. For example, Partnership for 21st Century Skills (2007) reminds educators that curriculum and instruction are at the heart of educational endeavours because they determine what is taught and how it is taught. A 21st century education depends on integrative curriculum that unites core academic subjects, interdisciplinary themes and essential skills with instructional approaches in which pedagogies, technologies, resources and contexts work together to prepare students for life. For curriculum, the implication is that integration best supports student learning.

As noted, the Consortium of National Arts Education Associations (2002) defined interdisciplinary education as helping students to identify and apply authentic connections between two or more disciplines or to understand essential concepts that transcend individual disciplines. As it considered the implications interdisciplinary learning created for schools, the Consortium outlined three instructional models of interdisciplinary curriculum. First, in *parallel instruction*, two teachers work together on a common topic or concept (e.g., a science and dance teacher focused on concepts of motion or mechanical energy). Second, in *cross-disciplinary instruction*, teachers collaboratively plan around a common theme or problem. Teachers may team-teach and share areas of expertise (e.g., choosing a theme of *conflict* to link instruction in visual arts and literature). Third, in *infusion*, teachers collaboratively plan instruction that builds on strong relationships between subjects, on their expertise and on student knowledge (e.g., high school students worked in groups and on individually-selected topics to relate historical events to musical events during the Renaissance and Baroque cultural eras).

The Consortium's explication of ways of teaching clearly considers how learning could be organized in an interdisciplinary fashion.

As noted earlier, Beane (1991) believed middle school curriculum should be organized around rich, provocative themes rather than abstract, artificial subject areas because such rich themes helped students better search for knowledge, skills, and self and social meaning. The implication for curriculum is that it requires flexibility in its organization to permit instruction to occur in a manner that is conducive to relevant meaning making for students.

Recently, Bellanca (2010) critiqued the current state of education and curriculum development. If schools continue to follow a factory model that breaks curriculum into isolated boxes where students learn that English is not math, math is not science, and science is not social studies, 21st century skills could simply become little boxes of trivial *stuff*. Such trivializing would render powerful activities, such as critical and creative thinking, to separate topics to be mastered and tested, but not necessarily used; and, communication and collaboration would become separate courses, with problem-solving being another separate *elective*—a little box to be checked off rather than utilized powerfully to engage learning. The point is that the implemented curriculum can be rich or poor, depending upon the level of student engagement.

How might research about interdisciplinary learning impact curriculum? Drake and Reid (2010) note that research has consistently shown that students in integrated programs demonstrate academic performance equal to or better than students in discipline-based programs. In addition, these students are more engaged in school and less prone to attendance and behaviour problems. Drake and Reid suggest that an integrated curriculum has its roots in the late 1930s, but lost out to a shift in education toward accountability and a focus upon disparate subject-based, standardized curriculum that has highlighted too much control and too little learning. Curriculum developers need to be cognizant of the nature of siloed learning, especially if the goal of learning is to ensure that what students learn can be applied to real-world contexts.

Duerr (2008) provides reasons as to why interdisciplinary instruction creates more effective learning for all students, especially adolescents. She believes that middle school students seldom recognize links between the classroom and the real world. To fully reach these students, both traditional and modern approaches must be taken. Interdisciplinary instruction helps integrate content and skill development; and, Duerr believes curriculum should undergo a dynamic change that encourages teachers to evolve their practices in ways that interweave curriculum and real-life problem solving.

Years earlier, Furner (1995) examined what was then current literature relevant to interdisciplinary education, and asked: "What is the most effective way for teachers to plan for interdisciplinary instruction?" The answer? The research of the time indicated that using interdisciplinary curricula provided more relevant, less fragmented, and more stimulating student learning experiences. Prior to Furner, Hayes Jacobs (1989) noted two pitfalls with interdisciplinary curriculum, if educators did not approach curriculum with care: 1) the *potpourri problem*, where learning samples disparate knowledge from separate disciplines; and 2) the *polarity problem*, where discipline specialists and others promoting interdisciplinary study sit on opposite ends of the spectrum. Hayes Jacobs offered two criteria for effective interdisciplinary programs: 1) design features that include a scope and sequence, a cognitive taxonomy to encourage thinking skills, behaviour indicators to track changes, and a clearly defined assessment scheme; and 2) integration of both discipline-specific and interdisciplinary learning experiences. More recently, Orillion (2009) echoed Hayes Jacobs' point that, without a clear model and attention to metacognitive groundwork in interdisciplinary learning, interdisciplinary teaching was difficult and confusing for both students and teachers. For curriculum developers, it will become increasingly important that the curriculum design model is clear and easily understood, so that implementation of an interdisciplinary curriculum is seamless for students.

To Integrate or Not To Integrate Subject/Discipline Areas

Vars and Beane (2000) agreed that curriculum should be organized around real-life problems and issues significant to both young people and adults. Where would such problems and issues arise? Their answer is to allow content to be drawn from a variety of subject and discipline areas. Vars and Beane noted that the essential goal of education is to help students make sense of life experiences and learn to participate in a democracy. They believe schools can reap the benefits of student-centred, integrated curriculum and instruction that can lead to the development of strong enough competencies to demonstrate acceptable learning on standards-based tests. They also believe school curricula should address questions young people have about themselves and their world. In short, they believe curriculum should be organized around themes rather than artificial subject areas.

Twenty years later, ArtsSmarts (2010) has mirrored these thoughts to support arts integration across subject disciplines. The model postured four interrelated stages of learning: 1) design (establishing ideal conditions for student learning, giving students a voice, and greater ownership in their learning); 2) inquiry (creating conditions for students to experience creativity and new ways of knowing through exploration, research and experimentation); 3) expression (having students bring together what they had learned and developed as skill sets to creatively communicate learning); and 4) reflection (helping students articulate what they have learned to support deep learning) as ways to support and equip students for the 21st century.

Aprill (2010) summarized understandings that emerged from the CAPE (Chicago Arts Partnerships in Education) model of arts integration across the curriculum. He states that the arts have always been connected to other domains of knowledge and have engaged media for expressing concepts like identity, history, science and language. He believes arts integration generates intellectual challenge, creative and critical thinking, inquiry and community building.

Russell-Bowie (2009) examined arts-integrated programs as a way to provide students with multifaceted, in-depth learning experiences using three integration models and promotes the concept *syntegration*. Russell-Bowie believes teachers face creative control over what they teach, including pressure from high-stakes testing to teach standardized curriculum that stresses drill and repetition but ignores students' diverse learning styles. She defines the practical problems of integrating curriculum and presents three models of integration where synthesizing subjects can achieve authentic outcomes. These models are *service connections* (one subject aids learning in another subject), *symmetric correlations* (two subjects use the same material to achieve outcomes) and what she calls *syntegration*, (subjects work together synergistically to explore themes, concepts or foci questions while achieving their own subject-specific and generic outcomes). Russell-Bowie has found that outcomes achieved through *syntegration* were greater than outcomes achieved when subject areas were taught alone or connected with other subjects. Russell-Bowie believes teachers should purposefully plan broad themes or concepts that cross subjects so that themes or concepts are explored in meaningful ways in different subjects. Russell-Bowie believes *syntegration* helps students develop higher levels of learning and critical thinking as they apply, compare, analyze, synthesize and evaluate ideas across subject areas.

Focusing on the middle school years, Beane (1991) spoke to the disassociation between school and real life. He used the analogy of a jigsaw puzzle and suggested that, as learners, it was important to assure the pieces were there and everything fit together. Beane believed two important aspects were crucial to curriculum integration: 1) integration implies wholeness and unity rather than separation and fragmentation; and 2) real curriculum integration occurs when young people confront personally meaningful questions and experiences they might integrate into their own meaning systems.

Godinho and Shrimpton (2008) found that interdisciplinary units generated student and teacher excitement, which they attributed to learning crossing but not transcending disciplinary boundaries. Their research supported both disciplinary understandings and interdisciplinary connections and found that teachers embraced interdisciplinary underpinnings and worked from conceptual understandings that made learning relevant and cultivated student voice. Students transformed their learning through significant classroom interactions, gaining deeper levels of thinking and coming to better understand and discuss their transformative learning experiences. Godinho and Shrimpton also found that, when teams worked together, they achieved what Robertson (1996) calls a "new professionalism" of deep learning, commitment to continuous professional learning, working and learning in collegial teams, building capacity by risking change, developing and drawing upon collective intelligence, and trusting the process. Similar to other studies reviewed, these authors embrace Gardner's premise that disciplinary understandings come prior to interdisciplinary connections. They believe the best educational stance is to sustain interdisciplinary learning while keeping subjects intact and valuing the teaching of knowledge that is specific to each discipline.

Mathison and Freeman (1997) describe why interdisciplinary approaches in school curriculum are a good idea. Their review of literature in interdisciplinary studies of Kindergarten to Grade 12 curriculum noted that the historical goal of interdisciplinary developments was to help students synthesize and connect knowledge to everyday life. To complete their meta-analysis, they reviewed more than 150 articles and outlined three main approaches they saw combining disciplines: 1) interdisciplinary; 2) integrated; and 3) integrative studies. These approaches share the common elements of advocacy for connected rather than separate disciplines, active inquiry rather than passive learning, and student-centred rather than discipline-centred curriculum. However, the three approaches also differ in the importance of disciplinary knowledge, teacher role, and the value of personal knowledge and experience.

Mathison and Freeman's (1997) meta-analysis defines an *interdisciplinary approach* as combining two or more disciplines but keeping them distinct. The objectives of an *interdisciplinary approach* include critical thinking skills and in-depth content, which are typically teacher-directed but welcome student input. An *integrated approach* transcends discipline knowledge by exploring more unified views of knowledge. It is inquiry-oriented and usually thematic, where activities are teacher directed. Finally, *integrative approaches* start with student and teacher concerns, transcend disciplines in a search of coherence and meaning, and are built through negotiations and interactions. Goals include personal relevance, collaboration and citizenship skills.

Legendre (2004) and Jonnaert (2001) describe current curriculum as an objectives-based approach supported by an extensive body of research and literature from around the world. However, present curriculum reforms are moving towards a socio-constructivist perspective, which is epistemologically far removed from today's objectives-based curriculum and requires a radical revision. A genuine theory of socio-constructivist remains to be developed and no adequately structured framework applicable to program development is available to program writers. With no guidelines currently available, program writers face an enormous challenge of being "expected to develop programs and simultaneously experiment with methods for developing them."

Much of the onus of developing interdisciplinary learning opportunities or curricula falls upon teachers. Although complex, it is an avenue worth pursuing since interdisciplinary learning and/or curricula have the potential to positively impact personal teaching approaches and relationships with one's colleagues and students. Interdisciplinary curricula and/or learning can push teachers and students toward "deeper thinking" as they bridge disciplines, span eras and encourage the application of knowledge. Interdisciplinary curricula encourage teachers to work together in the development of teaching units which, in turn, often develops a sense of collegiality, enthusiasm and an appreciation of academic disciplines. Interdisciplinary curricula and/or learning can also positively impact students as the content has the potential to be more exciting and relevant, especially if it connects the disciplines to each other, and to the past and present in a way that relates to students' lives (Hayes Jacobs, 2004).

BIBLIOGRAPHY

Abrantes, P. (2001). Revisiting the goals and the nature of mathematics for all in the context of a national curriculum. *Proceedings of the Conference of the International Group of Mathematics Education*. Retrieved from http://www.eric.ed.gov/PDFS/ED466732.pdf

Aprill, A. (2010). Direct instruction vs. arts integration: A false dichotomy. *Teaching Artist Journal, 8*(1), 6–15.

Arts Education Partnership. (2003). Creating quality integrated and interdisciplinary arts programs: Report of the arts education partnership national forum. Retrieved from http://www.aep-arts.org/files/publications/ArtsIntegrationReportFinal.pdf

ArtsSmarts. (2010). 21st century learning. Retrieved October 12, 2011, from http://www.artssmarts.ca/en/home.aspx

Beane, J. (1991). The middle school: The natural home of integrated curriculum. *Educational Leadership, 49*(2), 9–13.

Bellanca, J. (2010). *Enriched learning projects: A practical pathway to 21st century skills.* Bloomington, IN: Solution Tree Press.

Blevins, D. G. (2011). Brain matters: A journey with neuroscience and religious education. *Religious* Education*, 106*(3), 246–251.

Boyer, S. J., & Bishop, P. A. (2004). Young adolescent voices: Students' perceptions of interdisciplinary teaming. *Research in Middle Level Education Online, 28*(1). Retrieved from http://www.nmsa.org/Publications/RMLEOnline/tabid/101/Default.aspx

Brophy, J., & Alleman, J. (1991). A caveat: Curriculum integration isn't always a good idea. *Educational Leadership, 49*(2), 66.

Bynack, V.P. (1984). Noah Webster's linguistic thought and the idea of an American national culture. *Journal of the History of Ideas, 45*, 99–114.

Callahan, R. E. (1962) *Education and the cult of efficiency: A study of the social forces that have shaped the administration of public schools.* Chicago, IL: University of Chicago.

Chandramohan, B., & Fallows, S. (Eds.). (2009). Conclusion: Towards interdisciplinarity in the twenty-first century. In B. Chandramohan & S. Fallows (Eds.), *Interdisciplinary learning and teaching in higher education: Theory and practice* (pp. 160–161). New York, NY: Rutledge.

Consortium of National Arts Education Associations. (2002). Authentic connections: Interdisciplinary work in the arts. Retrieved April 18, 2011, from http://www.unescobkk.org/fileadmin/user_upload/culture/Arts_Education/Resource_Links/Authentic_Connections.pdf

Cordogon, S., & Stanciak, L. (2000). An examination of the effects of an interdisciplinary curriculum program on behavior and academic performance in a suburban high school. (A Compilation from the First Three Years of a Four-Year Study). Retrieved from http://www.eric.ed.gov/PDFS/ED442816.pdf

Cremin, L. A. (1970). *American education: The colonial experience 1607–1783*. New York, NY: Wiley.

Drake, S. M., & Reid, J. (2010). Integrated curriculum: Increasing relevance while maintaining accountability. Research Monograph # 28. Toronto, ON: The Literacy and Numeracy Secretariat.

Duerr, L. L. (2008). Interdisciplinary instruction. *Educational Horizons, 86*(3), 173–180.

Edutopia. (2008). Why should schools embrace integrated studies? It fosters a way of learning that mimics real life. Retrieved October 12, 2011, from http://www.edutopia.org/integrated-studies-introduction

Furner, J. (1995). Planning for interdisciplinary instruction: A literature review. Paper presented at the Annual Meeting on Effective Classroom Teaching (Tuscaloosa, AL, April 26, 1995).

Gardner, H. (2007). *Five minds for the future*. Boston, MA: Harvard Business School Press.

Godinho, S., & Shrimpton, B. (2008). Interdisciplinary curriculum: A sustainable future or an unattainable vision in a changing educational climate? Retrieved from Http://www.aare.edu.au/08pap/god08708.pdf

Grady, J. B. (1994). Interdisciplinary curriculum: A fusion of reform ideas. Retrieved from http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED375980&ERICExtSearch_SearchType_0=no&accno=ED375980

Hayes Jacobs, H. (Ed.). (1989). Chapter 1: The Growing Need for Interdisciplinary Content. In H. Hayes Jacobs (Ed.), *Interdisciplinary curriculum: Design and implementation*. Alexandria, VA: Association for Supervision and Curriculum Development.

Hayes Jacobs, H. (2004). What is interdisciplinary learning? Retrieved November 7, 2011, from http://www.thirteen.org/edonline/concept2class/interdisciplinary/index.html

Irwin, R. L. (2003). Towards an aesthetic of unfolding in/sights through curriculum. *Journal of the Canadian Association for Curriculum Studies, 1*(2), 63–78. Retrieved from http://pi.library.yorku.ca/ojs/index.php/jcacs/article/viewFile/16859/15665

Jonnaert, P. (2001). La thèse socioconstructiviste dans les nouveaux programmes d'études au Québec: Un trompe l'oeil épistémologique? *Canadian Journal of Science, Mathematics and Technology*, *1*(2), 223–230.

K–12 Academics. Textbooks. Retrieved from http://www.k12academics.com/history-education-united-states/textbooks

Kay, K. (March 2011). Framework for 21st Century Learning. Retrieved from http://p21.org/documents/1.__p21_framework_2-pager.pdf

Kliebard, H. M. (2004). The struggle for the American curriculum, 1893–1958 (3rd edition). London, England: Routledge Falmer.

Legendre, M. F. (2004). Cognitivisme et socioconstructivisme: Des fondements théoriques à leur utilization dans l'élaboration et la mise en oeuvre du nouveau programme de formation. In P. Jonnaert & A. M'Batika (Eds.), *Les réformes curriculaires: Regards croisés* (pp. 13–48). Québec, QC: Presses universitaires du Québec.

MacMath, S., Wallace, J., & Chi, X. (2009). Curriculum integration: Opportunities to maximize assessment *as*, *of*, and *for* learning. *McGill Journal of Education*, *44*(3), 451–465.

Mathison, S., & Freeman, M. (1997). The logic of interdisciplinary studies. Report Series 2.33. Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, March 24–28, 1997).

Miller, J. E. (2010). Quantitative literacy across the curriculum: Integrating skills from English composition, mathematics, and the substantive disciplines. *Educational Forum, 74*(4), 334–346.

Mishra, P., Koehler, M. J., & Henriksen, D. (2011). The seven trans-disciplinary habits of mind: Extending the TPACK framework towards 21st century learning. *Educational Technology*, *51*(2), 22–28.

Orillion, M. F. (2009). Interdisciplinary curriculum and student outcomes: The case of a general education course at a research university. *The Journal of General Education, 58*(1), 1–18.

Palinscar, S. (1998). Social constructivist perspectives on teaching and learning. *Annual Review of Psychology, 49*(1), 345–375.

Partnership for 21st Century Skills. (2007). 21st century curriculum and instruction. Retrieved from http://www.p21.org/documents/21st_century_skills_curriculum_and_instruction.pdf

Reed, D. K., & Groth, C. (2009). Academic teams promote cross-curricular applications that improve learning outcomes. *Middle School Journal, 40*(3), 12–19.

Rippa, A. (1997). *Education in a free society: An American history*. New York, NY: Longman.

Robertson, S. (1996). Teachers' work, restructuring and postfordism: Constructing the new professionalism. In I. Goodson & A. Hargreaves (Eds.), *Teachers' professional lives* (pp. 28–55). Bristol, PA: Falmer Press.

Russell-Bowie, D. (2009). Syntegration or disintegration? Models of integrating the arts across the primary curriculum. *International Journal of Education & the Arts*, *10*(28). Retrieved from http://www.ijea.org/v10n28/

Scotland Ministry of Education. (2008). *Curriculum for excellence: A framework for learning and teaching.* Retrieved from http://www.scotland.gov.uk/Publications/2008/06/06104407/0

Scotland Ministry of Education. (n.d.). Interdisciplinary learning. Retrieved from http://www.ltscotland.org.uk/understandingthecurriculum/howisthecurriculumstructured/interdisciplinarylearning/index.asp

Spelt, E. J. H., Biemans, H. J. A., Tobi, H., Luning, P. A., & Mulder, M. (2009). Teaching and learning in interdisciplinary higher education: A systematic review. *Educational Psychology Review, 21*(4), 365–378.

Stein, Z., Connell, M., & Gardner, H. (2008). Exercising quality control in interdisciplinary education: Toward and epistemologically responsible approach. *Journal of Philosophy of Education, 42*(3–4), 401–414.

Tennyson, Lord Alfred. Retrieved February 3, 2012, from http://en.wikipedia.org/wiki/Flower_in_the_crannied_wall

The John Dewey Project on Progressive Education. Retrieved October 12, 2011, from http://www.uvm.edu/~dewey/

Vars, G. F., & Beane, J. A. (2000). *Integrative curriculum in a standards-based world.* ERIC Clearinghouse on Elementary and Early Childhood Education.

Zhou, G., & Kim, J. (2010). Impact of an integrated methods course on preservice teachers' perspectives of curriculum integration and faculty instructors' professional growth. *Canadian Journal of Science, Mathematics and Technology Education, 10*(2), 123–138.

CHAPTER 6: FLEXIBLE TIMING AND PACING IN A VARIETY OF LEARNING ENVIRONMENTS

"A reed got into an argument with an oak tree. The oak tree marvelled at her own strength, boasting that she could stand her own in a battle against the winds. Meanwhile, she condemned the reed for being weak, since he was naturally inclined to yield to every breeze. The wind then began to blow very fiercely. The oak tree was torn up by her roots and toppled over, while the reed was left bent but unharmed."

Aesop's Fable No.70 (Gibbs 2002, p. 202)

Educational reform has existed since the inception of formal education. Although reform intentions have varied, it could be argued that many reforms have merely tinkered with existing practices. Proof can be found in the fact that the overwhelming majority of schools run on the same length of school year, the same daily schedule, the same student groupings, the same staff organization and, fundamentally, in the same type of buildings as in the late 1890s. Technology has transformed the way in which people live, work, play and learn. It is possible to communicate across continents and oceans within seconds. Yet, the education system remains virtually the same as 100 years ago. Students, for the most part, sit in desks in brick and mortar schools accessing content through textbooks that may be outdated.

THEORETICAL FOUNDATIONS

Learning is less constrained now by time, space and the organizational requirements of educational providers than at any time in history, as people continue to take more control of their own learning. Van den Brande's (1993, p. 2) definition of flexible learning still serves education well:

> Flexible learning is enabling learners to learn when they want (frequency, timing, duration), how they want (modes of learning), and what they want (that is, learners can define what constitutes learning to them).

Flexibility of time suggests that learning is scheduled at times to suit learners, unlike the current situation where almost all learners go to school at set times and learn subject matter for set periods. This could include the duration and frequency of learning activities or the deadline for achieving a particular learning objective. It could also include the ability to start a course at any time of the year or at any time the need arises in a learner's life. Learners are not restricted to the convenience of educational providers. Learners can control the scheduling and pacing of their learning activities. In a flexible learning environment, learners can also control how they study. Flexible learning makes opportunities available to anyone wanting to take advantage of them. This can, at appropriate times, mean eliminating prerequisites and entry qualifications. Flexible learning can take place anywhere—usually at a time, pace and place that suits the learner (Goodyear, n.d.).

Flexibility over learning can include goals, methods and assessment. Flexibility over goals implies that learning activities can originate from the needs of learners. Assessment systems often shape traditional learning; flexible learning on the other hand may be relatively free of such influences.

Flexible learning should not exert control over how learners study, but, at times, it can and does. For example, although flexible learning need not be a solitary activity, it often is so; a flexible learning environment allows individuals to have a high level of control over the timing of their learning which, in turn, can make it problematic to engage in collaborative activities because it is sometimes difficult to have a group of learners at a common point in their learning (Goodyear, n.d.).

Learning Environments: Time

Flexibility in time allocations rather than fixed periods could provide schools with the opportunity to allocate time based upon what they are striving to achieve. Time can be allocated according to student needs and the depth and breadth of the desired learning. Some schools adopt a range of approaches, including time focused around subjects, blocking time periods to teach cross-curricular studies, whole days of learning outside the classroom and combinations of the preceding (Qualifications and Curriculum Development Agency, 2010).

Oliver (2000) speaks of what she calls "flexi-time schooling" and defines it as choosing when to be educated while using schools just as they are. She suggests that flexi-time schooling can lead to flexi-education, which is "a more flexible approach to all aspects of education and can be applied to aims, power, curriculum and organization as well as to location and time" (p. 1). She suggests that moving in this direction should probably begin by focusing on flexible time arrangements as a first step toward flexi-schooling and that "these could take the form of so many days or part-days per week; or a block of weeks in school and then a block of weeks out of school" (p. 1). In Britain, any school may accommodate flexi-schooling, but no school is under obligation to do so. Although full-time home education is a right and full-time school education is an absolute right, flexi-schooling is not an absolute right because the school is entitled to refuse its implementation on arbitrary grounds (Oliver, 2000).

Keefe and Jenkins (2002) report that school schedules provide a good picture of a school's educational philosophy. Schools with traditional philosophies most likely have structured, rigid schedules. Schools with constructivist or learner-centred philosophies likely use personalized or at least flexible schedules. Two ingredients seem necessary for developing more personalized school schedules for students: 1) both students and teachers need input into the use of time; and 2) achievement is judged based on performance. Emphasizing performance rather than time increases opportunities for student choices in curriculum and instruction (Keefe & Jenkins, 2002).

Learning Environments: Pace

Flexible pacing can allow all students to gain a deeper understanding or to move ahead in a given curriculum as they master content and skills at a pace that provides a steady challenge without unreasonable pressure. The Educational Resources Information Centre (1989) suggests that flexible pacing can be achieved using a variety of methods:

- *continuous progress* – students move ahead as they master content and skills
- *compacted courses* – courses are compacted into abbreviated time frames
- *advanced level courses* – students are enrolled in courses normally reserved for those at higher grade levels
- *grade skipping* – students skip grade levels in the normal promotion pattern
- *early entrance* – students enter school earlier than the prescribed age
- *concurrent or dual enrollment* – students at any grade level take some classes in two or more school grades
- *credit by examination* – students receive credit upon satisfactory completion of a comprehensive examination or upon certification of mastery.

Learning Environments: Space

According to Trilling and Fadel (2009), not only do time and pace need to change but learning environments need to change as well to accommodate the diverse needs of learners; i.e., school buildings and spaces also need to be flexible in their design. According to the authors, "Schools can become learning centres for the surrounding community, and as they do, community use of the school facilities will become an important design goal for schools" (p. 141).

The imaginative use of space, both within and outside the school, should be considered. Role-play can use whole classrooms, parts of classrooms, other parts of school facilities or grounds to create stimulating learning spaces. In addition, there are many opportunities to learn in the local community. Places, such as theatres, sport facilities and places of worship, can be excellent learning venues. Visits to local businesses, parks, historical sites or further afield can be used to stimulate, enhance or consolidate learning and widen student horizons (Qualifications and Curriculum Development Agency, 2010).

Contrary to some predictions, the rise in digital learning is unlikely to see traditional on-campus universities replaced by mega online, corporate institutions, but rather to invite a reconsideration of the structure and functioning of what on-campus teaching and learning can become. Although the work of Jamieson, Fisher, Gilding, Taylor and Trevitt (2000) that follows pertains to universities, there is much in it that is applicable to the Kindergarten to Grade 12 situation, as elementary and secondary schools continue to make more use of communication and information technologies in their daily work.

Jamieson, Fisher, Gilding, Taylor and Trevitt (2000) ask some important questions to this effect:

> What is the nature and purpose of face-to-face interaction in the teaching and learning process? How can the communication and information technologies be effectively integrated into the on-campus environment to enhance existing approaches to teaching and learning? What type of on-campus environments (formal and informal) should universities provide which are not predicated on CITs playing the essential role in pedagogy? What type of teaching and learning facilities need to be provided for on-campus learners and teachers? (p. 2).

The new communication and information technologies have much to contribute; but if benefits are to be reaped, a more informed approach to integrating them into various learning environments must be found. Too often, existing facilities do not meet user needs in terms of comfort or basic use, becoming repositories more so for these new technologies rather than inviting learning environments. Typically, these laboratories are fitted with inexpensive non-ergonomic furniture that does not allow the use of non-information technology resources and that offer little opportunity (e.g., computers located on small surfaces separated by walls) for student-to-student interaction. Laboratory rules also often work against student-to-student interactions (e.g., individual computer use only). In general, such practices have produced teaching and learning environments inadequate on architectural and pedagogical grounds (Jamieson, Fisher, Gilding, Taylor & Trevitt, 2000). They (pp. 6–8) offer the following set of design principles based on emergent ideas of student-centred, flexible learning:

- design space for multiple uses concurrently and consecutively
- design to maximize the inherent flexibility within each space
- design to make use of the vertical dimension in facilities
- design to integrate previously discrete campus functions
- design features and functions to maximize teacher and student control
- design to maximize alignment of different curricula activities
- design to maximize student access to, and use and ownership of, the learning environment.

QUALITATIVE AND QUANTITATIVE STUDIES

An Alberta Teachers' Association (2011) study was conducted to provide data about Alberta teachers' efforts to make student learning more flexible in terms of time and space. It focused on "… the impact of flexible and digitally-mediated environments on the conditions of professional practice for teachers …" (Preface). Flexible and digitally-mediated learning environments were divided into three categories for the study: 1) face-to-face learning environments in which digital technologies were one component of the student learning; 2) primarily digital learning environments (i.e., online learning, e-learning); and 3) outreach schools and/or distance education. The teachers involved in the study used some form of digital technology to personalize learning in order to make their classes more flexible in time and space. The study reports that, although 80 percent of respondents rated teaching in their context as positive, only 63 percent would recommend it to others because they felt professional practices were deteriorating because of increasing workload, role expansion and lack of personal boundaries. Although

many reported a level of teaching comfort, a number felt that such flexibility required substantial effort to attain mastery and they could not recommend it to others nor was it suitable for everyone. A summary of the major findings included the following.

1. Participants in the focus groups were concerned with responsibilities being downloaded, providing technical support and counselling students with complex needs.

2. Participants noted that online reporting tools dissolved the boundaries between work and personal time as "anytime access" created an expectation of "anytime service."

3. The study found that lack of time was a problem. Reporting student progress online, developing individualized program plans, and frequent electronic communication with parents reduced the amount of time that teachers had to work with students. Large online classes were also problematic.

4. Teachers and administrators were both positive about the potential of technology to make timing and pacing of instruction more flexible. Participants rated interactive whiteboards as useful, but suggested social networking was less useful.

5. Low levels of satisfaction with the support received in teaching situations (those teaching in outreach schools were more satisfied) were reported. They were least satisfied with support for designing courses and access to professional development related to the use of technologies.

6. Participants reported that teaching conditions had worsened or stayed the same rather than improving. This was attributed to a lack of physical, emotional and academic readiness on behalf of the students.

The study highlights the importance of ensuring that new technologies are introduced thoughtfully and that teachers receive adequate training in their use as important aspects of the change process (Alberta Teachers' Association, 2011).

Hancox and Barnes (2004) examined the gifted and talented curriculum within schools and created a new curriculum that put students' emotional engagement first. Five universities in the United Kingdom offered a range of three-week summer schools to "gifted and talented" 11 to 16-year-olds. This initiative, heavily subsidized by the government in the United Kingdom, wanted to push "the cream of the nation's pupils forward" using school holiday time to bring together nominated students from all parts of the country. This pushing forward was done to challenge students in areas outside the national curriculum and to get them emotionally involved in their learning rather than speeding up their education.

Drexler (2010) studied how a Networked Student Model facilitated a personal learning environment for independent inquiry. Fifteen students, coming from traditional classroom situations, were involved in personalized learning environments. This learning model extended beyond regular face-to-face learning and allowed learners to assume full control outside the classroom walls. Students in this study followed a constructivist approach to learning where students constructed knowledge based on experiences and

social interactions. Technology was used as a collection tool, an exploration vehicle, a learning tool, a social medium to promote conversation and an intellectual partner to facilitate reflection. In a traditional classroom, the teacher controls the primary content and selects or designs the curriculum. In the Networked Student Model, students have both the ability and control to connect with subject matter experts directly and they learn to "… identify valid content and expertise, recognize questionable sources and compare conflicting viable points of view …" (p. 373). The results from the study showed that once students were comfortable with the changed learning environment, they became more adept at managing their time and gaining greater control over their learning."

Eyre (2007) reviews Keller's Personalized System of Instruction that dominated the teaching literature in the 1970s and 1980s. She wonders if the Personalized System of Instruction is regaining traction as education moves to more flexible approaches to learning. Eyre suggests that as researchers continue to work on "puzzles" surrounding self-pacing, mastery learning and the provision of effective feedback for students, the single area where the Personalized System of Instruction is gaining popularity is in distance education. This is because in distance education, programmed instruction modules are replacing live proctors, thus making Personalized System of Instruction approaches more fiscally attractive. Computers have resolved one major Personalized System of Instruction hurdle—multiple-choice tests can now be graded automatically, thus freeing up teachers to work with students on other learning activities.

The adoption of Project-Based Learning is one way to add a flexible learning environment to school curricula. Bradley-Levine, Berghoff, Seybold, Sever, Blackwell and Smiley (2010) report that "…Project-Based Learning implementation is a complex process requiring educators, students and their families, policy makers and community members to redefine beliefs and expectations about teaching and learning" (p. 1). They present findings drawn from a mixed-methods research study that examined how a professional development workshop on project-based learning was sustained by school, district and higher education support structures and how these structures affected teacher perceptions of the Project-Based Learning implementation process in their classrooms, at their schools and across their district. The findings caution readers that the implementation of Project-Based Learning, an attractive alternative to help produce a flexible learning environment, is not an easy task and that for Project-Based Learning to be successful, implementation has to be a "… comprehensive, serious, sustained, well-supported effort" (p. 1).

Jamieson, Fisher, Gilding, Taylor and Trevitt (2000) suggest there is much more to space and place than meets the eye. Sir Winston Churchill High School (2010) is reported to have observed that, "We shape our buildings and afterward our buildings shape us." Traditionally, on-campus university teaching has taken place in lecture theatres, seminar rooms and laboratories. The physical environment is integral to the teaching and learning process because it governs much of the teaching that happens within it. The same is true of Kindergarten to Grade12 classrooms. Kaser (n.d.) reports that arranging the physical environment of a classroom is one way to improve the learning environment. She suggests that classrooms should be arranged to meet the teacher's learning goals. The spatial layout should include finding ways that allow the teacher to be seen by all students and the teacher to see all students; facilitate the teacher's movement throughout the classroom; minimize distractions for both the teacher

and students; provide each teacher and student with personal space; and ensure that each student can see materials and presentations being employed by the teacher.

IN PRACTICE

The move toward implementing more flexible timing and pacing in a variety of learning environments is a worldwide trend in Canada and internationally. This innovation is taking many forms. What follows is a plethora of these innovative practices.

Flexible Timing and Pacing

Open School BC, operating on a cost-recovery basis within the British Columbia Ministry of Education, designs, develops and distributes educational resources and services to public sector clients and Kindergarten to Grade 12 schools. Projects include accredited courses addressing specific curriculum (British Columbia Ministry of Education, n.d.). The British Columbia Ministry of Education (2006) allows flexibility in programs of study. For example, in the Kindergarten to Grade 7 social studies package, the following statement is made about addressing of local contexts:

> The Social Studies K to 7 curriculum includes opportunities for individual teacher and student choice in the exploration of topics to meet certain learning outcomes. This flexibility allows educators to plan their programs to meet the particular requirements of their students and to respond to local contexts. It may be appropriate to allow for student input when selecting current and relevant topics (p. 9).

NB3-21C was a three-year plan designed to move New Brunswick's public education system to meet the challenges and opportunities of the 21st century. The Ministry felt that a number of significant shifts needed to occur within core business areas to achieve a 21st century learning model, including a significant shift in the current learning model. It was deemed that a learner-centred learning model needed to evolve to meet this shift (New Brunswick Department of Education, 2010). The Ministry also supports and encourages provincial, national and international partnerships using information and communication technology where students and teachers can learn anywhere and anytime and can be exposed to new learning practices through contact with different cultures.

Sir Winston Churchill High School (2010), in Calgary, Alberta, is involved with two American schools (the Academy of Information Technology and Engineering in Stanford, Connecticut, and Dorsey High School in Los Angeles, California) in a multi-year educational initiative. This project stems from a relationship between the National Aeronautics and Space Administration, the International Space Agency National Laboratory, SMART Technologies, Global NetGeneration of Youth and Oracle Education Foundation. The project's purpose is to inspire students to achieve academic excellence and to enter careers in science, technology, engineering, mathematics and the humanities. Students and teachers at the three schools have formed teams exploring projects of interest using an inquiry-based experiential (hands-on) approach. Students from each participating school communicate and collaborate using a number of media, including satellite videoconferencing and an Internet learning management system from Oracle

called *ThinkQuest*. At present, about 30 male and female students in grades 10, 11 and 12 at Sir Winston Churchill High School have volunteered to be part of this team. Although the program covers portions of the provincially-mandated curriculum, it runs outside of the regular curricular timetable.

The mission of the School of One (n.d.) in the United States is to provide students personalized, effective and dynamic classroom instruction so that teachers have more time to focus on the quality of their instruction. To achieve this mission, School of One has re-imagined the traditional classroom model. Instead of one teacher and 25 to 30 students in a classroom, each student participates in multiple instructional modalities, including a combination of teacher-led instruction, one-on-one tutoring, independent learning and work with virtual tutors. The School of One leverages technology as an educational model to individualize student learning. This study examined the effectiveness of the model when applied in an after-school setting as well as in a short-term, in-school setting. The evaluation assessed both student mathematics achievement gains as well as student and teacher opinions of the School of One program. Key findings were: 1) School of One students exhibited significantly larger gains in academic achievement; 2) participating students demonstrated favourable attitudes toward the School of One program; and 3) School of One teachers demonstrated favourable attitudes toward the program.

Willis (2010), in a newspaper article, reports on the Ohio Core Curriculum, created by the Ohio Senate Bill 311 in 2006. Bill 311 allowed school districts to develop plans for students to earn credits based on subject competency, not strictly on classroom time. In addition, a new curriculum was implemented where students could design some of their courses to achieve school credit outside of class. High school credits could be earned by demonstrating subject matter competency and was not based on the amount of time spent in the classroom. Students wanting to achieve credit outside of class were required to meet with their teachers and school counsellors to outline how their "outside of class" credits aligned with their career and post-secondary education plans. Student applications to earn credits outside of the classroom were also required to: 1) describe prerequisite courses completed; 2) explain how the selected course material would be completed; and 3) suggest how mastery of the subject matter would be evaluated.

Abrantes (2001) describes changes in the Portuguese education system that emerged, especially in the late nineties, around school autonomy and curricular decisions. The movement to change a rigid system to a "flexible management of the curriculum" was implemented to allow teachers to organize learning around different disciplines in an integrative manner that enabled interdisciplinary learning. This change gave teachers and schools more responsibility for students with a broader curriculum that enabled decision making related to student needs rather than just curricular content. New regulations provided schools with the minimum amount of time to be dedicated to each curricular component (grouped by disciplines or interdisciplinary area) and the maximum hours per day allotted to designated compulsory activities. Schools control over 20 percent of the unallocated time.

Leadbeater (2008) reports on a number of interesting schools in Britain. One school, Bridgemary, organizes teaching around ability rather than age. Older students are encouraged to serve as mentors for younger students. The timetable is deliberately scrambled so students, who require longer times to develop and master core skills, have more time. Approximately 20 percent of the students in the school are able to accelerate their learning. Some take examinations up to one year earlier than usual. Some students start school early (e.g., 7:30 a.m.) while others start late (e.g., 1:00 p.m.). Cramlington is another school included in Leadbeater's (2008) report. The school's operating vision is to develop collaborative and independent approaches to learning by changing:

- where learning takes place (offering more opportunities to learn in the community)
- the space where it happens (redesigning classrooms and entire schools to become centres of more social approaches to learning)
- the time learning happens (allowing longer and shorter periods of learning, including whole school projects lasting a week)
- the pace learning happens (offering catch-up and consolidation lessons for those taking longer to pick up skills, and stretch and exploration for those who are ready to go further faster) (p. 35).

Hodge (2008) and the Singapore Ministry of Education (2010a) both report that decentralized national curricula structures encourage and allow schools to customize curricula to meet student needs. Two main goals in the Singapore education system are flexibility and diversity. This allows schools greater autonomy and flexibility over curriculum time allocation, thus, allowing students more time, where warranted, to develop skills and attitudes. Flexibility also allows for more integration of subjects and subject matter to aid in the development of new student understandings (INCA, 2010b). For instance, at Singapore's primary level, core subjects are being taught according to student abilities. To teach to student ability, teachers consider their students' abilities when designing lessons and assessment tasks in hopes that students will learn at a pace that suits them. At the secondary level, students are placed in one of three streams, the Express (accelerated academic), Normal (academic) or Normal (technical) courses according to ability. This placement is not permanent, as students have the ability to move from one stream to another based on their academic performance (Singapore Ministry of Education, 2010a). Schools are given the autonomy and, in some instances, the resources to develop areas of strength and niches of excellence, either in areas of study or in co-curricular activities. Students are encouraged to learn more actively and independently and examinations will be reviewed to reduce rote learning and encourage experimentation and independent learning (Singapore Ministry of Education, 2010b).

South Korea's Ministry of Education, Science and Technology has overall responsibility for control of the curriculum and has been on record suggesting that individuals receive the education they want, anywhere, anytime (UNESCO-IBE, 2006/2007). Recent emphasis has been on more decentralization of curriculum control. The Sixth National Curriculum, for example, allowed local education authorities to have a say in selecting appropriate subjects and number of courses required at the high school level. It also encouraged individual schools to modify the national curriculum based on the needs and circumstances of the school and local communities, and based on the interests of students, teachers and community members. It is hoped that more autonomy to schools and local authorities will encourage

curricula more appropriate to individual schools and students, which, in turn, will contribute to increased diversity of educational programs (INCA, 2010a).

South Korea is moving to diversify curriculum content and instructional methods in consideration of each student's ability, aptitude and career choice, and is encouraging schools to broaden their autonomy to organize and implement their own curriculum. Schools will be given flexibility to adjust instructional hours depending upon individual situations and the development of the level of their students. In elementary schools, optional activities should focus on creative activities and not be used for in-depth and supplementary study of existing subject matter. There is also a suggestion that schools should investigate computer-aided and multimedia materials and become less reliant on textbooks (Korea Ministry of Education, Science and Technology 2007; INCA, 2010a, 2011).

Assessment and Learning in Knowledge Spaces (2011) is an artificial intelligence software system designed to assess students on an individual and continuous basis. The system is based on the theoretical work known as Knowledge Space Theory, which applies concepts from combinatorics (branch of mathematics concerning the study of finite or countable discrete structures) and stochastic processes (a mathematical form of probability theory) to determine how particular elements of knowledge (concepts from algebra, for example) can be gathered to form distinct knowledge states for individuals. Using this theory, students are given questions to define their current level of knowledge related to a discipline. Based on the data generated, *Assessment and Learning in Knowledge Spaces* obtains a picture of what students are able to do and customizes the learning support based on each student's individual profile. That profile is presented to the students in the form of a pie chart that provides students entry into the *Learning Mode*. This entry point gives students an array of topics to learn. Students choose a topic and the system offers practice problems to teach the topic. According to the website, students are offered a variety of problems that help them master the content in a consistent manner. Students experiencing difficulty are supplied with explanations. Students progress when the system deems they can consistently answer questions related to the topic under study. To ensure retention of knowledge, the system periodically reassesses students and makes adjustments to their course plan.

The *Times of India* (2011) reports that Pratham Shiksha, a school for the underprivileged, is trying to reduce the number of dropouts, especially among its female population, by providing education to students according to their needs and at convenient times. The school felt that the drop-out problem could not be helped by developing education-centric policies. Rather, it sees the problem as a social one and, until the economic situation of the poor is improved, the situation will continue. To counter that, the school of 250 students between 3–12 years of age, has introduced pre-primary classes to help students become accustomed to the school environment. Much effort is put into overcoming psychological fears or complexes that students may have toward learning, and students are encouraged to think independently and become more responsible. Because many students work or support families with household chores, the school moved to a flexible timing schedule so students could come at a variety of times while they continue to hold jobs and help their families. The school is equipped with two buses to carry students to and from four slum areas near the school. Flexible school hours allow

students to study in three shifts—mornings, afternoons or evenings—and has helped fill the school to near capacity.

Variety of Learning Environments

Because the structure of school learning was formed more than a century before digital communication appeared, and has changed very little, an obvious disconnect exists between the way students use technology outside of school and their use of technology in school. Welcoming, safe and inclusive environments are imperative to meet the diverse abilities and learning styles of individuals, teams and groups. Virtual learning spaces can increase this potential. Students show natural abilities to use emerging technology but "they need to be taught how these tools can be used in learning and critical thought. This is a task for the 'Learning Commons'" (Ontario School Library Association, 2010, p. 7), which helps schools focus on learning collaboratively by presenting opportunities for collaboration and new relationships among teachers, teacher-librarians and students. Learning communities are based on a cross-curricular perspective:

> … that recognizes literacy, numeracy, knowledge, thinking, communication and application as foundations for learning how to learn. A Learning Commons becomes the physical and virtual catalyst where inquiry, imagination, discovery and creativity come alive and become central to growth—personal, academic, social and cultural (Ontario School Library Association, 2010, p. 3).

In British Columbia, the Provincial Learning Network connects more than 1800 schools, post-secondary and other public institutions, providing a secure, managed, high-speed connection to government, the Internet and relevant educational programs and subject matter. The Provincial Learning Network, sponsored by the British Columbia Ministries of Education, Advanced Education and Labour Market Development, and private sector partners was founded on the principle of universal access—all learners in the province have access to learning opportunities and educational programs. These services are available to clients, regardless of geographic location, and bring opportunities and programs to communities who might otherwise be unable to access them through community partnerships (British Columbia Ministry of Education, n.d.).

Alberta Education (2009) suggests that, "Distributed learning is characterized by any learning that is purposefully designed to allow teachers, students and resources, in classroom or decentralized locations, to interact while separated by time and/or place for some or all of their learning activities" (p. 5). Flexible scheduling, flexible pacing and varying levels of structure are used depending on student needs. Learning options with a variety of delivery approaches (e.g., print, digital, web-based, face-to-face) are used in learning environments, including classroom, work experience, project-based learning, online education and independent study. Distributed learning aims to connect students, teachers, parents and the community across the province, in an effort to provide choice, flexibility and authentic learning experiences.

CONSIDERATIONS FOR CURRICULUM

Although worthwhile upgrades in curriculum practices can be made, options are limited by basic program structures that house current practices. Those structures become the proverbial "box" (Hayes Jacobs, 2009, p. 62). Thinking in fresh ways about reshaping schools demands preparation and research; otherwise, the known is reiterated. Hayes Jacobs proposes "a redesign task force for long-term research and development with a goal of creating possible proposals for new versions of school" (Chapter 4). She suggests essential questions for governing programmatic structures that support student learning and these questions are quoted below:

1. What type of both long-term and short-term schedules best support specific learners?
2. What ways of grouping learners will assist them in their learning experiences?
3. How should faculty be configured to best serve students and to assist one another?
4. In what ways can both physical and virtual space be created and used to support our work? (Hayes Jacobs, 2009, p. 63).

At the most basic level, curriculum is nested within long-and-short-term schedules where time is a currency. Examining current practice versus current possibilities suggests a number of intriguing alternatives. School schedules can be divided into minutes, hours, days, weeks and months. Considerations for time could be guided by these questions:

1. What time do learners really need to carry out specific tasks? A free and flexible schedule would not work for many teachers and learners, where continuity and structure are essential to learning.
2. What classroom activities are possible and best served in a 20-minute block of time, in 40 minutes, in two hours, in a half-day, in a day, in a week? (Schools are currently governed by the concept that the only thing that can be done is what the schedule allows. Technology has also changed the way that time is considered; for example, e-mail is checked in one's own time frame and has, in many instances, replaced scheduled phone calls that were so common at one time. Although change has been embraced in this area, schools seem to be content to rely on old scheduling habits.)
3. How can curricula envision learning experiences and then match them to time configurations within the limits or possibilities of schools?
4. What if schools offered a virtual curriculum menu? (Virtual curriculum could allow students to have a set of options to be worked on at their own time, pace or place. Virtual schools are provocative and can stimulate excitement and anxiety because they challenge one's fundamental sense of place and time. Technology has the potential to eliminate the need for students to gather in common spaces during regulated time frames.)

5. How can one rethink and maximize school schedules, considering other ways and places (both physical and virtual) for students to spend their time learning (Hayes Jacobs, 2009)?

Realtors suggest that, when purchasing or selling a home, location is everything. Historians and anthropologists, alike, report that where people live has everything to do with their life possibilities. The same can be said for education. A school's location and how it creates internal structures determines its possibilities. Nair (2009) states:

> In the 21st century, education is about project-based learning, connections with peers around the world, service learning, independent research, design and creativity, and, more than anything else, critical thinking and challenges to old assumptions (p. 1).

Nair (2009) also suggests that current school systems are "best represented not by falling plaster and leaking roofs, but by something much more fundamental—the philosophy behind the design of more than 99 percent of our school buildings" (p. 1). Simply repairing physical structures ignores education's real problems. Too often dated structures and systems lead learning. Ignoring new learning environments suitable for new times and new learning opportunities is constrained by current program structures and declares that the education sector is not ready to learn from past experiences (Hayes Jacobs, 2009).

Leadbeater's (2008) booklet, *What's Next? 21 Ideas for 21st Century Learning*, makes interesting observations about schools operating in Britain using alternative approaches to time, space and pace. He describes the following:

- Large schools should be broken up physically or organizationally into smaller units (approximately 450 students) to allow different environments, such as vocational, specialist, academic and "catch-up" to co-exist within a single school.
- Students should be given opportunities (he suggests a summer term) to take part in personal challenges of their choosing where they collaborate with others to learn outside of school.
- To make learning part of their lifestyle, rather than something imposed upon them, the standard school day should be discontinued so students can opt to learn early (7:30 a.m. to 1:00 p.m.) or late (1:00 p.m. to 6:30 p.m.).
- Students should be grouped and taught according to ability rather than age to allow for accelerated learning for some and longer catch-up sessions for others.
- All students should be given small budgets to take care of, so they could get used to investing in their own learning.
- Schools should be encouraged to become productive enterprises by either housing businesses on site or creating their own businesses.

- Long summer holidays should be discontinued because they create social and educational problems. Research suggests that long summer holidays disadvantage low-income students who lose reading skills over the summer, which, in turn, increases the attainment gap when school resumes. Leadbeater (2008) reports on a school that is having success after shifting to a schedule including five eight-week terms with two-week breaks between terms and one month off in the summer.
- Community-based teachers could be used to expand the range of settings where learning is possible. A community-based teacher could be someone accredited in a community, who would allow students to learn more formally outside of a school.
- All schools should be required to complete a project in and for their school. Such efforts would create stronger relationships between schools and communities.
- Schools should create partnerships with public agencies and businesses to change cultures of learning.
- Teachers should play a vital role in adapting and designing curricula flexible enough to attend to local circumstances and needs.
- Technology should be used to access virtual learning platforms from homes and classrooms.
- Schools can be made smaller through physical separation or more imaginative use of time; e.g., all students are not at school at the same time.

Leadbeater (2008) also discusses school-based innovation and points out that innovation is highly collaborative and cumulative, which "relies on mobilizing and motivating staff, pupils, parents, partner agencies and other schools" (p. 48). He adds that innovation is a constant process of combining and recombining ideas that come from the "margins" and are applied to the "mainstream" (p. 49). He finishes by pointing out that, "Innovation leaders need to be good at 'push-me-pull-you.' They cannot afford to lose legitimacy while innovating, often in the face of skepticism and even hostility from parents, who do not want undue risks taken with their children's education" (p. 50).

To quote, Hayes Jacob (2010), "Ultimately, form should follow function, and as we expand the possible functions of curriculum and instruction, we should expand the menu of forms available for formal and informal learning experiences" (p. 78). Although approaches to time, pace, space and learning environments have varied little throughout the history of schooling, it would appear that the only limiting factor in these parameters is one's imagination.

BIBLIOGRAPHY

Abrantes, P. (2001). Revisiting the goals and the nature of mathematics for all in the context of a national curriculum. *Proceedings of the Conference of the International Group of Mathematics Education*. Retrieved from http://www.eric.ed.gov/PDFS/ED466732.pdf

Alberta Education. (2009). *Discover phase report: What we heard and recommendations for Alberta's distributed learning forum*. Retrieved from http://education.alberta.ca/media/1157513/discoverphasereport.pdf

Alberta Teachers' Association. (2011). The impact of digital technologies on teachers working in flexible learning environments. Retrieved from http://www.teachers.ab.ca/SiteCollectionDocuments/ATA/Publications/Research-Updates/PD-86-21%20Impact%20of%20Digital%20Technologies.pdf

Assessment and Learning in Knowledge Spaces. (2011). ALEKS tours. Retrieved November 10, 2011, from http://www.aleks.com/tour

Bradley-Levine, J., Berghoff, B., Seybold, J., Sever, R., Blackwell, S., & Smiley, A. (2010). What teachers and administrators "need to know" about project-based learning implementation. Paper presented at Annual Meetings of the American Educational Research Association. Denver, CO. April, 2010. Retrieved November 9, 2011, from http://www.bie.org/research/study/teachers_and_administrators_need_to_know

British Columbia Ministry of Education. (2006). *Social studies K to 7: Integrated resource package 2006.* Victoria, BC: British Columbia Ministry of Education. Retrieved from http://www.bced.gov.bc.ca/irp/pdfs/social_studies/2006ssk7.pdf

British Columbia Ministry of Education. (n.d.). PLNet (Provincial learning network) website. Retrieved November 10, 2011, from http://www.bced.gov.bc.ca/plnet/

British Columbia Ministry of Education. (n.d.). Open school BC educational resources and services website. Retrieved November 10, 2011, from http://openschool.bc.ca/home.html

Drexler, W. (2010). The networked student model for construction of personal learning environments: Balancing teacher control and student autonomy. *Australasian Journal of Educational Technology, 26*(3), 369–385. Retrieved from http://www.ascilite.org.au/ajet/ajet26/drexler.pdf

Educational Resources Information Centre. (1989). Meeting the needs of able learners through flexible pacing. Retrieved from http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED314916&ERICExtSearch_SearchType_0=no&accno=ED314916

Eyre, H. L. (2007). Keller's personalized system of instruction: Was it a fleeting fancy or is there a revival on the horizon? *Behavior Analyst Today, 8*(3), 317. Retrieved from http://www.eric.ed.gov/PDFS/EJ800986.pdf

Gibbs, L. (2002). *Aesop's Fables. A new translation by Laura Gibbs*. Oxford, England: Oxford University Press. Retrieved from http://mythfolklore.net/aesopica/perry/70.htm

Goodyear, P. (n.d.). Flexible learning and the architecture of learning places. Retrieved November 7, 2011, from http://www.aect.org/edtech/edition3/ER5849x_C021.fm.pdf

Hancox, G., & Barnes, J. (2004). Young, gifted and ... human. *Improving Schools, 7*(1), 11–21.

Hayes Jacobs, H. (Ed.). (2009). Chapter 4: New school versions: Reinventing and reuniting school program structures. In H. Hayes Jacobs (Ed.), *Curriculum 21: Essential education for a changing world* (pp. 60–79). Alexandria, VA: ASCD. Retrieved November 9, 2011, from http://www.ascd.org/publications/books/109008/chapters/New-School-Versions@-Reinventing-and-Reuniting-School-Program-Structures.aspx

Hodge, W. (2008). *Basic education revisited: A look at the current content and reform*. Retrieved from www.vnseamo.org/downloads/Malay/Singapore.doc

INCA (International Review of Curriculum and Assessment). (2011). Korea: Curricula web page. Retrieved September 14, 2011, from http://www.inca.org.uk/korea-curricula-mainstream.html

INCA (International Review of Curriculum and Assessment). (2010a). Korea: Curricula (age 3–19). Retrieved March 14, 2011, from http://www.inca.org.uk/1395.html

INCA (International Review of Curriculum and Assessment). (2010b). Singapore: Context, principles and reforms of education. Retrieved March 14, 2011, from http://www.inca.org.uk/1011.html

Jamieson, P., Fisher, K., Gilding, T., Taylor, P. G., & Trevitt, A. C. F. (2000). Place and space in the design of new learning environments. *HERDSA (Higher Education Research and Development), 19*(2), 221–237. Retrieved from http://www.oecd.org/dataoecd/41/62/2675768.pdf

Kaser, C. H. (n.d). Arranging the physical environment of the classroom to support teaching/learning. Retrieved December 14, 2011, from http://www.education.odu.edu/esse/docs/classroomenvironments.pdf

Keefe, J., & Jenkins, J. (2002). Personalized instruction. *Phi Delta Kappan, 83*(6), 440–448. Retrieved November 10, 2011, from http://www.lecforum.org/publications/Jenkins_Keefe_KAPPAN_Article_1.htm

Korea Ministry of Education, Science and Technology. (2007). *The school curriculum of the Republic of Korea*. Retrieved November 14, 2011, from http://english.mest.go.kr/web/1709/en/board/enview.do?bbsId=25

Leadbeater, C. (2008). *What's next? 21st century learning*. Retrieved November 14, 2011, from http://www.innovationunit.org/sites/default/files/What's%20Next%20-%2021%20ideas%20for%2021st%20century%20learning.pdf

Nair, P. (2009). Don't just rebuild schools: Reinvent them. Retrieved November 9, 2011, from http://www.fieldingnair.com/press/Education_Week_Dont_Just_Rebuild_Schools_Reinvent_Them.pdf

New Brunswick Department of Education. (2010). *NB3-21C: Creating a 21st century learning model of public education three year plan 2010–2013*. Retrieved from http://woodstockmiddleschool.nbed.nb.ca/Documents/DoE%20-%20PIP%20%28NB3-21C%29%202010-201.pdf

New Brunswick Department of Education. (n.d.). E-Learning–Partnerships: Provincial, national and international. Retrieved from http://www.gnb.ca/0000/as/ip-e.asp

Oliver, K. (2000). Flexi-time schooling–Towards flexi-schooling and flexi-education. Retrieved November 10, 2011, from http://flexitimeschooling.org/fts.pdf

Ontario School Library Association. (2010). Together for learning: School libraries and the emergence of the learning commons. Retrieved from http://www.libraryng.com/node/2611?from=50&comments_per_page=10OSLA

Qualifications and Curriculum Development Agency. (2010). Introducing the new primary curriculum: Guidance for primary schools. Retrieved from http://www.clusterweb.org.uk/UserFiles/ASK8/File/Whole_School_Issues/Curriculum_Design/21770_Design_Guidance_AW_web.pdf

School of One. (n.d.). Video overview. Retrieved September 14, 2011, from http://schools.nyc.gov/community/innovation/SchoolofOne/PersonalizedLearning/ProgramOverview.htm

Singapore Ministry of Education. (2010a). *Nurturing students.* Retrieved September 14, 2011, from http://www.moe.gov.sg/education/nurturing-students/

Singapore Ministry of Education. (2010b). *Education in Singapore*. Retrieved November 9, 2011, from http://www.moe.gov.sg/about/files/moe-corporate-brochure.pdf

Sir Winston Churchill High School. (2010). NGY NASA club. Retrieved November 10, 2011, from http://schools.cbe.ab.ca/b857/student_activities/NASA/index.html

The Times of India. (2011). *Jaipur school that opens on students' timing*. Retrieved November 7, 2011, from http://articles.timesofindia.indiatimes.com/2011-10-04/jaipur/30242279_1_school-administration-jaipur-school-private-school

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. San Francisco, CA: Jossey-Bass.

UNESCO-IBE. (2006/2007). World data on education (6th edition). Retrieved July 12, 2011, from http://www.ibe.unesco.org/fileadmin/user_upload/archive/Countries/WDE/2006/ASIA_and_the_PACIFIC/Republic_of_Korea/Republic_of_Korea.pdf

Van den Brande, L. (1993). *Flexible and distance learning*. Chichester, England: Wiley.

Willis, P. (2010). Excitement builds around credit flexibility's potential in Worthington. Retrieved March 15, 2011, from http://www.snponline.com/articles/2010/07/27/multiple_papers/schools/allwocredi_20100727_0532pm_6.txt

CHAPTER 7: RESPONSIVE CURRICULUM FOR A DIGITAL AGE

> "Every morning in Africa, a Gazelle wakes up. It knows it must run faster than the fastest Lion or it will be killed. Every morning a Lion wakes up. It knows it must outrun the slowest Gazelle or it will starve to death. It doesn't matter whether you are a Lion or a Gazelle ... when the sun comes up, you'd better be running." (African Proverb)

This African proverb reflects the nature of today's society—a society "on the run." Ours is a rapidly changing "digital" society constantly becoming more complex, unpredictable and interwoven. All aspects of life are impacted. Today, individuals tend to make career and job moves more frequently. Many people work in fixed-term or flexible contract jobs. Lifelong learning is more than a buzzword, but is a requirement for individual economic well-being. An estimated 77 percent of jobs in Britain involve some form of information and communication technology competence that requires upgrading skills as technology changes (Beetham, McGill & Littlejohn, 2009). Opportunities for learning in formal educational settings are more numerous and openly available because digital technologies are more widespread, and non-educational organizations are becoming aware of the power and potential of technology for training. At the same time, practical and social knowledge is being shared continuously via the social web.

Knowledge, social relationships, communication and literacy are also changing rapidly. What is most often considered useful knowledge is biased toward what can be represented in digital form or applied to immediate situations. Social relationships are conducted, textured and sustained via digital media. Communications and media are changing profoundly and rapidly with the onslaught of new social media and gaming technologies that are being embraced by people of all ages. Critical engagement with ideas in a variety of media is now an essential skill for navigating the information age. Literacy practices are also changing. Writing is no longer paper-based but is a largely screen-based medium. Searching and editing software have greatly changed the way in which writing is typically constructed. Images and video are increasingly being used to access and communicate knowledge (Beetham, McGill & Littlejohn, 2009).

The current industrial age, assembly-line educational model that is based on fixed time, place, pace and curriculum is insufficient in today's society and knowledge-based economy (Software & Information Industry Association, 2010). The Foundation for Excellence in Education (2009) suggests, "digital interaction and learning through social media, the Internet, and mobile devices are a way of life for most teens everywhere except in education" (p. 5). The Foundation goes on to suggest that, "spending more money without changing the system or adding a layer of digital learning over the current system is not the answer. Instead, education needs to transition into the digital age, which means a new way of operating" (p. 5).

THEORETICAL FOUNDATIONS

Transitioning into the digital age in education is a call for a "responsive curriculum." Moll (2005) is one of few researchers who has written directly about this concept in a theoretical way. He feels that:

> despite the various meanings that we might attach to the term, it still seems that the concept is used largely in its everyday, descriptive sense in the education debates that we are aware of. It operates largely polemically, allowing us to attach a level of urgency to whatever concern we have about educational delivery. There is no well-developed theory of curriculum responsiveness available to us. The concept has little theoretical depth in regard to what object or objects of study it refers and what kinds of relationships to other concepts it implies (p. 9).

Moll (2005), however, develops a discussion that helps illustrate the concept of the "responsive curriculum" in a theoretical way. His interpretation of the concept has appeal because it suggests the possibility of judging the effectiveness of education programs to meet the needs of a transforming society and learners. He suggests interpreting the concept in a number of ways. First, questions might be raised about the economic responsiveness of the curriculum—the ability of educational programs to meet the changing needs of employers and, hence, to provide them with employees who will be able to increase their economic competitiveness.

Second, one might talk of a culturally responsive curriculum, a concept made prominent by educational anthropologist Erickson (1987) when he referred to cultural dissonance between teachers and ethnically diverse students that contributed to school failure. Culturally responsive has come to mean much more. For example, Gay (2000) suggests that a culturally responsive curriculum and culturally responsive teaching can be characterized by the following:

- acknowledging that cultural heritage can affect learning and is worthwhile content of the formal curriculum
- building bridges between academic and lived sociocultural realities (e.g., between home and school)
- using a variety of instructional strategies related to diverse learning styles
- teaching learners to understand and value their own and each others' cultural heritages
- incorporating cultural resources and materials in all the subject areas taught in schools.

Third, one might reflect on the responsiveness of the curriculum to its knowledge disciplines or subject matter and the growing access to these materials for learners. For example, there are 31 billion searches on Google every month—in 2006, this number was 2.7 billion. The number of text messages sent and received every day exceeds the total population of the earth; it is estimated that four exabytes of unique information will be generated in 2011 alone—more than the previous 5000 years (You Tube, n.d.).

Finally, there is the question of the responsiveness of curriculum to the current and future needs of the learner. Defining responsiveness is incredibly complex in today's society where the top 10 in-demand jobs in 2010 did not exist in 2004. Students are being prepared for jobs that do not yet exist and that will use technologies that have not been invented to solve problems that do not yet exist. The United States Department of Labor estimates that today's learners will have 10–14 jobs by the age of 38 (You Tube, n.d.).

From the above discussion at least four senses of "responsive curriculum" can be discerned. Theoretically, there is a suggestion that "curriculum responsiveness" is a concept that insists that all of its apparent dimensions be studied simultaneously—the economic, the sociocultural, the programmatic and the individual. There is no doubt that the various realities they refer to articulate with each other and constitute opportunities and challenges for each other.

Experiential E-learning

Much of the literature suggests that curriculum responsiveness often depends on the increased and appropriate use of technology. For example, The United States Department of Education (2010) offers a model of learning powered by technology. Their model calls for engaging and empowering personalized learning experiences for learners of all ages. The "what" and "how" of teaching should be matched with what people need to know and how they learn. State-of-the-art technology should be used to enable, motivate, and inspire all students to achieve, regardless of background, languages, and disabilities. The model calls for ensuring that professional educators are "well connected to the content and resources, data and information, and peers and experts they need to be highly effective. And it calls for leveraging the power and technology to support continuous and lifelong learning" (p. v).

Experiential learning philosophies and principles are often cited as underlying various forms of active lifelong learning including e-learning. E-learning comprises all forms of electronically supported learning and teaching and centres upon acquiring new knowledge and skill by "doing" as contrasted to didactic or passive learning styles. Experiential learning is one educational philosophy that provides a foundation for e-learning. Experiential learning has been described by many, including Aristotle (1946), Plato (1953), Dewey (1938), Locke (1968), Revans (1982) and Kolb (1984). Experiential learning theory offers "the foundation for an approach to education and learning as a lifelong process that is soundly based in intellectual traditions of social psychology, philosophy, and cognitive psychology" (Kolb, 1984, pp. 3-4).

In experiential learning, theory and practice are integrated. The two are not independent but are in a continuous process of interaction. Theoretical frameworks are developed and tested in reality. Theory underpins practice and the results of practical applications guide the development of a more applicable theory. Carver, King, Hannum and Rowler (2007), proponents of experiential e-learning, propose a new model for e-learning rooted in experiential learning that features a taxonomy with a continuum of levels from simple content sharing and recall of prior experience at one end to direct experience/action learning at the other end. Their taxonomy can be paraphrased as follows:

Type 1 Experiential E-Learning – Content Sharing: The learners' involvement consists of reading text, viewing videos, or listening to podcasts. Learners are limited to recall of prior experience as a way of meaning making from what they read/viewed.

Type 2 Experiential E-Learning – Online Conversation: Students and instructors engage in online conversations for the purpose of instruction. The experiential aspect is the shared experiences of the learners in conversational interactions prompted by the instructor.

Type 3 Experiential E-Learning – Meaningful Online Conversation: Students and instructors conduct online conversations using discussion forums, chat rooms, or other forms of communications mediated by technology. The online conversation emerges from the experiences and needs of the students rather than originating from requirements specified by the instructor. Interactions at this level have heightened experiential value as they are based on the students' own experiences.

Type 4 Experiential E-Learning – Drawing On Student Experiences: This approach places the students' experiences at the forefront and has them actively engaged in planning and delivering instruction. When students specify objectives, they draw on and highlight their own experiences to identify content and activities that would be meaningful to them.

Type 5 Experiential E-Learning – Problem-Based/Service Learning: This approach is constructed around real problems that exist in an actual organization. This is a constructed experience for students in which they participate vicariously for the purpose of learning in a situated fashion.

Type 6 Experiential E-Learning – Direct Experience/Action Learning: This learning can focus on an actual situation in which students find themselves. Similar to "action learning," students bring problems from their work directly into the classroom and focus on these real problems.

Direct experience is involved at the higher levels of the taxonomy, while the role of experience is limited to recalled experiences at the lower level. The lower levels of this taxonomy may, therefore, be considered as "passive" e-learning, while the higher levels may be considered as "active" e-learning. Regardless of specific level, learners always make sense of new information in light of their experiences. This taxonomy is important because, when e-learning is designed to incorporate maximum levels of experiential learning, it can become more effective (Carver, King, Hannum & Rowler, 2007). Carver's taxonomy is an ideal basis for an e-learning curriculum that is responsive to individual needs, abilities and potential.

David Kolb (1984) in his book, *Experiential Learning: Experience as the Source of Learning and Development*, noted that experiential learning allows learners to reflect upon new experiences from different perspectives. These reflective observations engage learners in abstract conceptualizations, which in turn, help them create generalizations, or principles that integrate their observations into sound theories. These theories then serve as guides to further action by allowing learners to test new learnings in different and more complex situations. The result is another concrete experience, but this time at a more complex level. This cycle repeats as learning continues.

Digital Literacies

An important aspect of e-learning is what Beetham, McGill and Littlejohn (2009, p. 9), refer to as "digital literacies." The term expresses a tension between two points of view cited as follows:

- education needs to continue to do much of what it has always done (literacy as a generic capacity for thinking, communicating ideas, and intellectual work)
- education needs to change fundamentally (digital technologies and networks as transforming what it means to work, think, communicate and learn).

According to Beetham, McGill and Littlejohn (2009, p. 9), the term *literacy* in each of these points of view is understood to involve:

- *a foundational knowledge* (e.g., reading, writing or numeracy) upon which more specific skills depend
- *a cultural entitlement* – without which a learner can be impoverished relative to culturally valued knowledge
- *communication* – the ways in which individuals relate to culturally significant communications in a variety of media
- *the need for practice* – skills are not acquired on a once-and-for-all mastery but through continuing development in different contexts
- *a socially and culturally situated practice* – most often dependent on the context in which it is executed
- *self-transformation* – literacies, or their lack thereof, have a lifelong impact.

Beetham, McGill and Littlejohn (2009, pp. 14–15) suggest key considerations regarding literacies and their implications:

Literacies as situated practices – cannot be acquired through one-off induction sessions or skills. Learners require ongoing practice, embedded in relevant subject contexts (relevant to learning goals and assessment criteria).

Learning to learn – positive learning experiences help learners pursue and persist in learning. Digital literacies are not "add ons" but must be recognized, incorporated and, sometimes, reconceptualized.

Technologies and technical literacies – rather than being readily incorporated, digital tools are fundamentally changing what it means to communicate, make meaning, think, work and learn. Technology availability, ease of use and low cost are features that impact how learners access information and communicate with one another.

Media and representation – learners need skills to critically evaluate and/or to produce media representations. The media required might vary from subject to subject (notation systems for mathematics and science or spatial, narrative or virtual for gaming simulations).

Information literacies – criticism of information literacies has focused on too much individual use and on failing to recognize different cultures of information use.

Learners – rapid, wide-spread and accessible ease of use are features of learning with digital technologies that are changing the expectations for education. Too often, educators make assumptions about a learner's facility with technology at the peril of the learner. For instance, learners with their own technology (e.g., laptop, Smartphone) might have no idea how to use them properly or understand the full functionality of the various applications available. Many users lack evaluative and critical skills. Digital capabilities are individual and multiple.

Developing learners – learner development of a range of strategies for their own learning. These strategies include becoming more evaluative, critical, self-confident, self-aware and skilled at using technologies. Effective learning strategies are best supported in *communities of practice*, *communities of inquiry*, or *learning groups* focused on tasks of value to the learner.

Kahn and Kellner (2005) suggest that changes in information access as well as computer literacy standards have taken place over the decades. Critical media literacy (being able to critically evaluate information) is especially important today because there are so many, widely available information sources. Critical media literacy teaches students to engage media representations and discourses critically, because it stresses learning to use media technologies as modes of self-expression and social activism when appropriate.

Distributed/Blended Learning Models

Alberta Education's Discover Phase Report (2008) on the distributed learning strategy noted that the introduction of new information, communication and learning technologies has made it possible to support student learning and success through a variety of learning environments, anytime, any place or any pace. Non-traditional learning and teaching methods have been used in selective situations to solve issues of timetabling and/or access. However, the Internet, global marketplace and overall emergence of distributed collaboration networks, have broadened the potential and forms of learning from the synchronous, teacher-centred, classroom-based, industrial model of learning to an asynchronous, collaborative, more flexible and student-centred learning paradigm—distributed learning. Distributed learning is characterized by any learning that is purposefully designed to allow teachers, students and resources, in classroom or decentralized locations, to interact while separated by time and/or place for some or all of their learning activities.

Students benefit from distributed learning with a range of learning options like flexible scheduling, flexible pacing and varying levels of structure depending on their personalized learning needs. These distributed learning options are provided in a variety of delivery formats and mediums; e.g., print, digital, Web-based, face-to-face, and in a variety of environments; e.g., classroom, work experience, project-based learning, online education and independent study. Distributed learning connects students, teachers, parents and the community across the province, and, in doing so, provides choice, flexibility and authentic learning experiences. It offers the potential of exploring different relationships and building highly personalized and individualized learning opportunities for student success, as well as expanding teacher expertise to critically influence and support student learning.

Distributed learning, sometimes called a *blended*, *hybrid* or *mixed-mode* learning approach, combines face-to-face and digital activities to form an integrated instructional approach. For example, a class that normally meets three days per week might meet once per week in a face-to-face format, while learning activities that would normally take place during the other two classes could be moved online. The goal of distributed learning is to take advantage of the best aspects of both face-to-face and online instruction. Classroom time can be used for students to engage in advanced interactive learning experiences, while the online portion of the course can provide students with content at any time and any where there is Internet access. There are no rules for developing ideal distributed learning. As noted earlier, distributed learning encompasses a broad continuum, and can include any mix of face-to-face and online instructional content. The blend of approaches will vary depending on the content, the needs of the students and the preferences of the instructor (Penn State, 2009).

The North American Council for Online Learning (n.d.) has outlined a blended learning continuum that runs from "fully online" to traditional "face-to-face." This continuum is a useful consideration when moving to a blended model of responsive curriculum. It can be outlined as follows:

- fully online curriculum with all learning done online and at a distance and no face-to-face component
- fully online curriculum with options for face-to-face instruction, but not required
- mostly or fully online curriculum with select days required in classroom or computer lab
- mostly or fully online curriculum in computer laboratory or classroom where students meet every day
- classroom instruction with significant, required online components that extend learning beyond the classroom and beyond the school day
- classroom instruction integrating online resources, but limited or no requirements for students to be online
- traditional face-to-face setting with few or no online resources or communication.

This continuum would be a useful consideration for any institution moving toward an e-learning curriculum from a traditional face-to-face approach. It would allow for a curriculum change to be responsive in both direction and complexity, and to proceed in accordance with external and internal resource (financial and human) pressures over any period of time.

QUALITATIVE AND QUANTITATIVE STUDIES

Technology and Responsive Curriculum

E-learning has become a major influence on how instructional programs are offered and holds the potential to make a curriculum responsive. Unfortunately, face-to-face classroom instructional models underlie many e-learning courses (Hannum, 2001; Twigg, 2001; Engelbrecht, 2003). This pattern is familiar; for example, early use of computers merely involved placing traditional instructional content in the form of textbooks, workbook or flash cards onto computers for delivery to students. The possibilities of e-learning were missed.

New ways of thinking and new models are needed to realize the full potential of e-learning (Kumar, 2004; Clark, 2003). If e-learning is to improve learning opportunities, educators need to rethink the models that underlie e-learning (Gunasekaran, McNeil & Shaul, 2002; Schank & Kemi, 2000). Progress will depend on utilizing learner-centred models that place students at the focal point, not the teacher and not the classroom (McCombs & Vakili, 2005; Mendenhall, 2007). What follows are studies of practices that have the potential to make curriculum responsive.

The Project RED (n.d.) is an advocacy plan to revolutionize the way the United States looks at technology as part of teaching and learning. The belief is that technology can help re-engineer the educational system by transforming learning, just as it has transformed homes and offices in almost every other segment of society. Project RED research findings suggest that using technology in schools can improve learning performance and financial outcomes. Observations include the following:

1. Technology is no longer a supplement, because it is integral to students' lives outside of the classroom and is most effective as an integral part of the core curriculum.
2. Well-trained teachers who can confidently integrate technology into their practice and who are supported by a principal committed to change are key to using technology to its fullest potential.
3. Social media, games and simulations can be used to engage, encourage collaboration, excite, and empower students about learning.
4. Regular online assessment can be used to gauge student learning and then instruction can be tailored for personalized learning experiences.
5. Technology applications have proved effective and can be used at any time in intervention programs.

The Digital Learning Council in the United States was launched to identify policies to integrate current and future technological-innovations into public education. The Council, working to customize education for all, explored technology-enhanced learning in traditional schools, online learning, onsite learning and learning that combined online and onsite learning. Interviews with more than 100 leaders from government, philanthropy, business, technology and think tanks, in addition to data from more than 40 web conferences were used. Ten elements of high-quality digital learning were identified:

1. All students are digital learners.
2. All students have access to high quality digital content and courses.
3. All students can customize their education.
4. Student progress is based on demonstrated competency.
5. Digital content, materials, and online or blended courses are of high quality.
6. Digital instruction and teachers are of high quality.
7. All students have access to multiple high quality providers.
8. Student learning is used to evaluate the quality of content and instruction.
9. Funding creates incentives for performance, options and innovation.
10. Infrastructure supports digital learning (Foundations for Excellence in Education, 2010).

The report, *Next Generation User Skills: Working, Learning and Living Online in 2013,* asked whether web methods of communicating, collaborating, and contributing would become the core skills for 2013. Arguing this possibility, an examination of whether the current education system was fit for this purpose noted that success would depend upon several factors:

- Do the behaviours of digital natives fit the purposes of education and employment?
- Are teachers capable of supporting and adding value to such ways of knowing?
- Are they compatible with curriculum design and assessment methods?
- Will the risks be surmountable in terms of safety, quality and other ethical issues? (Next Generation User Skills, 2008).

The work of the Alliance for Excellent Education (2010) suggests that digital learning can solve three significant educational challenges: 1) increased global demand for skilled workers; 2) significant financial shortfalls; and 3) looming teacher shortage. The Alliance reports that embracing online learning has the potential to strengthen the supply and quality of teachers, improve efficiency and increase student post-secondary and career readiness. Clark's (2001) book, *Learning from Media: Arguments, Analysis and Evidence*, would appear to add credence to the Alliance's findings when he reports that the benefits to education associated with multimedia instruction include a wide range of instructional options, considerable reductions in learning time, the time required of expert teachers and the cost of learning (Clark, 2001).

A report by Sharpe, Beetham and Benfield (2009) synthesizes the findings from projects funded by the Joint information Systems Committee in the United Kingdom. The Joint information Systems Committee champions the use of digital technology to ensure the United Kingdom retains its world-class status in research, teaching and learning. The report focuses on a series of studies of learners having access to technology and who are, generally speaking, confident in its use. These learners not only use technology for leisure but also to access information and gain support from friends and colleagues. The learners in these studies led complex lives and used technology to meet and manage the competing demands of their lives—home, work, family and study. Technology helped meet the flexibility demands

of their study needs, including their own specific learning requirements. It should also be noted that a small portion of the learners involved in these studies were not skilled technology users and felt disadvantaged by their lack of skills.

The *REVEEL* project concluded that learning is now taking place in technology-rich societies and that there is a need to remodel education as lifelong learning. Learners need to have the ability to self-manage the learning process; the capability of negotiating learning outcomes; the time to review and reflect on the learning process while learning; the ability to find and evaluate the use of a wide-range of digital and non-digital resources; and the ability to share and develop this learning literacy with others (Beetham, McGill & Littlejohn, 2009).

The Learning Literacies for the Digital Age (Beetham, McGill & Littlejohn, 2009) project focused on reviewing the evidence of change in the contexts of learning. The Learning Literacies for the Digital Age "Framework of Frameworks" for analyzing the components of digital and learning literacy include the following points: 1) learning to learn, metacognition; 2) academic practice, study skills; 3) information literacy; 4) communication and collaboration skills; 5) media literacy; 6) information and communication technology/digital/computer literacy; 7) employability; and 8) citizenship (Beetham, McGill & Littlejohn, 2009). Their review of evidence suggested that learners can become more critical, evaluative, self-aware, self-confident, skilled, and capable using technologies and developing a wider and more effective range of strategies for their own learning. Skills acquired iteratively, through practice within authentic tasks and as needed, are better retained than those taught as one-offs, in isolation, and through direct instruction. From their review of future learning scenarios, the following key message is offered: educational institutions must adapt to help students deal with issues, such as economic uncertainty, high competition for employment in the global knowledge economy, and increased levels of alternative contract-based or self-employment.

The *Learners' Experiences of e-Learning* program espoused a pyramid model of developing digital competence which, supported by Martin and Grudziecki (2006), "builds on basic access and skills, through practices and strategies, to 'creative appropriation' of technologies for personal development, personal styles of participation in learning, and the achievement of personal learning goals" (Sharpe, Beetham & Benfield, 2009, p. 23). However, the British Library *Google Generation* report highlighted that young people, although familiar with computers, rely on the most basic research skills and have few critical and analytical skills to assess information they access. They are also impatient in their navigation and display no tolerance for any delay in satisfying their information needs (Martin & Grudziecki, 2006). OfCom's *Media Literacy Audit* (2008*)* found that, although young people enthusiastically adopted new media, adoption was not necessarily accompanied by an understanding of how the media was produced. Although confident in their use of the Internet, they did not always practise critical thinking or appropriate care as they used websites.

The United Kingdom's *Digital Britain Report* identifies a wide range of agencies with a potential role to play in fostering media literacies, of which educational institutions are only one. The media itself, the arts, libraries, museums and galleries and local communities are also important actors in this arena. Key elements identified as fostering digital *engagement* are digital inclusion, digital life skills and digital

media literacy (Department for Culture, Media and Sport and Department for Business, Innovation and Skills, 2009).

The *DigEuLit* project, as summarized in Martin and Grudziecki's paper, *Concepts and Tools for Digital Literacy Development* (2006), provides a useful model for thinking about levels of literacy:

Level 1: digital competence (skills, concepts, approaches, attitudes, etc.)
Level 2: digital usage (professional/discipline application)
Level 3: digital transformation (innovation/creativity).

The International ICT Literacy Panel (2007) defines information and communication technology literacy as using digital technology, communications tools and/or networks to access, manage, integrate, evaluate and create information to function in a knowledge society. The panel's definition reflects the belief that information and communication technology literacy is a continuum. The panel (p. 3) also developed an organizing framework for information and communication technology literacy and the components identified as essential for functioning in a knowledge society:

1. Access – knowing about and knowing how to collect and/or retrieve information.
2. Manage – applying existing organizational or classification schemes.
3. Integrate – interpreting and representing information, which involves summarizing, comparing, and contrasting.
4. Evaluate – making judgements about the quality, relevance, usefulness or efficiency of information.
5. Create – generating information by adapting, applying, designing, inventing or authoring information.

Literacies for Learning in Further Education (n.d.) examined the literacy practices of learners' everyday lives and concluded that these were generally *multimodal*, in that they used symbols, pictures, colour, music, etc.; *multimedia*, in that they used paper-based and electronic media; *shared,* in that they tended to be interactive, participatory, and collaborative; *non-linear,* in that reading paths did not follow a linear path but rather dipped into different sections for relevant bits; *purposeful* to the student; *clear* in their sense of audience; *generative*, in that they involve sense-making and creativity; and, *self-determined* in terms of activity, time, and place.

The Joint Information Systems Committee (2008) reported on 37 extensive case studies done by facilitating inter-institutional exchanges. Participants studied one another's practice and worked collaboratively (both face-to-face and online) to question, challenge and reflect on each other's practice. One area that interested them was determining the drivers for developing e-learning approaches. They summarized these drivers as recruitment and retention of larger numbers of students; flexibility in "time and place;" engaging students through rich media and a range of pedagogic support measures; making teaching relevant to "Generation Y" students; developing skills and professional attitudes; preparing for

employment and practice—practising skills in "safe" simulated surroundings; institutional strategic policy directives and maintaining reputations for innovation; preservation of institutional assets and continuity despite staff changes; and assuring quality.

Although technology supports responsive curriculum, studies that examine the motivational benefits of multimedia instruction have mixed findings. Although an attractive option for students, their interest, most often, seems to lead them to reduce their effort to learn. Research evidence suggests that, as student interest in multimedia courses increases, learning tends to decrease. One hypothesis for this finding is that students feel that learning in these courses requires less work (Clark & Feldon, 2005). The suggestion is that a mismatch might exist between what is learned in multimedia courses (processes, for example) and what might be measured by summative tests (homogenized content).

The flexibility of multimedia permits instruction to be tailored to different learning styles by providing different versions of the same lesson. However, attempts to validate this assumption have generally failed. Attempts to insert socially-engaging learning supports into multimedia courses seem not to increase learning and sometimes appear to diminish instructional effectiveness. The flexibility of multimedia technology allows for course designs where students can control the pacing of instruction and navigate between and within lessons. The ability to navigate within lessons, combined with unguided or minimally-guided instruction, seems to decrease learning for students with less prior knowledge of course subject matter. In an ironic twist, strong instructional guidance seems to interfere with the learning of more advanced students (Clark & Feldon, 2005).

Muir's (2007) research focused on school uses of computer, specifically on integrating technology into the curriculum for student learning. Muir referred to ways of using technology for teaching and learning as "Type I" and "Type II." The "Type I" sustaining approach to educational computing uses computers to mimic behaviours and procedures teachers use without the technology. For example, teachers use technology to create worksheets, track grades or create PowerPoint presentations instead of using blackboards or overheads. Advantages of Type I computing include automation, ease of access and modification, and high-quality design. The Type II disruptive applications represent innovations in teaching and learning. Type II educational applications create new and better ways of teaching that help empower students to do work they could not do before.

Armstrong, Barnes, Sutherland, Curranb, Millsc and Thompson (2005) carried out case studies illustrating the introduction of interactive whiteboards and reported that that the introduction of interactive whiteboards into the classroom involves much more than the installation of the board and software. Teachers are critical agents in mediating and integrating the software into the subject aims of the lesson and the appropriate use of the interactive whiteboards to promote quality interactions and interactivity. Professional development is critical for ongoing support to ensure appropriate use of interactive whiteboards and accompanying software.

Kearney and Schuck (2006) completed five case studies examining the way teachers and students interact and learn in classrooms in which student-generated digital video projects occur. Students enjoyed the opportunity to "find a voice" through their digital video tasks, while attempting to

communicate in a contemporary way with a wide peer audience. Indeed, students showed an acute awareness of their peers as both the subjects of their filming and the target audience for their projects. This awareness was a pivotal factor in their notions of authenticity.

The Responsive Classroom (n.d.) is a reportedly research-based and widely-used approach to elementary education that increases academic achievement, decreases problem behaviours, improves social skills, and leads to high-quality instruction. Rimm-Kaufman (2006) completed a three-year study comparing three schools implementing the Responsive Classroom approach with three non-implementing schools and found that the Responsive Classroom approach was associated with better academic and social outcomes for elementary school students. The key findings for students at schools where Responsive Classroom was used were: 1) students had greater increases in reading and math test scores; 2) teachers felt more effective and more positive about teaching; 3) students had better social skills; 4) teachers offered more high-quality instruction; 5) students felt more positive about school; and 6) teachers collaborated with each other more.

The Responsive Classroom approach rests on the following principles: 1) the social and academic curricula are equally important; 2) how students learn is as important as what they learn; 3) social interaction facilitates cognitive growth; 4) students need to learn cooperation, assertion, responsibility, empathy and self control if they are to be successful socially and academically; 5) knowing students individually, culturally and developmentally is essential to good teaching; 6) knowing students' families is essential to good teaching; and 7) working relationships among adults in school are critically important to how well students learn (Rimm-Kaufman, 2006, p. 3).

Some of the things to be done while teaching responsively include helping the learner focus, providing reassurance, structuring the task to help students decide which steps to take, modelling how an expert does it, "thinking aloud" to let the learner observe expert thinking, and modelling self-evaluation (Responsive Classroom, n.d.).

In summary, the appropriate use of e-learning is not the silver bullet for a responsive curriculum; yet, it is important from students' perspectives. It provides them with a sense of relevancy about how they learn and connect with things in their daily lives that keeps them active and engaged.

Curricular Changes and Responsive Curriculum

Both South Korea and Singapore have taken steps to decentralize aspects of curriculum that should help with having responsive curricula. In Korea, the Sixth National Curriculum, for example, "allowed local education authorities to select appropriate subjects to teach and decide the unit number of courses required at the high school level. It also encouraged individual schools to modify the national curriculum or to develop new subjects, based on the needs and circumstances of the school and local communities and on the interests of students, teachers and community members" (INCA, 2010, Section 5.1.1). The policy of decentralized curriculum continued with the Seventh Curriculum revision. It intended that, as more autonomy is given to schools and local authorities, "curricula will become more appropriate to individual schools and students, and will contribute to increasing the diversity of educational programmes" (INCA, 2010, Section 5.1.1).

In Singapore, the focus in recent years has been to help all students achieve their aspirations through multiple pathways, by recognizing a broader range of talents and abilities. Reforms have injected greater diversity, flexibility and choice into the system. "Beyond the customization by streams, schools are provided some 'white space' in the curriculum to develop innovative and relevant school-based curricula and programs that are more finely tailored to the needs of their students" (Singapore Ministry of Education, 2010, p. 7). In addition, "To provide greater space for school-based flexibility in the curriculum, there was judicious content reduction across subjects so that 10 to 20 percent of curriculum time could be freed up as 'white space.' Teachers have the autonomy to use the 'white space' to customize lessons, using a variety of teaching and assessment methods to better meet the needs of their students"(p. 8).

CONSIDERATIONS FOR CURRICULUM

A curriculum represents educational ideas in practice, underpinned by underlying values, and includes all the planned learning experiences of a school or educational institution. A curriculum should be in a form that is easily communicated, open to critique and readily transformed into practice. A curriculum can exist at three levels—what is planned, what is delivered and what is experienced. A curriculum must remain responsive to changing values and expectations if it is to remain relevant and useful. A curriculum has at least four important elements: content; teaching and learning strategies; assessment processes; and evaluation processes (Prideaux, 2003).

Learning occurs best when curriculum, instruction and assessment align with standards. In Washington state, learning standards supply the foundation of the defined curriculum documents (broadly defined as a district curriculum guide, a scope or sequence, a course syllabus, a unit or lesson plan). Instruction is the implementation of a defined curriculum, including the teachers' methods and resources. Assessment can take a multitude of forms—diagnostics, classroom-based formative and summative assessment that measures student proficiency of the defined curriculum (State of Washington, n.d.).

A responsive curriculum entails several layers of responsiveness: 1) to provincial and local policy; 2) to the teaching context; 3) to teaching colleagues; 4) to the local community; and, most importantly, 5) to students. Thus, during curriculum planning, curriculum design, curriculum enactment and curriculum assessment, all factors in these layers must be considered to build a responsive curriculum. A responsive curriculum also requires that the development of the curriculum be iterative, continuously informed and revised based on feedback from the users, students and teachers. It must have flexibility built into it; it needs to be emergent rather than rigidly predefined; and, it needs to be tolerant of diversity and differences, meaningful to students; and, mostly, it needs to invite constant input from its users (Michigan State University, n.d.).

Curriculum enactment is important in making a curriculum responsive. Classroom instruction is crucial because no matter how responsive a curriculum is in design, its classroom implementation could easily ruin its responsiveness if it does not take measures to be responsive to the teaching context and to the students. Responsive curriculum enactment entails two aspects. First, it has to be responsive to things that worked and things that did not work, analyzing the reasons behind the successes and failures, and

making adjustments to the curriculum to make it fit the teaching context and the target students. Second, to be responsive to the diversified needs of the students, lessons need to be conducted in ways that invite and engage students in iterative dialogues around the what, how and why of learning, so curriculum can be adjusted to better serve students (Michigan State University, n.d.).

The assessment component in the curriculum is essential if curriculum is to be responsive. A responsive curriculum is impacted by how assessments are constructed and how results are used. It should be remembered that standardized testing is only one kind of assessment and also is exceedingly traditional. At present, various forms of alternative assessments, such as performance-based assessment, portfolio assessment and self-assessment are widely used. A fundamental reason for changing assessment is conceptual changes about knowledge. With the influence of post-modernism, it has been argued that knowledge is value laden and socially constructed instead of being fixed and objective. Associated with these influences comes a change in the view of learning. Within a constructivist framework, learning is no longer seen as memorizing isolated facts but a process of meaning making and knowledge construction. Thus, assessment must be "interactive, dynamic and collaborative" and "integral to the teaching practice and embedded in the social and cultural life of the classroom" (Gipps, 1999, p. 378, as cited in Michigan State University, n.d).

Assessment is shaped by multiple and, in some instances, competing forces, such as one's educational history; conception of knowledge and learning; understanding of the purpose of education; the needs and expectations of the school, parents and students; and the broad institutional environment. Educators in a responsive curriculum environment need to be conscious of the origins of their assessment practices and the assumptions embedded in their practices (Michigan State University, n.d.).

Kozma (2010) suggests transformations of educational policy to meet change. Key characteristics of transformational policy are that it is systemic, coherent, action-oriented, inclusive of local participation, innovative and scalable, and provided with financial resources. A model for policy development includes the following stages, noting that each stage impacts the other and happens in parallel:

- Envision the future:
  - create long-term shared vision
  - define government and stakeholder mission
  - analyze the socio-ecosystem
- Develop country master plan:
  - create long-term plan
  - look for levers
  - build multi-stakeholder alignment
  - design strategies

- Implement initiatives:
  - team with partners
  - provide resources

- Evaluate and adapt:
  - monitor, adapt, revise
  - measure success
  - recommend change (p. 4).

The Partnership for Next Generation Learning (2010, p. 2) suggests a set of design attributes to be used for systems change that are grounded in a solid base of research and best practices from around the world. The cited attributes are:

1. Personalizing learning, which calls for a data-driven framework to set goals, assess progress and ensure students receive the academic and developmental supports they need.

2. Comprehensive systems of learning supports, which address social, emotional, physical and cognitive development along a continuum of services to ensure the success of all students.

3. World-class knowledge and skills, which require achievement goals to sufficiently encompass the content knowledge and skills required for success in a globally-oriented world.

4. Performance-based learning, which puts students at the centre of learning processes by enabling the demonstration of mastery based on clear and commonly-shared expectations.

5. Anytime, everywhere opportunities, which provide constructive learning experiences in all aspects of a child's life, through both the geographic and the Internet-connected community.

6. Authentic student voice, the deep engagement of students directing and owning their individual learning, and shaping the nature of education experiences among their peers .

Further, according to Jackson and Crawford (2008), modern technology has changed how students learn. Their findings impact a responsive curriculum. Skills, such as multitasking and the tendency to rely on trial and error rather than traditional ways of learning, have prompted researchers to determine how to integrate learning into a system where students can learn through discovery by using multiple topics and multi-logical directions. For such learning to occur, the authors made the following suggestions:

- Scope and sequence should determine information management, evaluation and synthesis skills to be taught in a developmentally appropriate sequence where a first step would include changing traditional practice.
- Students should be challenged to investigate provocative, age-appropriate questions that motivate them to inquire and research for answers and then communicate, with others, what they have found.

- Professional development with teachers should focus on their abilities to manage and evaluate both information and students in the process of acquiring this information and teachers must be taught to evaluate student products.
- Students should engage in more active engagements with both other learners and instructors.

According to the New Brunswick Department of Education (2010, p. 21), developing an information and communication technology-rich environment can be facilitated by:

1. Developing an implementation plan for widespread rollout of technology, including a refresh schedule, adequate technical support and updated infrastructure.

2. Using technology to foster communication and collaboration, including electronic messaging, multimedia publishing, videoconferencing, shared authoring tools and social networking applications.

3. Providing mobile clusters of netbook computers for all Kindergarten to Grade 5 classrooms.

4. Exploring options to provide all students in grades 6 to 12 with one-to-one access to netbook computers.

5. Supporting teachers through online professional development opportunities and resources in the use of technology to enhance flexible learning opportunities and spaces all within information and communication technology-rich learning environments.

6. Creating and equipping media centres in schools for media production.

7. Designing and implementing a centralized online technology mentorship model to support teachers.

A blended learning approach can incorporate intentional instructional shifts to an online or a technology-based environment. Students can spend a portion of each day learning in a traditional class setting while another portion can be spent learning on their own in a technology-rich environment. This model allows for different levels of staffing and for using different locations, to allow teachers to work with students in more personalized settings (Foundation for Excellence in Education, 2010).

Undoubtedly, a responsive curriculum is important for today's learners and educators as they respond to changes in the *nature of work*; the *nature of learning for work*, and *learning in work*; (arguably) the nature of cognition or knowledge processing; the nature of useful knowledge in society; the nature of social life and citizenship; communications media; other technologies and technical capabilities; and, the experience and expectations of learners themselves, as a consequence of the above (as cited in Beetham, McGill & Littlejohn, p. 8).

Teaching information management, evaluation, and synthesis skills in a developmentally appropriate sequence would be a first step in changing traditional practice. Subject area content would need to be presented in overarching themes that allow integration across disciplines and provide flexible time frames that allow for discovery. Students would need to be presented with provocative and age-appropriate questions that motivate them to inquire and research for the answers. They would then communicate with others what they have found. "The ability to quickly identify relevant sources of information and to synthesize this information into appropriate solutions is a critical skill for students to master if they are to succeed in an information-rich environment" (Jackson & Crawford, n.d.).

Professional development is crucial if teachers are to manage and evaluate both information and students. Many teachers, from the generation of digital immigrants, are uncomfortable with online researching skills and some have limited ability to evaluate and validate information they gather. Teachers must be supported in their ability to evaluate student products (Jackson & Crawford, n.d.). In the traditional model, instruction is delivered and then reiterated to the teacher for evaluation. "A model that places the student in a more active role of both learner and instructor would more closely align with the multidimensional digital world to which most learners have now become accustomed and foster the filtering of information for validity and reliability" (Jackson & Crawford, n.d.).

It will be difficult for a curriculum to be responsive until the manner in which teachers teach and how students are evaluated changes. Students must move from consumers of information to producers of information. "This, above all else is the key to engaging digital learning. However, until teachers are trained to expect and accept content gathered through social networks, with emphasis on teaching students how to check validity and reliability of the web, the full power of the digital natives cannot be released or expanded" (Jackson & Crawford, n.d.).

A responsive curriculum, then, involves the ability to change not only the content of what is learned at the policy level but also what occurs at the classroom level, including the learning environment and the available technological tools that can increase student engagement and, thus, learning.

BIBLIOGRAPHY

Alberta Education. (2008). *Discover phase report: What we heard and recommendations from Alberta's distributed learning forum: A culmination of all aspects of the discover phase*. Retrieved from http://education.alberta.ca/media/1157513/discoverphasereport.pdf

Alliance for Excellent Education. (2010). The online learning imperative: A solution to three looming crises in education. Retrieved September 28, 2011, from http://www.all4ed.org/files/OnlineLearning.pdf

Aristotle. (1946). *Rhetoric*. Oxford, England: Oxford University Press.

Armstrong, V., Barnes, S., Sutherland, R., Curranb, S., Millsc, S., & Thompson, I. (2005). Collaborative research methodology for investigating teaching and learning: The use of interactive whiteboard technology. *Educational Review*, *57*(4), 455–467. Retrieved September 28, 2011, from http://smartboards.typepad.com/smartboard/files/article1.pdf

Beetham, H., McGill, L., & Littlejohn, A. (2009). Thriving in the 21st century: Learning literacies for the digital age. Glasgow, Scotland: The Caledonian Academy, Glasgow Caledonian University. Retrieved September 27, 2011, from http://www.jisc.ac.uk/media/documents/projects/llidareportjune2009.pdf

Carver, C., King, R., Hannum, W., & Rowler, B. (2007). Exploring the tangible benefits of e-learning, JISC/University of Northumbria. Retrieved September 28, 2011, from http://jolt.merlot.org/vol3no3/hannum.htm

Clark, R. E. (Ed.). (2001). *Learning from media: Arguments, analysis and evidence*. Greenwich, CT: Information Age Publishers.

Clark, R. E. (2003). Research on web-based learning: A half-full glass. In R. Bruning, C. Horn & L. PytlikZillig (Eds.), *Web-based learning: What do we know? Where do we go?* Greenwich, CT: Information Age Publishers.

Clark, R.E., & Feldon, D.F. (2005). Five common but questionable principles of multimedia learning. Cambridge Handbook of Multimedia Learning, Cambridge University Press. Retrieved September 28, 2011, from http://www.cogtech.usc.edu/publications/clark_five_common.pdf

Department for Culture, Media and Sport and Department for Business, Innovation and Skills. (2009). *Digital Britain: Final report*. Retrieved September 27, 2011, from http://www.official-documents.gov.uk/document/cm76/7650/7650.pdf

Dewey, J. (1938). *Experience and education: The Kappa Delta Pi lecture series*. New York, NY: The Macmillan Company.

Engelbrecht, E. (2003). A look at e-learning models: Investigating their value for developing an e-learning strategy. *Progressio*, *25*(2), 38–47.

Erickson, F. (1987). Transformation and school success: The politics and culture of educational achievement. *Anthropology and Education Quarterly*, *18*(4), 335–356.

Foundation for Excellence in Education. (2010). *Digital learning now*. Retrieved September 28, 2011, from http://www.excelined.org/Docs/Digital%20Learning%20Now%20Report%20For%20Governors.pdf

Gay, G. (2000). *Culturally responsive teaching: Theory, research, & practice*. New York, NY: Teachers College Press.

Gunasekaran, A., McNeil, R. D., & Shaul, D. (2002). E-learning: Research and applications. *Industrial and Commercial Training*, *34*(2), 4–53.

Hannum, W. H. (2001). Design and development issues in web-based training. In B. Khan (Ed.), *Web-based training*. Englewood Cliffs, NJ: Educational Technology Publications.

INCA (International Review of Curriculum and Assessment). (2010). Korea: curricula (age 3–19). Retrieved on September 27, 2010, from http://www.inca.org.uk/1395.html

International ICT Literacy Panel. (2007). *Digital transformation: A framework for ITC literacy*. Retrieved September 28, 2011, from http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf

Jackson, S. H., & Crawford, D. (n.d.). Digital learners: How are they expanding the horizon of learning? Retrieved September 28, 2011, from http://cnx.org/content/m17218/latest/

Joint Information Systems Committee. (2008). Exploring tangible benefits of e-learning: Does investment yield interest? Retrieved September 28, 2011, from http://www.jiscinfonet.ac.uk/publications/camel-tangible-benefits.pdf

Kahn, R., & Kellner, D. (2005). Reconstructing techno literacy: A multiple literacies approach. *E-Learning, 2*(3), 238–251. Retrieved from http://www.wwwords.co.uk/ELEA/content/pdfs/2/issue2_3.asp#4

Kearney, M., & Schuck, S. (2006). Spotlight on authentic learning: Student developed digital video projects. *Australasian Journal of Educational Technology*, *22*(2), 189–208. Retrieved September 28, 2011, from http://ascilite.org.au/ajet/ajet22/kearney1.html

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice Hall Inc.

Kozma, R.B. (2010). Policy for educational transformation: An education policy brief. Retrieved September 28, 2011, from ftp://download.intel.com/education/transformation/EDUCATION_POLICY_22pg_Final.pd

Kumar, M. (2004). A critical discourse in multimedia design: A pedagogical perspective to creating engaging online courseware. *E-Journal of Instructional Science and Technology*, *7*(2).

Literacies for Learning in Further Education. (n.d.). About the research. Retrieved September 27, 2011, from http://www.lancs.ac.uk/lflfe/description/index.htm

Locke, J. (1968). *The educational writings of John Locke*. London, England: Cambridge University Press.

Martin, A., & Grudziecki, J. (2006). DigEuLit: Concepts and tools for digital literacy development. Retrieved September 27, 2011, from http://www.ics.heacademy.ac.uk/italics/vol5iss4/martin-grudziecki.pdf

McCombs, B. L., & Vakili, D. (2005). A learner-centered framework for e-learning. *The Teachers College Record*, *107(*8), 1582–1600.

Mendenhall, R. W. (2007). Technology: Creating new models in higher education. Retrieved from http://www.nga.org/Files/pdf/HIGHEREDTECH.pdf

Michigan State University. (n.d.). Gaining ground in teaching—Resources. Retrieved September 28, 2011, from http://gaining.educ.msu.edu/resources/node/177

Moll, I. (2005). Curriculum responsiveness: The anatomy of a concept. Retrieved October 4, 2011, from http://www.saide.org.za/Resources/SearchOurDatabase/SearchResults/tabid/1488/mctl/Details/id/37738/Default.aspx

Muir, M. (2007). Research summary: Technology and pedagogy. Retrieved September 28, 2011, from http://www.nmsa.org/Research/ResearchSummaries/TechnologyandPedagogy/tabid/1506/Default.aspx

New Brunswick Department of Education. (2010). Creating a 21st century learning model of public education three year plan 2010–2013: Anglophone Sector. Retrieved on September 28, 2011, from http://woodstockmiddleschool.nbed.nb.ca/Documents/DoE%20-%20PIP%20(NB3-21C)%202010-201.pdf

Next Generation User Skills. (2008). Next generation user skills: Working, learning, and living online in 2013. Retrieved September 27, 2011, from http://www.sqa.org.uk/sqa/files_ccc/HNComputing_NGUSReport_NextGenerationUserSkills.pdf

North American Council for Online Learning. (n.d.). Blended learning: The convergence of online and face-to-face education. Retrieved September 28, 2011, from http://www.inacol.org/research/promisingpractices/NACOL_PP-BlendedLearning-lr.pdf

Ofcom. (2008). Media literacy audit: Report on media literacy amongst children. Retrieved September 27, 2011, from http://stakeholders.ofcom.org.uk/market-data-research/media-literacy/medlitpub/medlitpubrss/children/

Partnership for Next Generation Learning. (2010). Retrieved September 28, 2011, from http://www.ccsso.org/Documents/2010/PNxG_Innovation_Lab_Net_Overview-Aug%2010_2010.pdf

Penn State. (2009). Web learning @ Penn State. Retrieved September 29, 2011, from http://weblearning.psu.edu/blended-learning-initiative/what_is_blended_learning

Plato. (1953). Laws. In J. D. Wild, *Plato's modern enemies and the theory of natural law*. Chicago, IL: University of Chicago Press.

Prideaux, D. (2003). Curriculum design. Retrieved September 28, 2011, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1125124/

Project RED. (n.d.). Technology has changed the world … and it can change education too. Retrieved September 28, 2011, from http://www.projectred.org/uploads/PREP11/PR_Brochure_04292011.pdf

Responsive Classroom. (n.d.). Introduction: Responsive teaching. Retrieved September 28, 2011, from http://education.alberta.ca/apps/Readtolive/Workshops/Ws1.htm

Revans, R. W. (1982). *The origins and growth of action learning*. Bickley, England: Chartwell-Bratt.

Rimm-Kaufman, S. E. (2006). Social and academic learning study on the contribution of the Responsive Classroom® approach. Retrieved September 28, 2011, from http://www.responsiveclassroom.org/sites/default/files/pdf_files/sals_booklet_rc.pdf

Schank, R. C., & Kemi, J. (2000). Extracurricular as the curriculum: A vision of education for the 21st century. White Paper presented to the United States Department of Education. Chicago, IL: Northwestern University and Cognitive Arts Corporation.

Sharpe, R., Beetham, H., & Benfield G. (2009). Learners' experience of e-learning synthesis report: Explaining learner differences. Retrieved October 4, 2011, from http://www.jisc.ac.uk/media/documents/programmes/elearningpedagogy/lxp2finalsynthesis.pdf

Singapore Ministry of Education. (2010). Building a national education system for the 21st century: The Singapore experience. Paper presented at the Building Blocks for Education: Whole System Reform. Toronto, ON. Retrieved from http://www.edu.gov.on.ca/bb4e/Singapore_CaseStudy2010.pdf

Software & Information Industry Association. (2010). *Innovate to educate: System [re]design for personalized learning*. Retrieved September 28, 2011, from http://www.siia.net/pli/presentations/PerLearnPaper.pdf

State of Washington, Office of Superintendent of Public Instruction. (n.d.). Teaching and learning. Retrieved September 27, 2011, from http://www.k12.wa.us/curriculumInstruct/default.aspx

Twigg, C. A. (2001). Innovations in online learning: Moving beyond no significant difference. New York, NY: Center for Academic Transformation. Retrieved September 28, 2011, from http://www.center.rpi.edu/PewSym/Mono4.pdf

United States Department of Education, Office of Educational Technology. (2010). *Transforming American education learning powered by technology*. Retrieved September 28, 2011, from http://www.ed.gov/sites/default/files/netp2010.pdf

You Tube. (n.d.). Rapid increases in knowledge and technology. Retrieved October 4, 2011, from http://www.you.tube.com/watch?v:9XXaZRHhmxY

Zins, J. E., Bloodworth, M.R., Weissberg, R. P., & Walberg, H. J. (2004). The scientific base linking social and emotional learning to success. In J. E. Zins, R. P. Weissberg, M. C. Wang & H. J. Walberg (Eds.). *Building academic success on social and emotional learning: What does research say?* (pp. 3–22). New York, NY: Teachers College, Columbia University.

CHAPTER 8: STUDENT-CENTRED/PERSONALIZED LEARNING

"The ultimate goal of the educational system is to shift to the individual the burden of pursuing his education."
John W. Gardner

The latter part of the 18th century is best known for three revolutions: the American Revolution, the French Revolution and the Industrial Revolution, but the 18th century also saw an educational revolution. Education, once considered the privilege of only the rich and elite, changed with respect to the philosophy of who should be educated. First, the growth of national citizenship meant changes in how people were viewed. Freedom and equality became tenets of Western society and people became citizens who deserved, by birth, a sense of equality under the law. Furthermore, in a pragmatic way, as the Industrial Revolution came to rule society's economic life, greater numbers of workers were needed to produce goods in large quantities. These workers required at least some education and skills; and, the industrial activities of the day seemed to transfer easily into the educational milieu. It became quite possible to teach groups of students academic skills at the same time in the same classroom, instead of teaching them individually. This spelled the beginning of "mass education."

Generations of students have experienced this mass education for more than two centuries, and the system has worked to become more standardized, efficient and practical. Asking teachers to teach everyone in similar ways seemed democratic, and the method of mass education reduced costs, time and energy—all important values in an era of industry.

Prior to mass education, students were mostly instructed as individuals—usually a single teacher worked with one student or small numbers of students. Today, there is again a move toward a more student-centred learning, often referred to as the personalization of learning. Personalized learning is a method of instruction in which content (sometimes including instructional technology) and the pace of learning are based upon the abilities and interests of each individual learner. This instructional pattern is an antithesis to mass instruction where content, materials and the pace of learning are standardized for all students in a classroom or a course of study. What follows are various viewpoints related to student-centred/personalized learning.

Darling-Hammond (1996) argues that the industrial model of education was conceived as an alternative to small elite schools but has not allowed education to fully develop a democratic citizenry. In fact, the model has alienated students from their own learning due to a complexity of factors within the system's design. Darling-Hammond believes professionalism in teaching is a key leverage point to make the changes needed to better prepare students for democratic life.

According to Keefe (2007), a personalized school is one in which each individual, student or teacher matters and each student has a designed personal program. Keefe believes educating for a post-technological age is a challenge and today's schools must produce adaptable individuals and lifelong learners who are able to keep up with rapid change. Keefe believes conventional age-graded schools function on the premise that schooling is about teaching the masses and not individual learners.

Anderson (2011) notes that, "Mass Education is adequate, as long as students are highly motivated to learn and get ahead of their peers" (p. 13). In industrialized countries, where prosperity is already the norm, education does not always translate into significantly higher standards of living. Therefore, the economic incentive to learn is not always present and motivation must become intrinsic. Personalized learning, although not new, allows students to engage in learning that is motivating.

McRae (2010) purports that personalized learning is often represented as a novel approach that can be used to broadly reorganize 21st century schooling and as a way to enhance the pedagogical practices of educators. He affirms that in order to achieve personalized learning, the individual strengths of students need to be assessed and addressed according to students' specific needs and learning styles. He states that:

> To achieve this end, governments and school jurisdictions around the world are pulling together a mélange of policy priorities that range from focusing on emerging technologies to increasing students' active community engagement in learning. As with past educational reforms, personalized learning is now being represented by a complex collection of voices ranging from those who are the critically informed to the misleading and myopic zealousness of those who focus on technology as the metaphor for all change in an education system (para. 22).

In another critical review, Peters (2009) believes personalized learning has emerged in the last decade as a response to the problem of globalization and the waning industrial model. Peters connects personalization to individualization and examines it as one of many strategies for overcoming the bureaucratic government. Peters discusses "mass customization" as the discourse from which personalization emerged and focuses on personalizing learning as the model of future public sector reform.

Recent advancements in learning technologies, sometimes called "personal learning environments," have used technology to shape individualized (personal) learning. These technological systems are employed to help learners control and manage their own learning, which includes providing support so that learners might: 1) set their own learning goals; 2) manage both content and process of their learning; 3) communicate with others about the process of their learning; and by doing so 4) achieve personal learning goals (van Harmelen, 2006).

Van Harmelen (2006) goes on to suggest that when personalized learning is studied, part of that personalization is connected to technology, using computer subsystems that include desktop applications or web-based services. Technological possibilities include social networks and other networking protocols that can cross boundaries (peer-to-peer, web services, syndication) to connect resources and systems within personally-managed spaces. One newer aspect of personalized learning includes alternative approaches developed in Learning Management Systems. There is, however, another broader sense of personalized learning.

In the article, "Personalized Instruction," Keefe and Jenkins (2002) review the basic elements of personalized instruction. Learning and personalized instruction happens when a school accounts for individual student characteristics and needs, using flexible instructional methods to organize the learning environment. Teachers committed to personalized learning help students develop personal learning plans; diagnose cognitive strengths, weaknesses and other style characteristics; help adapt the learning environment and instruction to learner needs and interests; and mentor authentic and reflective learning experiences for their students.

In the past, Keefe and Jenkins (2002) note that antecedents of personalization have been known as non-graded education, continuous progress education, individualized instruction, and individually guided or prescribed education, to name a few. Each concept has some element of personalized education, but is more limited. Personalization is broader and more systematic in its goals and strategies. Current systematic approaches to instructional improvement, such as learning style-based instruction and differentiated instruction, aim to be fully personalized.

THEORETICAL FOUNDATIONS

Alberta Education (2010), in *Inspiring Action on Education*, provided an initial description of what personalized learning is, stating:

> Learning in the 21st century requires relevant and empowering experiences for all young Albertans. There is a need to broaden *what* students learn, *when* they learn, *where* they learn, *how* they learn, and the *rate* at which they progress in achieving learning outcomes. Personalized learning involves the provision of high-quality and engaging learning opportunities that meet the diverse needs of all learners, flexible timing and pacing, through a range of learning environments with learning supports and services tailored to meet their needs (p. 14).

The United States Department of Education in its *National Education Technology Plan 2010* notes that individualization, differentiation and personalization have become buzzwords in education, but little agreement exists about their exact meaning. What is agreed upon is that a one-size-fits-all model of teaching and learning no longer works. Some education professionals use *personalization* to mean that students can choose what and how they learn according to their interests; others suggest that *personalized instruction* is learning paced differently for different students.

The United States Department of Education (2010) suggests that *individualization* is instruction paced to the learning needs of different learners. The content and learning goals are similar for all students, but students can progress through the material at different speeds according to their learning needs. Some students take longer to finish a topic, might skip topics that cover information they already know, or might repeat topics if they need more help. *Differentiation* is instruction tailored to the learning preferences of different learners. Learning goals are the same for all students, but the instructional method varies according to the preferences of each student or what research has found works best for similar students.

Personalization refers to instruction paced to learning needs and tailored to learning preferences and to the specific interests of different learners. In a fully personalized environment, the learning objectives, content, method and pace may all vary so that personalization encompasses differentiation and individualization. Keefe and Jenkins (2002) add six basic elements of personalized instruction: 1) the dual teacher role (coach and advisor); 2) diagnosing student learning characteristics; 3) a culture of collegiality; 4) interactive learning environments; 5) flexible scheduling and pacing; and 6) authentic assessment.

According to Darling-Hammond (1996), there are four basic elements of a personalized instructional approach: 1) structures for caring and learning that help teachers know students well and work with them intensely; 2) shared exhibits of student work that clarify what the school values and how students are doing; 3) structures that support teacher collaboration focused on student learning (teacher teams); and 4) structures for shared decision making and dialogue about teaching and learning with other teachers, students and parents.

Since 2004, the Specialist Schools and Academies Trust (n.d.) and iNet have supported David Hargreaves' research into effective personalization. They believe personalized learning helps society more fully meet the needs of more students and helps students achieve their full potential during school to become better prepared for lifelong learning. For Paludan (2006) schooling continues to represent the views of society; however, he notes that, in modern society, the established educational system no longer has a monopoly on imparting skills and knowledge. Still, it remains the place where the groundwork for the lifelong learning is laid. On the other hand, the concept of lifelong learning implies personalization of learning. The increased learning, conducted after formalized education, usually takes place outside the classroom and learners choose their own subject matter.

Keefe (2007) believes there is no right way to personalize learning. Personalization depends on experience and point of view. To some, it means individualization; to others, it suggests a personal touch dealing with students or a supportive classroom; and to still others, it means empowering individual students personally, psychologically and instructionally. Keefe's review of the history of personalization over the last 40 years indicates that many educators see personalization as a passing trend and will not even consider it, given the amount of time and effort required to make it both educationally and financially feasible.

Encompassed in the debate around personalization is the notion of a student-centred or learner-centred approach (as it is most often called). For Keefe (2007) the core of personalization starts and ends with the student. He defines personalization, philosophically, as learner-centred and notes that students should be actively involved in learning and in making decisions about their learning; personalization focuses on student strengths and skill development, with student success in learning and satisfaction as goals. Skills of self-direction and responsibility are key as each student is seen as being unique. From a learning point of view, personalization is interactive and enables collaborative conversations between teachers, parents and community members, as they relate to developing meaningful learning activities for students. The learning is value-oriented and instills creativity through constructive learning activities. A personalized learning environment builds on the natural way students learn and fosters unified, active, experiential thought.

Delaney (1999), in describing learner-centred schools, notes that the five factors involved are metacognitive and cognitive, affective, developmental, personal and social factors, and individual differences. These factors form the 12 learner-centred principles developed by the American Psychological Association (McCombs & Whisler, 1997, as cited in Delaney, 1999, p. 5). A learner-centred process involves metacognitive and cognitive factors that rely on pursuing personally meaningful goals and discovering and constructing meaning from information and experience that is filtered through the learner's unique feelings and thoughts. In the learning process, the learner works to construct representations of knowledge that are meaningful and coherent, based on available qualitative and quantitative data, and pursues the linking of new information with what already exists and what is future-oriented in ways that are unique and meaningful to the learner. This leads to "thinking about thinking" (metacognition) and the potential this has for facilitating critical and creative thinking.

From the affective side, he notes the power of motivation to influence learning, and it is suggested that the depth and breadth of information processed, as well as what and how much is learned and remembered, are influenced by: 1) self-awareness and beliefs about personal control, competence and ability; 2) clarity and saliency of personal values, interests and goals; 3) personal expectations for success or failure; 4) affect, emotion and general states of mind; and 5) the resulting motivation to learn. He notes that intrinsic motivation aids learning and enhances learning tasks.

He also notes how learners' developmental constraints and opportunities shape them as learners as they progress through physical, intellectual, emotional and social developmental stages. These stages are functions of unique genetic and environmental factors. Personal and social factors relate to social and cultural diversity, and are facilitated by social interactions and communication with others in flexible, diverse (in age, culture, family background) and adaptive instructional settings. In addition, social acceptance, self-esteem and learning are also factors that will heighten individuals' learning when they engage in learning that is respectful and where caring relationships with others are fostered. Finally, individual differences in learning and cognitive filters for personal beliefs, thoughts and understandings resulting from prior learning and interpretations set the stage for an individual's ability to construct reality and interpret life experiences. These 12 American Psychological Association's learner-centred principles permit a better understanding of learner-centredness where the focus is on who the learner is, how the learner learns and under what conditions learning potential is optimized.

Delaney (1999), in concluding his paper, reminds the reader that "Varying degrees of 'learner-centredness' [personalized learning] exist in schools today. To suggest that our schools are totally lacking 'learner-centredness' would be inaccurate and irresponsible; there are teachers and administrators, who, on a daily basis, make valiant efforts to teach from a learner-centred perspective" (p. 272). He cautions that although the concept has merit and could be one way to respond to school reform, it should not be viewed as the "silver bullet" or panacea for complete school reform; rather it is an approach that is worth consideration.

McCombs and Whisler (1997, as cited in Delaney, 1999, p. 269) describe characteristics of learner-centred schools as offering students the opportunity to:

1. choose their own projects
2. work at their own individual pace
3. show excitement about learning new things
4. work with students of different ages, cultures and abilities
5. demonstrate their knowledge in unique ways
6. [be] actively engaged and [participate] in individual and group learning activities
7. go beyond minimal assignments.

Meece (2003) describes five key assumptions, emanating from the original American Psychological Association's learner-centred principles and relating to learner-centred classrooms. These are: 1) learners are distinct and unique; 2) learners' unique differences must be taken into account if all learners are to be provided with learning opportunities that are both challenging and support self-development; 3) learning is constructed and best occurs when it is meaningful and relevant, allowing learners to be actively engaged with their knowledge while making connections with what has been previously acquired or experienced; 4) learning occurs best in an environment where positive interpersonal relationships are cultivated and where students feel acknowledged, valued, respected and validated; and 5) students are naturally curious and learning will occur naturally. The notion that they need to be "fixed" is a false one; rather, their learning needs to facilitated and nurtured.

These American Psychological Association's learner-centred principles are further exemplified in *Leadership for Personalising Learning* by the National College for Leadership of Schools and Children's Services (West-Burnham, 2010) in the United Kingdom. For this institution, personalized learning is comprised of five key components: 1) maximizing individual student achievement through various teaching and learning strategies; 2) instilling high expectations and aspirations that focus on student success; 3) including all students in programming that meets their particular needs and interests; 4) focusing on interpersonal relationships between students and all those involved in their learning, including parents and peers, to maximize quality learning experiences; and 5) clarifying the personal and professional responsibilities for all those involved in the learning process by placing importance on

performance. The document goes on to state that since there are many definitions for personalized learning and that not one of them is authoritative in nature is a good thing, as it provides opportunities for school leaders and their teachers to derive a definition that is more meaningful and applicable to their particular school situation.

However, personalized learning is not without its critics—or, at least, those who warn about its potential problems. McRae (2010) notes that much of the impulse behind personalization of learning is laudable, and that personalization aligns with promising new forms of assessment, differentiated learning and instruction, and redesigning high schools beyond age cohorts and class structures. He believes personalized learning is a flexible approach to education that moves from an industrial model to find ways to personalize learning that help develop skills and knowledge so that the next generation might creatively navigate an uncertain future. However, McRae notes in *The Fourth Way,* Hargreaves and Shirley's (2009) suggestion that personalized learning is often a "Third Way" reform effort driven by business-like customization and actually constrains deeper learning through barriers, such as accountability.

According to Hargreaves and Shirley (2009), Third Way reformers see personalized learning as a central educational strategy for transforming education. They state that personalized learning is supposed to tailor teaching and assessment to the strengths, needs and learning styles of individual students and cite the work of David Hargreaves, a key change agent in the United Kingdom, who believes personalization demands a new shape for schooling that emphasizes projects rather than short lessons as the unit of learning. For Hargreaves, personalization transcends classroom and school and relates to lifelong learning (and not just in the sense of learning *throughout* life but learning *for* and *about* life).

Hargreaves and Shirley (2009) also argue that many Third Way proponents view personalization as a way to customize learning for the masses to provide short bursts of instant gratification. However, they warn that such learning provides few opportunities for deeper understanding or critical thinking. At its best, personalized learning should take students to areas of personal interest and connect them to current, compelling issues that can affect their lives. They further purport that using assessment for learning approaches provides teachers and students with important information on student learning. They argue that personalization must reconceptualize the fundamental nature of teaching and learning itself, and not just the mechanisms for delivering it. The vital 21st century skills that drive new knowledge economies are integral to the agenda of personalized learning.

Wolk (2010) discusses the lack of progress in school reform in terms of graduation rates and the lack of success for high school graduates in college. He believes standardization is the main problem in failed reform efforts and argues that holding students to similar content standards, moving them through common curricula, giving them little say in their own education and forcing them to take standardized tests will not help education policy makers close the achievement gap. He argues that a personalized approach to education should have small school environments; no standardized core curriculum, no typical academic courses and no rigid schedule; students who are significantly designing their own learning; "real-world" learning; assessment based on authentic learning exhibits; and teachers acting as advisors and facilitators of learning.

According to Carreiro King (2003), inclusive education means that all students within a school, regardless of abilities or disabilities, become part of the school community. To create inclusive education, the educational community needs to implement effective delivery techniques and change assessments to meet individual learner needs. Personalized learning requires that educators collaborate and gain curriculum and classroom management knowledge along with knowledge of individualized learning that helps students create effective learning models.

Wolf (2010) also agrees that the education system needs to be redesigned to accommodate student-centred or personalized learning. As she states, "Personalized learning models reverse the traditional model that view time and place (that is, seat time) as a constant and achievement as the variable. Instead, personalized learning ensures all students gain proficiency independent of time, place and pace of learning" (p. 7).

QUALITATIVE AND QUANTITATIVE STUDIES

A number of qualitative and quantitative studies have engaged the topic of personalized learning. For example, in their work in online learning, Samah, Yahaya and Ali (2011) note that, when considering individual differences, students' learning styles, learning orientations, preferences and needs must be understood. These allow learners to responsibly engage their own learning, retain information longer, apply knowledge more effectively, have positive attitudes toward knowledge, have more interest in learning, and have higher achievement and levels of intrinsic motivation. Learning orientations theory focuses on the whole person and can help examine the dynamic flow between psychological factors, past and future learning experiences, choices about cognitive learning preferences, styles, strategies and skills, responses to treatment, and learning and performance outcome. Previous research suggests that an online personalized learning environment is the best learning medium for individual differences because it impacts student achievement and satisfaction. However, learning environments must provide new information, contexts for learning and practice, feedback, transfer, organizers and attention devices. Interactivity is a must for online personalized learning environments.

This research is further supported by Robinson and Sebba (2009) whose findings showed that the degree of learner access to digital technologies and the encouragement imparted to use these technologies greatly impacts the extent to which such use will lead and influence their learning. The findings suggest that genuine learner-led personalized learning (using digital technologies) was relatively rare given the constraints that many teachers felt toward strictly adhering to the outcomes in the programs of study and given that their capacity to deviate from the curriculum reduced their ability to personalize learning. The key finding from this research, however, is that students who possessed good digital technology skills were the ones most adept at leading their own learning, especially when supported by teachers, with equally good technology skills, who permitted them to be actively involved in deciding what and how they were to learn and how their work was to be assessed.

Flavell's early work (1979) notes the importance of metacognition, which is defined as individual self-knowledge, ability to predict task performance and ability to monitor mastery and understanding. Experts know how to practise or test themselves to continue learning. Metacognitive ability allows

them to test understandings of partial solutions to prevent errors and other impediments toward reaching a goal. This is evidenced in the work by Suarez (2007) who prepared tiered instruction of mathematical concepts for his Grade 8 students attending a private school in Jakarta. While he had all students learning the same content, students chose the level at which they desired to work. He used a three-level colour coded system: green for foundational material, blue for extended familiar skills into more complex tasks, and black for more challenging, complex tasks. The key finding from this work was student choice and the effect that it had on achievement. He states:

> Offering tiered choices allows students to modify future decisions if, in hindsight, they view an assessment they have selected as too simple or too challenging. With this arrangement, one student's growth and success in mathematics need not come at the price of another's chance for the same (p. 63).

In fact, a main factor in the success of this structure is the opportunity for all students to reflect on their learning and to see personal growth in mathematics.

Leadbeater (2005) engaged in a series of visits to schools focused on answering questions about personalized learning and teasing out how the concept of personalization was manifested in changed practice among schools. His visits led to the development of a concept of personalization that focuses on student engagement, innovation and collaboration where learners are seen as co-investors in their education and have a say in what shapes their learning.

Jones, McClure and Yonezawa (2010) focused on relationships between student-perceived levels of personalization, students' opinions about advisory period and academic outcomes. Research results indicated that more positive perceptions of personalization were predictive of better academic outcomes. Results are consistent with qualitative work suggesting that higher levels of personalization are associated with higher levels of academic achievement, improved school culture and increased student engagement.

Sebba, Brown, Steward, Galton and James (2007) undertook research intended to describe effective personalization practices, which could be shared to identify facilitators and barriers to the development of personalized learning that informed future policy and practice. In their work with the Department for Education and Skills (United Kingdom), they described five components of personalized learning: 1) assessment for learning; 2) effective teaching and learning; 3) curriculum entitlement and choice; 4) school organization; and 5) beyond the classroom.

Daniels and Perry (2003) created a learner-centred framework based on two theories: 1) Learner-Centered Psychological Principles; and 2) Self-determination Theory. Responses to researchers suggest that students endorse learner-centred practices. Students expressed that: 1) they needed teachers to know them; 2) they desired quality learning experiences; and 3) they were willing to make choices and work together to accomplish goals.

In support of this notion, Barnes (2010) outlined a two-year research project where parents (who were artists) and their children created art together or separately through the guidance of teachers. The children, aged 3–14, had unlimited access to their parents' studios and art materials to create art projects they eventually put on public exhibit. Evidence gathered through diary entries maintained by the parents and online and face-to-face discussions examined how the research challenged views on creativity, intergenerational collaboration, learning and student-led learning. The project found that when teachers work and learn on an equal footing with students, motivation for both student and teacher increases. It also supports the notion that students should be involved in planning their learning in school.

Meece (2003) looked at goal theories of motivation and their relationship to the learner-centred principles, described earlier in this section, to better understand ways in which to improve adolescent engagement and learning in the middle school years. She surveyed 2200 middle school students across the United States and her findings showed strong evidence in favour of using learner-centred teaching practices where students' perspectives and views are taken into consideration. The negativity that is often reported during these years can be attributed to the notion that students feel left out of crucial decisions made about what they learn, how they learn and how they are assessed. Meece's findings showed that students' perceptions of their learning environment were better predictors of student motivation and learning than those reported by teachers. Meece suggests that student voice is an important consideration in a student-centred learning environment.

IN PRACTICE

A number of different countries and educators have considered student-centred or personalized learning as a means of transforming or reforming the education system. One such example is the Metropolitan Regional Career and Technical Center in Rhode Island, known for its diverse high school population. Grabelle and Littky (2004), in *The Big Picture: Education is Everyone's Business*, describe the key features of this school philosophy as tapping into the personal interests and strengths of each individual student and building a program around these interests and strengths; focusing less on a centrally-mandated curriculum; and connecting learning through "internships" where students learn by pursuing their passions and interests in the community and making it a more vibrant place for all. In this model, teachers become advisors as a part of the student-teacher relationship and it is upon this basis that individualized learning programs are developed. Student progress is measured and reported through narratives and portfolio presentations called "exhibitions of learning." There is currently one school in Canada that has adopted this philosophy. The school is located in Winnipeg, Manitoba and began in September 2009 with 35 students in grades 9 and 10.

Jacobs and Farrell (2001, as cited in Prapaisit de Segovi & Hardison, 2009), note in a detailed analysis of the Cooperative League of Thailand movement, that the shift in instruction from teacher-centred to learner-centred can be seen in the greater attention that is paid to the role of learners in the learning process. The social nature of learning, as seen in the use of pair and group work, promotes interaction and cooperative learning and recognizes individual differences among learners. There is greater emphasis on meaning versus rote learning and on the presentation of language forms in context. The

role of teachers is that of facilitators of learning through active engagement of learners in the process. In this learner-centred environment, students are given autonomy, with the goal of enhancing learning and communicative competence through interaction, while identifying student needs and diagnosing learning difficulties.

Carney (2008) explored the introduction, in the Tibet Autonomous Region, of the new Chinese curriculum for basic education. In contrast to previous initiatives since 1949, the present reform attempts to change both what is taught and fundamental notions of how learning is best facilitated. This new curriculum aims to change from teacher-focused to student-focused and to change from rote and mechanical learning to hands-on learning. Continuous self-assessment will check progress but also will provide a tool for learning.

As a way to move personalized learning into a school, Cramlington Village in England, has established a model of teaching and learning that informs lesson planning and professional development throughout the school. The model has four parts: 1) a lesson planning cycle based upon Allistair Smith's *Accelerated Learning Cycle*[11]and the idea that learning is connected to previous learning and is built upon what is previously known; 2) the principle of using inquiry through intensive information and communication technology and assessment for learning; 3) the principle of learning to learn; and 4) teacher promotion of personalizing learning, through modelling good learning behaviours and having learning conversations.

Easton and Soguero (2011) profile Colorado's Eagle Rock School that caters to disenfranchised students. The Eagle Rock Program accepts only students who have dropped out of school and graduates over 90 percent of those it accepts. To meet this end, they offer a practical look at what personalization and student-centredness might look like in schools based on this school's experience. Key features are: 1) small school size; 2) students not grouped by age or grade; 3) a focus on belonging (houses, advisories or communities); 4) a vision of collaborative work rather than competition; 5) an intentional design to focus decision making on student voice; 6) a competency-based curriculum; 7) individual pathways to graduation; 8) presentations that demonstrate competencies; and 9) interdisciplinary classes with a service learning component. The latter notion makes a strong case for entrusting students with the ability to make their school a vibrant and meaningful component of the community. In this light, the authors critique four assumptions that underpin "traditional" schooling and they are: 1) adults must create, maintain and improve schools; 2) there is a continued need to use time, credits and graduation to assess students; 3) learning is organized by content areas; and 4) schooling, as it is known today, does not need to change.

The New Jersey Department of Education (John J. Heldrich Centre for Workforce Development, 2010) is piloting a project entitled Personalized Student Learning Plans as a means of exploring more meaningful learning and to incite creativity and flexibility in student learning environments. The project involves students defining a formal plan in which they set learning goals based on personal, academic and career

[11] Accelerated learning involves learning that moves at a faster rate while deepening understanding. This is achieved through a positive learning environment that ensures students are in an appropriate psychological and physiological learning state. Adapted from http://www.brinbest.com/id16.html

interests that continue to high school. For the majority of the pilot schools, implementing the Personalized Student Learning Plans shifted substantially the way in which they approached student development. The schools and school jurisdictions that reported the greatest positive impact were those who went beyond presenting the Personalized Student Learning Plans and provided opportunities for students and teachers to interact in small groups. Factors that did matter (in schools that showed less positive results related to the implementation of the Personalized Student Learning Plans) were attributed to teacher buy-in, training quality, staff resources and communication. Teachers indicated that students were overall able to articulate long-term goals but experienced more difficulty in expressing short-term goals as they struggled to comprehend the purpose and relevancy of the Personalized Student Learning Plans to their daily lives.

Pearlman (2009) speaks to the creation of learner-centred school places and workplaces for the digitally-wired students of today. In his paper, he describes the work he is doing with the New Technology Foundation in Napa, California, where the classroom environment is quite different to what is the norm in most schools in North America. He describes the New Technology High School in this manner:

> Walk into a classroom at a New Technology High School and you will see what we call Students at Work—students writing journals online, doing research on the Internet, meeting in groups to plan and make their websites and their digital media presentations, and evaluating their peers for collaboration and presentation skills. The classroom learning environment also looks different ... populated with worktables, ... access to a desktop or a laptop computer ... The classroom, or student workroom, can also serve as a design workshop or even presentation space. ... There are 'no students' and 'no teachers.' Instead there are *learners* and *facilitators* (pp. 15–16).

What is unique about this learning environment is that the learning outcomes, corresponding to content standards and competencies, defined by the Partnership for 21st Century Schools, are embedded into projects, which are assessed and reported online in the form of "living grade reports." These outcomes are more than just what is deemed necessary for students to learn and know; rather, they are translated into real-world outcomes that students come to own and "believe they *need to know and be able to do*" (Pearlman, 2009, p. 17). To graduate from school, students demonstrate their competencies and content knowledge through their digital "professional" portfolios. Students in this learning environment come to speak, as Pearlman states, "of a culture of trust, respect, and responsibility" (p. 19).

CONSIDERATIONS FOR CURRICULUM

Theorizing and research on personalized learning has generated a number of insights for curriculum building. For student-centred/personalized learning to take hold and for curriculum to address this approach, certain foundations need to be considered.

Childress (2006), a sociologist who studied the lives of students in an American high school over a year, provides a critical analysis of traditional schooling through the eyes of students. Childress describes a set of competencies he suggests most members of society would agree are critical if students are to prepare for adult life. Childress argues that the current approach to high school education does not develop these competencies. Although Childress does not use the term "personalization" *per se,* he does promote an educational approach that contests "additive education;" i.e., a system where students are moved through a system that "piles on" content from course-to-course.

The Board of Directors of the Association of American Colleges and Universities (2004, pp. 5–6) identified five key educational outcomes as a foundation for quality education: 1) strong analytical, communication, quantitative and information skills; 2) deep understanding of and hands-on experience with the inquiry practices that explore the natural, social and cultural realms; (3) intercultural knowledge and collaborative problem-solving skills; 4) a proactive sense of responsibility for individual, civic and social choices; and 5) habits of mind that foster integrative thinking and the ability to transfer skills and knowledge from one setting to another.

To this end, Miliband (2004) notes that, as a policy direction, personalized learning aims to include reconciling excellence and equity, improving synergy and coherence, achieving high standards and inclusion, and addressing the needs of the whole child. Personalized learning is a system where each student matters and where attention is paid to individual learning styles, motivations and needs. Miliband believes schools, local government and national government must work together to successfully implement personalized learning.

McCombs and Weinberger (2003) note that focusing on both learners and learning helps offset alienation and helps youth feel more connected. These connections can increase student motivation and achievement and lead to higher self-confidence and more positive feelings about school. They believe that learner-centred practices effectively meet student needs within the current educational agenda.

Keefe (2007), from an organizational perspective, notes that a personalized school's organizational structure should be based on "knowledge work" where students are active learning apprentices; where teachers design high-quality work and become learning facilitators and performance coaches; and where students and teachers collaborate in decision making. Schools should be organized to have learning centres or areas where students can pursue personal research, work as self-paced learners, fulfill educational contracts and participate in small groups.

Hargreaves (2006) argues that current practices must be changed to allow schools to support personalized learning. Chief among them is changing curriculum. He believes school curriculum should allow students to have ownership and to engage the challenges young people crave. Current "tight" curriculum is based on a policy of accountability (tight curriculum matched with standardized assessment). However, an accountability framework does not necessarily support the development of meaningful personalized learning.

To better encourage learning, especially for limited English language learners, Bansberg (2003) outlines the critical factors that facilitate literacy: classroom environment, instructional strategies and assessment that targets individual student needs. Bansberg notes that the American Psychological Association's learner-centred principles support the focus on individual needs; on active, engaging learning; on providing students with the locus of control in terms of student choice and voice; and on encouraging ongoing learner assessment. These principles provide a framework for the development of curriculum that attends to student needs, and in the context of literacy sets the context for "providing the types of instructional environments that can facilitate high levels of learning, motivation and achievement for diverse learners" (p. 150).

Curriculum development can be further enhanced by the Universal Design for Learning (CAST, n.d.), a conceptual framework that aims to provide all students with access to relevant and meaningful learning experiences that can be tailored to meet the learning styles, preferences and needs of students. The premise behind the framework is to design learning experiences through recognition networks ("the what of learning"), strategic networks ("the how of learning") and the affective networks ("the why of learning"). Many years of research and design work led by CAST provides guidelines for curriculum developers to consider three key areas for improved learning for all: Multiple Means of Representation, Multiple Means of Action and Expression, and Multiple Means of Engagement.

Flynn (2006) notes that what is currently called the core curriculum (or distribution requirements) needs transformation. At the heart of change taking place in the undergraduate experience to prepare graduates for a new workplace, is the construction of an undergraduate experience that is transformative. There is a sense that "transformative" means transformed from X to Y, where X is a passive, "not-responsible-for-knowledge" learner (Kindergarten to Grade 12) to an active, "responsible-for-their-knowledge" multidimensional learner (undergraduate/graduate student). Perhaps these two poles are extreme, but they represent the insight many people have about education in general. Current models of undergraduate education are based on epistemology, methodology and instructional paradigms focused on transferring information and assimilating knowledge. In the face of technological transformation that has accelerated and created more complex problems, the response has been an attempt to keep up with accelerated information transfer by covering more or different content. Bransford, Brown and Pellegrino (2000) note that too often current curricula focus on memory rather than learning, leaving students with constrained opportunities to understand or fully grasp topics.

Harris and Cullen (2009) call for a re-evaluation of the epistemology of (undergraduate) education toward learner-centred curriculum. They note that the American Psychological Association's principles about learners and the learning process, which underpin much of learner-centred pedagogy, are now "widely shared and implicitly recognized in many excellent programs found in today's schools." They believe pedagogy itself won't assure institutional shift toward learner-centeredness but that all processes within an institution must be examined and reconsidered to fit a learner-centred paradigm.

In summary, the portrait of student-centred/personalized learning is large and diverse. This chapter suggests a need to broaden what, when, where, how and at what rate students achieve learning outcomes. Student-centred/personalized learning needs to provide high-quality, engaging learning opportunities that meet the diverse needs of all learners, have flexible timing and pacing, and include a range of learning environments, supports and services tailored to meet learner needs.

There needs to be a greater emphasis on assessment for learning that includes ongoing exchanges of information between students and teachers about student progress toward clearly-specified learner outcomes. Assessment can play a large role in helping students progress in a student-centred/ personalized learning environment. In this environment, students usually take examinations and tests when they are ready and not necessarily according to a pre-set schedule. Personal comprehension in these settings is more important than accumulating grades for one's report card. Teachers provide feedback to students while thoroughly reviewing their test and assignment results. Students are given a chance to redo unsatisfactory tests and assignments in order to bring their work up to a satisfactory level. Students only compete with themselves. Assessment in student-centred/ personalized learning can take on many forms, such as presentations, project exhibitions, musical recitals, art shows and demonstrations of various types (Jenkins & Keefe, n.d.)

Personalized learning can be achieved by building relationships within and among multidisciplinary learning teams to ensure a holistic approach to student success. Consideration is given to differentiation that helps students pursue chosen learning and careers. Students and teachers are supported by robust learning and assessment resources that address a range of learning environments and accommodate diverse backgrounds, abilities, cultural perspectives and personal interests. Too often the implementation of new pedagogy is accompanied by traditional assessment strategies; most often they are totally incompatible. Shareski (2005) asks an interesting question, "In keeping with the spirit of personalized learning should we not consider personalized assessment?" (p. 1). Although there is no simple answer, Shareski does provide some ideas worth considering. He suggests that most learning situations require certain outcomes and expectations and, therefore, it would be beneficial if teachers and students could negotiate the processes, content and product of the learning. A second idea put forward by Shareski is that students should be given some opportunity to determine weighting in regards to their grades. Students could, within an agreed-upon range, place varying emphasis on assessments that were indicative of their effort, energy and time.

In curriculum development, attention needs to be paid to students' ability to progress at a pace suited to their needs that will enhance their success. They need to have the opportunity to build on individual strengths and achievements, pursue their passions and interests, and learn in ways consistent with their individual learning styles. An important facet of this is that barriers to learning are reduced to allow flexible instruction and schedules. As such, for student-centred/personalized learning to take shape, it is important to provide curriculum choice.

This is reiterated clearly by West-Burnham (2010):

> The choice of what is to be studied is fundamental to any model of personalized learning if its potential is to be realized and it is to move beyond a cosmetic exercise. This is not to imply an 'open market' approach but rather guided opportunities, according to age and ability, to design personal pathways which are challenging, relevant and significant. In practice this might mean:
>
> - a focus on themes and ideas rather than progression through information
> - cross-curricular themes and integrated approaches to significant events …
> - the development of personal pathways following specific gifts and special needs
> - accessing the curriculum in a variety of ways; e.g., in school, online, studying a specialist option, in other schools and colleges, from employers and universities
> - learning through community engagement and through employment projects (p. 15).

West-Burnham (2010) goes on to describe the implications of such an approach to include the importance of systematic and detailed analysis of students' needs and interests to plan appropriate learning pathways; developing programs of study that focus on learning skills and less on content; and providing students with approaches that allow for deeper learning and flexibility in timing.

Anderson (2011) believes today's technologies can enable personalized learning experiences. She notes the importance of deep learning and the multiple exposures to the same content required, including sufficient time to reflect on what has been learned. She suggests leveraging the Internet/web to foster personalized learning through what she calls a "SOCRAIT" learning system, involving a personalized learning system of questions and answers driven by individual goals. Students create their own "library" of information and their questions become the organizing tool for further learning. Anderson's personalized learning system could look something like a social media page where recommendations for further reading and other topic areas for study are based on recent inquiries and previous student research. Students would not work through the same information or subject area at the same time. Classrooms would not be dictated by age or grade level but rather by common interest areas and levels of study.

In this vein, students and parents should be able to access a variety of learning experiences that include and extend beyond traditional education, including face-to-face, distributed and community-based learning, and students should be availed of opportunities to choose a blended approach to meet their personal needs. In a student-centred/personalized learning scenario, students contribute to diverse learning communities where social learning and developing and sharing knowledge is central to their experience. Digital technologies and community-based activities can enrich learning and help students apply learning to real-life contexts. These notions need to be built not only into curriculum but pedagogy as well.

As Murgatroyd (2011) succinctly notes, personalized learning could mean, for example:

- rethinking what learning needs to look like, so that it is focused on what is meaningful to students and challenges both their minds and hearts
- more student choice in how a high school diploma is attained or the option is given to have several high school diplomas
- assessments that are available at "any time and every day of the year" so that students may have greater flexibility in their pace of learning as it relates to learner outcomes
- more choice for students and awareness of the consequences of these choices in terms of their academic and work-related futures
- recognition of credentials from other education programs (post-secondary or work-related) to enhance the learning experience.

These implications, among others, warrant a look as to how learner outcomes, assessment practices and learning and teaching resources will need to change in order to be able to achieve this tall order.

BIBLIOGRAPHY

Alberta Education. (2010). *Inspiring action on education*. Retrieved from https://ideas.education.alberta.ca/media/2905/inspiringaction%20eng.pdf

Anderson, M. (2011). The world is my school: Welcome to the era of personalized learning. *The Futurist, 45*(1), 12–17. Retrieved from http://teachingcollegemath.com/files/pdf/jf2011_andersen.pdf

Association of American Colleges and Universities. (2004). *Our students' best work: A framework for accountability worthy of our mission. A statement from the board of directors of the Association of American Colleges and Universities.* Washington, DC. Retrieved from http://uncw.edu/cas/documents/AACUOurStudentsBestWork.pdf

Bansberg, B. (2003). Applying the learner-centered principles to the special case of literacy. *Theory into Practice, 42*(2), 142–150.

Barnes, J. (2010). The GENERATE project: Curricular and pedagogical inspiration from parents and their children working together. *Improving Schools*, *13*(2), 143–157.

Bransford, J., Brown, A. L., & Pellegrino, J. W. (2000). Learning and transfer. In J. D. Bransford, A. L. Brown & R. R. Cocking (Eds.), *How people learn: Brain, mind, experience, and school* (pp. 51–78). Washington, DC: National Academies Press. Retrieved from http://www.nap.edu/openbook.php?record_id=9853&page=51

Carney, S. (2008). Learner-centred pedagogy in Tibet: International education reform in a local context. *Comparative Education, 44*(1), 39–55. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/03050060701809417

Carreiro King, I. (2003). Examining middle school inclusion classrooms through the lens of learner-centered principles. *Theory into Practice*, *42*(2), 151–158.

CAST. (n.d.). About UDL. Retrieved from http://www.cast.org/udl/index.html

Childress, H. (2006). A subtractive education. *Phi Delta Kappan, 88*(2), 104–109.

Cramlington Learning Village. (2011). Where the art of teaching meets the science of learning. Retrieved November 24, 2011, from http://www.cramlingtonlv.co.uk/AboutCLV/TeachingLearningModel.php

Daniels, D., & Perry, K. (2003). "Learner-centered" according to children. *Theory into Practice, 42*(2), 102–108.

Darling-Hammond, L. (1996). The right to learn and the advancement of teaching*:* Research, policy and practice for democratic education. *Educational Researcher, 25*(6), 5–17.

Delaney, J. G. (1999). *What are learner-centred schools?* Faculty of Education, Memorial University of Newfoundland. Retrieved from http://www.mun.ca/educ/faculty/mwatch/vol1/delaney2.html

Easton, L. B., & Soguero, M. (2011). Challenging assumptions: Helping struggling students succeed. *Phi Delta Kappan*, *92*(5), 27–33.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34,* 906–911.

Flynn, V. (2006). Developing tomorrow's chief technology officers. *Information Systems Education Journal, 4*(19), 1–9. Retrieved from http://isedj.org/4/19/

Grabelle, S., & Littky, D. (2004). *The big picture: Education is everyone's business*. Alexandria, VA: Association for Supervision and Curriculum Development.

Hargreaves, A., & Shirley, D. (2009). *The fourth way: The inspiring future for educational change*. Thousand Oaks, CA: Corwin.

Hargreaves, D. H. (2006). A new shape for schooling? London, England: Specialist Schools and Academies Trust.

Harris, M., & Cullen, R. (2009). A model for curricular revision: The case of engineering. *Innovative Higher Education, 34*(1), 51–63. Retrieved from http://www.springerlink.com/content/412427707724v186/fulltext.pdf

Jenkins, J. M., & Keefe, J. W. (n.d.). Two schools: Two approaches to personalized learning. Retrieved from http://curriculumreform.wikispaces.com/file/view/Two+Approaches+to+Personalized+Learning.pdf

John J. Heldrich Centre for Workforce Development. (2010). *New Jersey department of education personalized student learning plan pilot program, 2009–2010 evaluation report*. Trenton, NJ: Rutgers. Retrieved from http://www.state.nj.us/education/sboe/meetings/2010/November/public/PSLP_Evaluation_Report.pdf

Jones, M., McClure, L., & Yonezawa, S. (2010). Can school structures improve teacher-student relationships? The relationship between advisory programs, personalization and students' academic achievement. *Education Policy Analysis Archives*, *18*(17), 1–17.

Keefe, J. W. (2007). What is personalization? *Phi Delta Kappan*, *89*(03), 217–223.

Keefe, J. W., & Jenkins, J. M. (2002). Personalized instruction. *Phi Delta Kappan, 83*(6), 440–448.

Leadbeater, C. (2005). *The shape of things to come: Personalised learning through collaboration*. Nottingham, England: Department for Education and Skills. Retrieved from http://www.education.gov.uk/publications/eOrderingDownload/STC%5B1%5D.pdf

McCombs, B., & Weinberger, E. (2003). Applying the LCPs to high school education. *Theory Into Practice, 42*(2), 117–126.

McRae, P. (2010). The politics of personalization in the 21st century. *ATA Magazine, 91*(1). Retrieved from http://www.teachers.ab.ca/Publications/ATA%20Magazine/Volume-91/Number-1/Pages/The-Politics-*of*-Personalization-in-the-21st-Century.aspx

Meece, J. (2003). Applying learner-centered principles to middle school education. *Theory into Practice, 42*(2), 109–116.

Miliband, D. (2004). Personalised learning: building a new relationship with schools. North of England Education Conference, Belfast (speech delivered January 8, 2004). Retrieved from https://www.education.gov.uk/publications/standard/publicationdetail/page1/PERSONAL-LEARNING

Murgatroyed, S. (2011). *Rethinking education, learning and the new renaissance*. Edmonton, AB: FutureThink Press.

Paludan, J. P. (2006). Personalized Learning 2025. OECD, Centre for Educational Research and Innovation. Retrieved from http://www.oecd.org/dataoecd/51/59/41176429.pdf

Pearlman, B. (2009). Making 21st century schools–creating learner-centered schoolplaces/workplaces for a new culture of students at work. *Educational Technology*, September–October, 14–19. Retrieved from http://www.bobpearlman.org/Articles/ET%20Bob%20Pearlman%20article.pdf

Peters, M. (2009). Personalization, personalized learning and the reform of social policy: The prospect of molecular governance in the digitized society. *Policy Futures in Education*, *7*(6), 615–627. Retrieved from http://dx.doi.org/10.2304/pfie.2009.7.6.615

Prapaisit de Segovi, L., & Hardison, D. M. (2009). Implementing education reform: EFL teachers' perspectives. *ELT Journal, 63(*2), 154–162.

Robinson, C., & Sebba, J. (2009). Personalising learning through the use of technology. *Computers and Education*, *54*(3), 767–775.

Samah, N. A.; Yahaya, N., & Ali, M. B. (2011). Individual differences in online personalized learning environment. *Educational Research and Reviews, 6*(7), 516–521.

Sebba, J., Brown, J., Steward, S., Galton, M., & James, M. (2007). *An investigation of personalised learning approaches used by schools*. Nottingham, England: Department for Education and Skills. Retrieved from http://www.canterbury.ac.uk/education/tf-mentors/ActivitiesforMentoring/Personalised/documents/DfESReport.pdf

Shareski, D. (2005). Personalized assessment. Retrieved from http://ideasandthoughts.org/2010/06/05/personalized-assessment/

Specialist Schools and Academies Trust. (2010). Personalizing learning 1. Retrieved from http://www.sst-inet.net/whatwedo/personalisinglearning.aspx 2010

Suarez, D. (2007) When students choose the challenge. *Educational Leadership*, *65*(3), 60–65.

United States Department of Education. (2010*). National education technology plan 2010: Executive summary*. Retrieved from http://www.ed.gov/technology/netp-2010/executive-summary

van Harmelen, M. (2006). Personal learning environments. Sixth IEEE International Conference on Advanced Learning Technologies (ICALT'06). Retrieved from http://www.cs.man.ac.uk/~mark/PLEs_draft.pdf

West-Burnham, J. (2010). *Leadership for personalising learning.* Nottingham, England: National College for Leadership of Schools and Children's Services. Retrieved from http://barrierbreakers.co.uk/wp-content/uploads/2011/01/2010-Leadership-for-personalising-learning.pdf

Wolf, M. A. (2010). *Innovate to educate: System [re]design for personalized learning: A report from the 2010 symposium*. Washington, DC: Software and Information Industry Association. Retrieved from http://siia.net/pli/presentations/PerLearnPaper.pdf

Wolk, R. (2010). Education: The case for making it personal. *Educational Leadership, 67*(7), 16–21.

CHAPTER 9: ASSESSMENT

"… institutional assessment efforts should not be concerned about valuing what can be measured but, instead, about measuring that which is valued."

Banta et al. (1996)

Schools are interesting places. There is teaching and learning, but how does one know whether teaching and learning have actually happened? Further, how do teaching and learning impact each other? These are complex questions.

Because the process of learning is extremely complex, it is important that a well-rounded assessment system provides evidence as to whether a student benefited from instruction and what changes might enhance that student's learning. Specifically, this well-rounded assessment system needs to provide the best evidence that learning has occurred. According to the Wisconsin Response to Intervention Center (n.d.), this type of assessment system helps answer these four questions:

1. What do we expect all students to be able to know and do?
2. How do we know if students are meeting the expectations?
3. What do we do if students are not meeting expectations?
4. What do we do if students exceed expectations?

To set the context for assessment, the Wisconsin Department of Public Instruction Office (2009, p. 1) notes that assessment provides information about how well students are progressing toward curriculum standards. Curriculum *standards* (learner outcomes in programs of study) define what students should know and do. Curriculum (programs of study) defines a body of learning experiences designed to reach given learner outcomes. Instruction provides specific learning experiences and ways to differentiate those experiences to scaffold student learning. Assessment gauges the attainment of learning to inform instructional practices and curriculum. A systematic approach to assessment includes strategies within a range of frequency and purpose.

The Wisconsin Department of Public Instruction Office (2009) also notes the following:

- *Formative assessment* or assessment *for* learning *is a continuous process, occurring during a lesson and* between lessons, and is used to make adjustments or changes in instructional strategies as well as to give students frequent and meaningful performance feedback. Formative assessment includes a variety of strategies, such as teacher observations, discussions, questioning for understanding and, often, class work that is not given a formal grade. Formative assessment shapes the next steps in student learning.

- *Benchmark assessment* occurs within, between and among instructional units and is used to identify strengths and gaps between learner outcomes and instruction. As a result of information gathered from the assessment on student progress, grade-level learning outcomes may be modified. Benchmark assessments can be developed by teachers, by the school district level or produced commercially. Benchmark assessment determines the degree to which student groups are progressing or the degree to which a program of studies is meeting the needs of students.

- *Large-scale assessment can* occur on an annual basis or at specific intervals (e.g., every two years) and is used to develop long-term, strategic evaluation plans regarding the effectiveness of programs of study (learner outcomes). Data is gathered so as to identify trends as well as to monitor performance at the provincial/territorial, school district and school levels. Assessment instruments are standardized to allow for comparisons across student groups. Large-scale assessments determine the degree to which schools, districts and provinces/territories are demonstrating successful learning (p. 1).

Each assessment strategy provides a different perspective and together the strategies provide a well-rounded approach to assessment that informs classroom, school, district, provincial and national decision making related to student learning.

The following sections describe what an assessment system could look like, generally and specifically, within the context of the assessment of competencies.

THEORETICAL FOUNDATIONS

Assessment Systems

Rothman's (2010) article notes that "assessment has long been at the centre of education policy debates, and for good reason" (p. 1). The goal of schooling is to maximize student learning with assessment providing a snapshot of what students know and can do. The purpose of assessment is to inform parents and students about student progress and to certify whether students have met standards to advance to the next grade or to graduate from school. There is concern, however, that the most prominent standardized assessments currently being used, especially in the United States, are inadequate and may have significant, if not negative, impact on student learning. Because these tests can only measure a limited range of knowledge and skills, they provide inaccurate and often incomplete pictures of student knowledge and abilities. For example, *end-of-year* tests are generally administered in a single setting where students sit for an hour or two and answer test questions in a booklet. Unfortunately, tests of this nature exclude project work and other activities, such as essay writing, that might take days or weeks to complete. These latter activities are of equal importance in knowing if students can apply knowledge to solve complex problems, communicate understandings or reflect on their performance—all very important skills, yet seldom measured by classroom or standardized tests.

No test can fulfill the information needed for all stakeholders. As such Rothman (2010) suggests a comprehensive system of coherent and cohesive assessments that are aligned to performance standards for post-secondary or career readiness is required. Without strong assessments, Rothman believes work to raise performance standards will fail. Students, parents, teachers, community members and public officials all need valid and reliable information to strengthen teaching and learning.

Rothman (2010, pp. 3–6) outlines the organizing principles of a good assessment system:

Coherence: A good system aligns curriculum, instruction and assessment around key learning goals. Alignment is critical to standards-based reform. A coherent system organizes around a small number of big ideas, rather than attempting to align all pieces to every standard.

Comprehensiveness: A good system consists of a *toolbox* of assessments that meet different purposes and provides users with information to make decisions. It would include measures to show if students are attaining the important knowledge and skills they should learn.

Accuracy and Credibility: A good assessment system should be grounded in clear, evidence-based ideas about learning and development that lead to post-secondary and career readiness.

Fairness: A good assessment system enables *all* students to demonstrate what they know and can do.

Darling-Hammond and Pecheone (2010) echo many of Rothman's ideas about formative and summative assessment regarding the integration of curriculum that is designed to support high-quality, coherent instruction. Their priorities include:

1. Assessment should be grounded in a thoughtful, standards-based curriculum and managed as part of an integrated system of standards, curriculum, assessment, instruction and teacher development.
2. Assessment should include evidence of actual student performance on challenging tasks that evaluate standards of 21st century learning.
3. Teachers should be involved in developing curriculum and scoring assessments.
4. Assessment should be structured to continuously improve teaching and learning. Assessment *as*, *of* and *for* learning should be included.
5. Assessment systems should emphasize the validity and quality of external assessment, with a primary aim to drive high-quality learning of intellectual skills, such as critical thinking or problem solving.
6. Assessment and accountability systems should use multiple measures to evaluate students and schools.
7. Assessment and accountability systems should be used primarily for information and improvement.

Darling-Hammond and Pecheone (2010) also provide a *theory of action*—a belief that an integrated system of curriculum and assessment (both formative and summative) should provide tests worth teaching to and should support high-quality, coherent instruction. They believe assessments should evaluate student work and reasoning, support transferable learning and teaching and, most importantly, provide information to teachers and students. Their *theory of action* includes:

- Summative tests that assess student progress and mastery of core concepts and critical skills using a range of formats, including selected and constructed response items and performance tasks designed to assess the full range of curriculum standards/learner outcomes.
- Formative assessment tools and supports, shaped around curriculum guidance that includes learning progressions.
- Focused professional development of curriculum and lesson development as well as scoring and examination of student work.
- Reporting systems that provide first-hand evidence of student performance (beyond scores), as well as aggregated scores by dimensions of learning, types of students, schools and districts.

Darling-Hammond (2010b) describes what assessment systems could look like if they were based on current educational research and best practices in educational assessment. She highlights the principles that should be associated with student assessment systems and outlines common elements of effective assessment systems in the United States and other countries. Darling-Hammond (2010b, p. 1) suggests that student assessment systems should do the following:

- address the depth and breadth of standards as well as all areas of the curriculum, not just those that are easy to measure
- consider and include all students as an integral part of the design process, anticipating their particular needs and encouraging all students to demonstrate what they know and can do
- honour the research indicating that students learn best when given challenging content and provided with assistance, guidance and feedback on a regular basis
- employ a variety of appropriate measures, instruments and processes at the classroom, school and district levels, as well as at the state [provincial] level. These include multiple forms of assessment and incorporate formative as well as summative measures
- engage teachers in scoring student work based on shared targets.

Darling-Hammond (2010b, pp. 3–5) reports that an analysis of common elements of effective assessment systems in the United States and abroad reveals several key themes:

1. The student assessment process is guided by common standards and grounded in a thoughtful, standards-based curriculum. It is managed as part of a tightly integrated system of standards, curriculum, assessment, instruction and teacher development.

2. Balance of assessment measures should include evidence of actual student performance on challenging tasks that evaluate applications of knowledge and skills.
3. Teachers are integrally involved in the development of curriculum and the development and scoring of assessment measures for both the on-demand portion of state (provincial) or national examinations and local tasks that feed into examination scores and course grades.
4. Assessment measures are structured to continuously improve teaching and learning.
5. Assessment and accountability systems are designed to improve the quality of learning and schooling.
6. Assessment and accountability systems use multiple measures to evaluate students and schools.
7. New technologies enable greater assessment quality and information systems that support accountability.

She also presents responsibilities of the federal government, states, districts and schools in the proposed assessment system, and describes how a new assessment system might be developed. Darling-Hammond believes new assessment systems must be designed to improve and inform learning, not just measure student progress. The Council of Chief State School Officers' white paper on comprehensive assessment systems to support high-quality learning (Darling-Hammond, 2010b) calls for assessment systems to support multiple purposes, at different levels of the educational enterprise, and to include multiple forms of assessment, incorporating formative and summative measures.

Stiggins (2006) also outlines a vision for the future of assessment that informs educational decisions at all levels and helps all students learn. He argues for profound changes in assessment to create a more well-rounded assessment system, which includes reshaping assessment priorities and redefining the relationship between assessment and effective schooling. He identifies components essential to bring about this assessment vision and explains how each will affect school achievement and school effectiveness. These components include:

- balancing summative with formative applications and large-scale with classroom assessment
- judging assessment quality by the results of learning and learners
- creating assessments that provide descriptions of student learning and help students improve.

Stiggins (2006) argues that assessments must be transformed from isolated to ongoing events in order to be truly effective. He defines assessment as the process of collecting and interpreting information useful for informing students and their parents/guardians, where applicable, about the progress they are making toward attaining the knowledge, skills, attitudes and behaviours to be learned or acquired and for informing those who make educational decisions.

Herman (2010) contends that coherent assessment improves teaching and learning. Assessment should not be viewed as a single event but rather as a coherent system of measures. Coherency involves horizontal, vertical and developmental alignment of assessments to serve classroom, school and district improvement. Coherence starts with a clear specification of the learning goals to be measured and the design of assessment tasks to reflect these specific goals.

Herman (2010) explains that *horizontal coherence* involves aligning learning goals, instruction and assessment. *Vertical coherence* involves making sure results provide relevant information for decision makers at school, district and provincial levels, and that data actually informs changes that lead to improved student achievement. Classroom-level assessments need to be ongoing and formative to determine the implications for next steps in the learning process. School or district assessments should be periodic to determine aspects of the system, such as professional development needs or curriculum revision. Assessment data can be used to determine how students are performing, curriculum strength and promising practices. Assessment at all levels, however, should reflect a common definition of student learning and reinforce the system's key goals.

The Alliance for Excellent Education (2010) views assessment as a crucial aspect of classroom curriculum and teacher practice. As such, the United States government is in the process of developing national common core standards for all core subject areas, including literacy. These standards will outline what it means to be ready for the world of work and post-secondary studies. This work includes setting future guidelines for assessment as it is felt that current assessment systems do not measure the full range of skills and competencies required of students. They "provide at best a blurry snapshot of student and school performance" (p. 1). These standards are a response to the belief that current assessment procedures are inadequate and may have a negative impact on student learning.

The Alliance for Excellent Education (2010) reports that assessment, since its inception in schools in 1840, has played a multitude of roles in American schools. Assessment was used to inform the public about the effectiveness of state schools and to hold schools accountable for their efficiency and effectiveness. Assessment informs parents of student progress and their readiness to advance in the school system, is used by teachers to see if their students are learning, and helps school jurisdictions determine the effectiveness of teachers. No one disputes the importance of these reasons for testing; however, there is a generally-accepted feeling that current assessment practices cannot serve all of these purposes. The metaphor of a wheel is used to explain what a proposed new assessment system might look like.

> … at the hub are the common core standards, and the spokes include summative assessments, formative assessments, curriculum tasks, instructional tools and professional development. In such a system, assessments are not separate and apart from classroom instruction, they are integral to it. All forms of assessment provide an ongoing information loop to teachers, school leaders, parents, policy makers and the public (Alliance for Excellent Education, 2010, pp. 2–3).

The Alliance for Excellent Education (2010) suggests that assessment systems should meet the following criteria: 1) match learning goals (assessment tasks should match learning goals); 2) use clarity in reporting (reports should be designed to allow different audiences to develop next steps); 3) use technology (technology can be used to make more efficient assessments); and 4) engage teachers (assessment can be strengthened by involving teachers in its development and use).

In the book titled, *Ahead of the Curve*, Reeves (2007) reviews the challenges of classroom and system assessment. Reeves' book examines effective assessment design and implementation, and notes that the basic purpose of assessment is not to rate, rank and sort students but to provide meaningful feedback that helps improve student performance. Reeves points out that assessment is most productive when it supports rather than simply measures learning.

Types of Assessment

In a look to the past, Guskey (2005) revisits the work of Benjamin J. Bloom to look at the problem of achievement gaps among different subgroups of students, a notion that has plagued education for years. He describes Bloom's belief that a reduction in student achievement gaps requires increasing the variance in how students are taught as well as the time allocated to learning. According to Guskey (2005), "Bloom emphasized that reducing variation in students' achievement does not imply making all students the same" (p. 5). Rather, Bloom believed that student achievement could be increased if students' individual learning differences were better met through differentiated instruction and assessments; i.e., that assessment tools would not only be used to assess students but would also be used to help them learn better. According to Guskey (2005, p. 3), Bloom coined the term *mastery learning* to describe the notion of feedback as a means of diagnosing students' learning difficulties and applying procedures to improve learning (remediation) with the ultimate goal of reducing the gaps between low achievers and high achievers.

As Wiggins (2006) states, "The point of assessment in education is to advance learning, not to merely audit absorption of facts" (para. 1). *Authentic assessment* can provide useful feedback and significant gains on conventional tests because it provides useful feedback as the tasks are more realistic. By *authentic assessment,* Wiggins means "performances and product requirements that are faithful to real-world demands, opportunities and constraints. The students are tested on their ability to 'do' the subject in context [and] to transfer their learning effectively" (para. 4). The best assessments educate learners by offering feedback. Feedback is extremely important because "improving the quality of classroom feedback offers the greatest performance gains of any single instructional approach" (para. 6). Wiggins pushes for a paradigm shift, where assessment is more than a measure of what students know—it is a way to improve instruction and learning.

Wiliam (2006) suggests that assessment should provide information to be used by both students and teachers to ensure that learning is kept on track. Wiliam identifies five strategies that allow assessment to help, rather than hinder, learning. These strategies are as follows:

1. Develop and use learning activities (e.g., discussions, questions, tasks) that elicit evidence of student learning during regular lessons. Appropriate activities will help teachers discover where students are in their learning. Planning such activities takes time but, when used properly, these activities will help teachers size up learning situations easily and keep student learning on track.

2. Provide feedback that moves learning forward. To have a positive impact on learning, feedback must not just inform students what to do to improve, but must also inform them of how to go about it.

3. Clarify and share learning intentions and success criteria with learners. Learning can be promoted by ensuring students understand the learning intentions and that what is assessed counts toward successful learning.

4. Make students own their own learning. Too many teachers fall into a trap of trying to create learning when, in fact, only learners create learning. Students need to be helped to own their learning "to the extent that they can self-manage both their emotional and their cognitive responses to challenges, so that all their energies are spent on developing capability rather than disguising its absence" (p. 6).

5. Encourage students to be learning resources for each another. This strategy has been shown to be significantly successful when two conditions have been met: 1) the learning environment has group goals so students are working as a group and just not in a group; and 2) there must be individual accountability so that each student is responsible for his or her contribution to the whole.

Guskey (2007) defines different assessment practices that currently are being used. Proponents of *authentic assessment* use multiple assessment sources for evaluation and strive to measure student and program success in innovative ways. Authentic assessment focuses on obtaining information about what each student knows and can demonstrate, and it can be used effectively for all students. *Effective assessment* (evaluation) is a continuous process integrated into all curriculum areas to give students and teachers data to assess and improve student learning and interpret the effectiveness of the materials, instructional strategies and teaching methods employed. Many evaluation tools are required to make accurate assessments of materials, strategies and learning within the classroom.

Authentic assessment is more than creating, administering, grading and recording the test, and then returning it to the student. Authentic assessment aids learning and is an important ingredient in inclusive classrooms. When implementing authentic assessment, students are empowered to integrate their learning, utilize higher-level thinking and problem solving and evaluate the goals they have accomplished through reflection and self-assessment.

Burke (2010) believes formative and summative assessment complement each other, and teachers need to work together to plan instruction and create common assessments. He believes that authentic performance tasks make curriculum more engaging, that checklists and rubrics should be used for instruction and assessment, and that instruction should be differentiated. Darling-Hammond (2010b) adds that assessment should occur within a coherent teaching and learning system. She believes school and government reform is needed to achieve this shift.

In a review of requirements for assessment *for* learning and assessment *of* learning, Crooks (2011) outlines tensions between these two assessment purposes. He discusses the nature of *assessment for learning* in New Zealand's primary schools and the impact of accountability pressures from assessment *of* learning. He also discusses how assessment *for* qualifications works in secondary education, noting how assessment *of* learning occurs both within schools and at the national level. He suggests that, because assessment *of* learning is associated with accountability pressures, it creates learning conditions different from assessment *for* learning. Nichols, Meyers and Burling (2009) argue, however, that formative assessment includes using test score information to inform teacher classroom behaviour.

Keeley (2011) believes formative assessment, often called assessment *for* learning, primarily exists to promote learning. Formative assessment is embedded in different stages of instruction, informs teachers about the best next instructional steps and engages students in thinking about their own ideas. Keeley highlights a form of formative assessment successfully used in science education—the *probe*—and describes how elementary science teachers might use probes to build their formative assessment repertoire and improve teaching and learning. *Probes* are formative assessment questions used to discover whether students understand key concepts or whether they fall victim to common misconceptions.

Bennett (2011) reviews several issues related to formative assessment, which include the definition of formative assessment; claims made for its effectiveness; the under-representation of measurement principles; and the impact of the larger educational system. He suggests that the term "formative assessment" is not well-defined in practice. Although research finds that formative assessment can facilitate learning, definitions of formative assessment are too broad to fully understand how formative assessment impacts all students. In addition, Bennett believes quantitative claims for the effectiveness of formative assessments is derived from untraceable, flawed, dated or unpublished sources. Bennett believes that in order to benefit from formative assessment, work must be done to conceptualize specific processes and methods, to use fundamental measurement principles that help teachers and students recognize the inferential nature of assessment, and to allow substantial time and professional support for teachers to become proficient at developing and carrying out formative assessments. Formative assessment approaches need to be conceptualized as part of a larger system in which all components, including summative assessment, work together to facilitate learning.

The notion that not all the forms of assessment have the same impact on learners is discussed in the Organization for Economic Co-operation and Development (2005) *Policy Brief: Formative Assessment: Improving Learning in Secondary Classrooms*. It notes a general distinction between assessment to promote learning (formative) and assessment to certify learners (summative). Formative assessment, through the literature, involves a cycle composed of three levels:

1. **Observation:** the role of this stage is to construct a reality of learning, conditions, modalities and their results. Observation helps discover learner knowledge and skills, rather than comparing them to other learners on some scale.

2. **Intervention:** it separates the symptoms that need to be addressed from the sources of the difficulties. It involves analyzing metacognitive knowledge. To be useful, the observer must identify and isolate mental functions or specific actions and identify their weaknesses.

3. **Regulation:** the concept of regulation has been developed to describe the mechanisms that provide guidance, control and the adjustment of cognitive, emotional and social activities as well as their relationship with a learner.

Individualization involves an optimal path in learning, which requires the use of a device for feedback that reflects the current state of the learner in relation to a competency. Implementing formative assessment requires modelling skills as an operational viewpoint. Paquette (2002) presents modelling skills in which competency is defined as a relation linking three areas:

1. **Knowledge:** may be concepts, procedures, principles or specific events to define the performance of a role or task. Knowledge is related to an area that qualifies for domain knowledge.

2. **Skills:** describe the processes that can be applied to domain knowledge to perceive, remember them, and assimilate them to analyze, synthesize or evaluate. These processes are, in fact, "meta-processes," which present a generic domain independent of the application. These skills have been subject to taxonomies shaped into cognitive, affective and motor.

3. **Public Target:** description of actors, their characteristics, their functions and tasks.

With a current push toward educational reform, a great potential exists for innovation and change in large-scale testing. Leighton and Gierl (2007) identified how large-scale educational tests created for Kindergarten to Grade 12 students could be improved to produce better information about what these students know. Leighton and Gierl integrate psychological research into educational test design in an effort to create test items that students could better understand. The new test items helped identify where students may be experiencing learning difficulties. They note an area of possible change in cognitive diagnostic assessment and believe that educational measurement and cognitive psychology researchers are in a position to design tests that provide specific and valuable information about students' cognitive strengths and weaknesses. Their work reviews cognitive diagnostic assessment in education, conceptually and philosophically, and outlines its methods and applications. They outline concepts, such as construct validity, test construction and statistical models, and outline unresolved issues in the area of test construction.

Assessment of Competencies

Idrissi, Bennani and Hachmoud (2009) reviewed literature that provides an overview of the competencies-based approach. They provide the following definition of competence: Competence is the implementation by a person, in a given situation and in a context, of a set of diversified and coordinated resources. This implementation is based on the selection, mobilization and organization of these resources and the relevant actions that these resources allow for the successful treatment of this

situation (p. 1261). They also outline problems that hinder the adoption of a competency-based approach but suggest that competency-based models can help educators meet the following challenges: 1) the proliferation of knowledge, which the authors suggest invalidates any pedagogy based solely on the transmission of knowledge; 2) the need to offer significant learning that leads to authentic applications; and 3) the perceived relevance of what is being taught in schools.

The authors feel it is better that the knowledge being taught is contextual rather than textual and detached completely from usage. In addition, competency-based approaches help educators know what students know and their mastery levels of this knowledge. Common hindrances to the adoption of competency-based approaches are identified as concerns about: 1) the resources needed for learning and assessment situations; 2) changing the way teachers practise their profession; and 3) what the authors refer to as the "theoretical concept of competence" because its definitions "are expressed in a natural language, which may be subject to many interpretations that may involve ambiguities" (Idrissi, Bennani & Hachmoud ,2009, p. 1261). The authors note different understandings of competency and seek to clarify the practices and ambiguities around the concept of competence. They propose an ontology, which "defines concepts (principles, ideas, class of objects, potentially abstract concepts) and relationships" (p. 1262). A situation, for example, presents problems to solve, challenges to consider and constraints to overcome. Teaching a situation can be broken into tasks with different degrees of complexity, with processes to execute and products to be developed. A situation has a context that can be real with all its complexity or it can be a simple scope of practice for integration of a competence.

According to Hipkins (2007), there are three broad purposes for assessment—accountability and reporting, improving teaching and learning, and fostering lifelong learning. Although the first two purposes are familiar to teachers, the third is less well-known but becoming more important as lifelong learning becomes viewed as an essential aspect of life. Strengthening of key competencies is an important means of achieving it. The author believes that future learners will need greater exposure to cultures other than their own; electronic access to abundant information; changing patterns of work and social engagement; and communication methods unrestricted by time and place or the need to be physically present (p. 4).

QUALITATIVE AND QUANTITATIVE STUDIES

Assessment

A number of studies have researched assessment practices. The National Education Association (2005) calls for a balance among multiple assessment systems. The Association believes classroom assessment should interface with standardized testing to provide a substantial research base on the positive impact of effective classroom assessment.

Heritage (2010) reviews *The Race to the Top (RTTT) Assessment Program,* which is funded by two state consortia to develop new assessment systems that measure student skills against a common set of college- and career-ready standards in mathematics and English language arts.

In a specific study, James, Black, McCormick, Pedder and Wiliam (2006) investigated 40 primary and secondary schools on classroom conditions. They based the assessment for learning on three premises: 1) practices, which are likely to promote "learning how to learn," overlap with assessment for learning; 2) evidence for its effectiveness is derived from careful, small-scale experiments; and 3) learning how to learn practices were novel and would need to be stimulated within schools. The project examined how assessment for learning could be developed as an effective tool to help students learn how to learn. Most teachers implemented assessment *for* learning procedures to the letter, but only 20 percent did so in a way that helped students become more independent learners. The 20 percent of teachers who succeeded in communicating the "spirit" of assessment *for* learning: 1) believed strongly in the importance of promoting student autonomy and felt responsible for helping students become independent learners; 2) reassessed their own practice when things went wrong rather than blaming external factors (the examination system or the students' abilities); 3) communicated their own commitment to and confidence in the values of independent learning to their students, who in turn adopted them; 4) structured and sequenced learning tasks in ways that exhibited, what John Dewey termed, *high organizations based on ideas*; and 5) viewed nothing as fixed or beyond their control and communicated this empowering philosophy with students by the way they taught.

Advice on assessment *for* learning techniques was useful to teachers in the short term, but professional learning required teachers to re-evaluate their beliefs about learning, the ways they structured tasks and the nature of their classroom roles and relationships. Staff in the highest-scoring secondary school saw significant increases in *making learning explicit* and *promoting learning autonomy* and significant decreases in their practice of *performance orientation*. James, Black, McCormick, Pedder and Wiliam (2006) concluded that learning how to learn is highly contextualized and impossible to separate from learning *something*.

Parsons, McRae and Taylor (2006) experienced similar findings in Alberta, where interviews with head teachers and school coordinators showed that schools approached challenges in two ways: 1) through structural approaches epitomized by procedural mechanisms; and 2) via cultural approaches that, over time living in the same space, gradually infused change as teachers lived day-to-day in their classrooms.

Butler and Winne (1995) believed self-regulated learning is the pivot upon which student achievement turns. They believed feedback is inherent in and a prime determiner of processes that constitute self-regulated learning, and reviewed research that elaborates on contemporary models of how feedback functions in learning. Specifically, they synthesized a model of self-regulation based on contemporary educational and psychological literature, used that model as a structure to analyze the cognitive processes involved in self-regulation, and interpreted and integrated findings from disparate research traditions. They proposed an elaborated model of self-regulated learning that embraces research findings and spotlights the cognitive operation of monitoring as the hub of self-regulated cognitive engagement. The model was then used to re-examine: 1) recent research on how feedback affects cognitive engagement with tasks; and 2) the relation among forms of engagement and achievement. The authors proposed that research on feedback and research on self-regulated learning should be tightly coupled, and that the facets of the proposed model should be explicitly addressed in future research.

Blazer (2010) reviews research on computer-based assessments to summarize advantages and disadvantages associated with computer-based testing programs over paper-and-pencil assessments. Research suggests that most students experience few performance differences when multiple-choice tests are taken on computer versus paper. Research also indicates that the mode in which students take tests might impact their performance when demographic characteristics, computer skills, computer type, test characteristics, item type and content area are considered. Blazer reports that students with more computer skills receive higher scores on computer-based tests; that open-ended items might lead to performance differences between computer-based and paper-and-pencil tests; and that performance might decline when students are required to scroll through information on the computer screen to respond to questions. Blazer suggests that transitions from paper-and-pencil to computerized tests should be done cautiously.

Csapó, Ainley, Bennett, Latour and Law (2010) explored the contribution of information and communication technology on educational assessment. Improvements included: 1) efficiency in collecting and processing data; 2) precision of data collection; 3) the speed and frequency of feedback for participants; 4) improved authoring and storing of items; 5) possible types of assessment tasks; and 6) the availability of stimuli (audio, video, animation) without specialized equipment.

In their meta-analysis review of Alberta Initiative for School Improvement Cycle 3 projects, Townsend, Adams and White's (2010) respondents reported that assessment for learning encouraged the following changes in students' levels of engagement, confidence and learning: 1) student understanding of what they have to learn; 2) student responsibility for their own learning; 3) student uses of portfolios; 4) student participation in the development of rubrics and criteria; 5) the power of descriptive feedback; 6) the use of student exemplars; 7) student-led conferences; 8) the power of peer assessment; 9) the power of self-assessment; and 10) the untapped potential of parents.

Although their work was not specifically about assessment, Townsend, Adams and White (2010) found that members of successful project teams: 1) focused primarily on student learning as the key indicator of success; 2) enjoyed continuity of team leadership and team membership; 3) planned clear alignment between target students, teaching strategies and the measures applied to learner outcomes;(4) ensured they had sufficient time to practise and incorporate new teaching and assessment ideas; 5) developed shared language and shared understandings in purposeful ways; 6) aligned their professional development needs more carefully to the needs of target students; 7) applied the principles of evidence-based practice and collaborative inquiry to their Alberta Initiative for School Improvement work; 8) adapted principles of adult learning to their professional development activities; 9) used the same assessment *for* learning principles that guided their project success with students to inform their own professional learning; 10) were supported by district and school leaders who understood project goals and needs; and 11) fostered the support of students and parents who were active partners in the formation of project plans, strategies, measures and reports. They also found that the 10 following factors contributed to project success: 1) leadership (in all its forms); 2) professional learning; 3) collaboration; 4) changes in teaching practice; 5) time spent on task; 6) depth of commitment; 7) trust; 8) reflective practice; 9) clarity of purpose; and 10) personal empowerment.

The increased use of assessment *for* learning is a result of discovering assessments that show how students learn to learn. Although using traditional, psychometric tests is questioned from the lens of assessment *for* learning, Tillema, Leenknecht and Segers (2011) critique assessment *for* learning. In their meta-review of literature, they evaluated studies using peer assessment for learning from two perspectives: 1) their recognition of educational measurement criteria; and 2) their consideration of student involvement in assessment of learning. Their results suggest that quality criteria are not always present during the different assessment steps or that enough attention is given to student involvement in assessment *for* learning practices.

Pellegrino and Quellmalz (2011) consider how to use technology in educational assessment. They examined both large-scale and classroom-based testing programs that have attempted to use technology to create rich, authentic tasks integrating knowledge and encouraging critical thinking and problem solving. They believe such aspects of cognition are seldom well-addressed in traditional testing programs. For them, technology can help consider strategies for developing balanced, multilevel assessment systems that involve articulating relationships among curriculum-embedded, benchmark and summative assessments across classroom, district, provincial/territorial/state, national and international levels. They also believe technology might play multiple roles in assessment-based information systems that address the needs of multiple factors operating across levels of the education system. They believe technology potentially can launch a new era of integrated, student-centred assessment systems.

In a study of teachers and administrators from two school districts in southern Ontario, Volante (2010) used a semi-structured interview format to ask elementary and secondary school participants about their understanding and use of assessment *of* (summative), *for* (formative) and *as* (student metacognitive skills) learning. Volante reported an overemphasis on assessment of learning techniques (i.e., tests, quizzes, projects). Few educators used assessment *for* and *as* learning consistently within classrooms, and teachers and school administrators found that many barriers, such as a push toward similar standards for all students, thwarted their attempts to use assessment *as* learning within classrooms and schools.

Corn (2006), a teacher of limited English proficient elementary students in California, describes how she used daily timed read-aloud drills to boost her students' scores on a benchmark assessment of reading rate required by her school district. Her school district emphasized speed because they believed it would increase students' reading rates and improve their scores on the California Standardized Test. Corn's school, in its fourth year as a school needing improvement under the No Child Left Behind policy, was threatened with closure if scores did not rise. However, her students' scores on the California Standardized Test and other tests revealed that even daily speed reading drills did not help many students meet the district's benchmark for speed. Worse yet, the strategy had not helped raise scores on the California Standardized Test. Corn discussed that stress on speed had unintended bad consequences and proposed a more balanced assessment of fluency.

The Organization for Economic Co-operation and Development's (2010) Programme for International Student Assessment reviews the extent to which students succeed in exhibiting some of the knowledge and skills deemed to be essential to fully participate in modern societies, particularly in reading, mathematics and science. The Organization for Economic Co-operation and Development believes it is important to provide an international testing service (as Programme for International Student Assessment scores are standardized worldwide) that allows one country to measure and compare the performance of its curriculum against other curricula. The Programme for International Student Assessment defines the areas it measures as follows:

- Reading literacy includes basic decoding "to knowledge of words, grammar, and linguistic and textual structures and features, to knowledge about the world. It also includes metacognitive competencies: the awareness of and ability to use a variety of appropriate strategies when processing texts" (p. 37).

- Scientific literacy is "an individual's scientific knowledge, and use of that knowledge, to identify questions, acquire new knowledge, explain scientific phenomena and draw evidence-based conclusions about science-related issues; their understanding of the characteristic features of science as a form of human knowledge and enquiry; their awareness of how science and technology shape our material, intellectual and cultural environments; and their willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen" (p. 137).

- Mathematical literacy is "an individual's capacity to formulate, employ and interpret mathematics in a variety of contexts. This includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena" (p. 122). Mathematical literacy also helps individuals recognize the role that mathematics plays in the world and helps them better make the judgements and decisions they need to be constructive, engaged and reflective citizens. Programme for International Student Assessment assessments define mathematical literacy as demonstrated by a student's ability to analyze, reason and communicate effectively as students pose, solve and interpret mathematical problems that involve quantitative, spatial and other mathematical concepts.

Assessment of Competencies

Binkley, Erstad, Herman, Raiaen, Ripley and Rumble (2010) examined how assessment can promote learning, support practice and support 21st century skills. To support learning, assessment should be: 1) aligned with desired skill development; 2) adaptable to change; 3) performance based; 4) value added in terms of providing information to be acted on; 5) reflective of accepted assessment criteria (fair, technically sound and valid). The paper identifies 10 important skills in four categories for 21st century learning. The skills noted in the *Ways of Thinking* category include: creativity and innovation; critical thinking; problem-solving and decision making; and learning to learn. Communication and collaboration are the two skills listed in the *Ways of Knowing* category. The primary skills included in the *Tools for Working* category include information and communication technology literacy. The *Living in the World* category includes citizenship, personal and social responsibility, and life and career.

Binkley, Erstad, Herman, Raiaen, Ripley and Rumble (2010) identified the following challenges to assessing 21st century skills:

1. Few practical assessments exist to measure 21st century skills.
2. Transforming psychometrics are needed to deal with divergent responses.
3. Assessment needs to make student thinking "visible" in order to reveal conceptual strategies.
4. Prompting or scaffolding is used to address the needs of selected students while conducting assessments.
5. Assessments for 21st century skills in traditional subjects will need to be developed.
6. New modes of communication are seldom represented in assessment.
7. Traditional assessments focus on individual performance and do not consider collaboration and teamwork.
8. The assessment of local and global citizenship is underdeveloped.
9. Validity and accessibility are important.
10. Cost and feasibility require consideration.

Wilson, Bejar, Scalise, Templin, William and Irribarra (2010) discuss how assessment results should be presented to various stakeholders to make these reports valid, reliable and useful for students, administrators, teachers and the general public. An adequate construct definition is the starting point for beginning to assess 21st century skills. Next, the assessment system needs a careful consideration of: 1) the definition of the constructs to be measured; 2) how the definitions will guide the assessment instrument selection or development; and 3) how responses will be coded, classified and/or quantified.

They also identify the following three issues in the assessment of 21st century skills: 1) generality versus context specificity (with 21st century skills, the context can be quite distant from the construct); e.g., communication can be measured within a wide variety of subject areas; 2) large-scale and classroom assessments (for assessment of 21st century skills to be useful to both teachers and government, a determination of what is best assessed in the classroom and what is best assessed in large-scale assessment must be determined without one area restricting the other); and 3) impact of advances in technology on assessments (items enabled by computers could have an impact on the construct to be measured; e.g., it might be possible for new information to be gained from the appropriate use of computers in assessment).

Scardamalia, Bransford, Kozma and Quellmalz (2010) suggest a developmental scheme to help teachers and students move toward a high-end knowledge environment and the assessment of competencies. Because much of the pressure to move to 21st century skills is coming from business, there has been perceived resistance from educators to move in this direction. Many educators feel that education should not be reduced to the sole purpose of job training. As legitimate as these concerns may be, the following statements provide the rationale for a move toward competency-based assessments.

- Both entry and professional level employees of the future will need to be able to think analytically and problem solve.

- Extensive learning is required to move a factory worker to a knowledge worker and this transition is best started in childhood.
- Many of today's manual occupations will require a sound familiarity with technology to be carried out in the near future.
- Regardless of whatever is done to promote 21st century learning, it must be inclusive and cannot be restricted to the elite.
- All workers need to be empowered to problem solve and assume additional responsibility.
- Education systems must focus on a deep level of constructivism that produces knowledge and is more than rote transfer.

In a study related to digital literacy (Pinkham, Wintle & Silvernail, 2008), Sanford Junior High School collaborated with the Center for Education Policy, Applied Research and Evaluation at the University of Southern Maine to enhance students' ability to evaluate websites effectively. Students were taught a standardized set of principles or benchmarks to follow while evaluating websites. These benchmarks included understanding the value of different domains and identifying clues to a page's value. Pre- and post-assessment measures were used. Study results showed that, when provided with instruction, students improved their skills in evaluating online material and that interventions of this nature could be specifically designed to address 21st century skills.

Mislevy, Behrens, Bennett, Dmark, Frezzo, Levy, Robinson et al. (2007, p. 1) reported on the use of external knowledge representations "to identify, depict, transform, store, share, and archive information." Five key roles of external knowledge representations in educational assessment were cited:

1. An assessment is in itself an external knowledge representation, which makes explicit the knowledge that is valued, ways it is used and standards of good work.
2. The analysis of any domain in which learning is to be assessed must include the identification and analysis of the external knowledge representations in that domain.
3. Assessment tasks can be structured around the knowledge, relationships and uses of domain external knowledge representations.
4. External knowledge representations can be created to organize knowledge about a domain in forms that support the design of assessment.
5. External knowledge representations from the discipline of assessment design can guide and structure the domain analyses noted in 2, task construction noted in 3, and the creation and use of design external knowledge representations noted in 4.

Learning how to learn is crucial for lifelong learning. In the Teaching and Learning Research Programme's Research Briefing (2006), it is noted that learning how to learn cannot be assessed separately from planning, teaching or assessing learning in a specific subject area. For real change to occur, educators must engage with deep principles of teaching and learning. The performance-related

culture in British schools makes it difficult for teachers to practise what they value. To encourage change, educational leaders must support teachers in creating innovations in classroom practices.

Meijer (2007) analyzed the construct *learning to learn* and the assessment of cross-curricular skills. The relationship between learning to learn and cross-curricular skills (i.e., designing and carrying out investigations; stating one's own ideas and opinions; working in collaboration) was found to be moderate at best, even though there were some similarities between the two concepts. In addition, cross-curricular skills appear to have more in common with academic achievement than with intelligence, suggesting that they are quite educable. Furthermore, they are moderately related to social-affective characteristics. It appears that a cohort of Grade 9 students who were tested for their cross-curricular skills in 1998 did considerably better compared to a cohort of Grade 9 students who were tested in 1996. There are some indications that this improvement may be related to the attention to these skills in schools (p. 155).

DiMartino and Castaneda (2007) suggest that traditional educational techniques and practices of assessment are not serving today's students and will not serve those of the future as they transition into the workforce. They call for *authentic assessment*, but believe authentic assessment has been stifled by the Carnegie Unit, which they call an insidious and powerful force in United States high schools. Yet, they argue that the Carnegie Unit has transformed education into clear sets of inputs, outputs and calculations centred upon the failed notion that seat time yields credits and that credits yield a diploma. Recently, the Carnegie Unit has become less favourable as authentic assessment has begun to appear. Obviously, not everyone believes that authentic assessment and the Carnegie Unit are incompatible and authentic assessment has been criticized for being subjective and lacking rigour.

DiMartino and Castaneda (2007) also comment on a recent survey of 400 employees from across the United States who indicated the skills most needed by new entrants to the work place include "oral and written communication, time management, critical thinking, problem solving, personal accountability, and the ability to work effectively with others" (p. 38). These are also reported to be the areas in which graduates are least prepared. These skills are not included in standardized assessment and as a result are not always being developed. They believe such skills can be assessed using the model of authentic assessment.

Authentic assessment focuses on realistic problems and requires that students use prior knowledge, recent learning and relevant skills to solve them. Examples of authentic assessment include senior topics that are researched-based and presented to a panel of evaluators and portfolios that represent a student's best work over the years. Authentic assessment has the potential to test the skills most valued by employers. To display these skills to perspective employers, DiMartino and Castaneda (2007) outline a graduation portfolio that consists of three elements: 1) career readiness (includes a résumé, a job application letter, reference letters and a personal reflection on readiness to enter the work force); 2) democratic citizenship folio (includes evidence of active involvement in the school or community as a whole); and 3) skills for lifelong learning folio (includes artifacts of student learning).

Reeves (2010) reports that content knowledge is an important part of education, but essential skills also include "global awareness, creativity and innovation, communication and collaboration, initiative and self-direction, and leadership and responsibility" (p. 307). Reeves compares test parameters for 20th century and 21st century learning. The 20th century skills test parameters are as follows:

- standardized conditions – one student is being compared to another so assessment must be the same for everyone
- secrecy of content – fairness dictates that no student knows in advance exactly what is expected
- individual results – success means scoring higher than other students.

Reeves' (2010) test parameters of 21st century skills are as follows:

- nonstandardized conditions – test should reflect the real world and its constant variations; standards are rewarded for their reaction to the unexpected
- openness of content – fairness means students are partners in the assessment process and have contributed to the process
- combination of individual and team results – individual and team success is measured in terms of individual and collaborative efforts.

Current assessments most often focus on what students know and, in a more limited way, performance assessment attempts to assess what students are able to do. Reeves (2010, p. 313) suggests adding the following elements and their associated questions to the assessment process.

- Explore – What did you learn beyond the limits of the lesson? What mistakes did you make and how did you learn from them?
- Create – What new ideas, knowledge or understanding can you offer?
- Understand – What is the evidence that you can apply your learning in one domain or the other?
- Share – How did you use what you have learned to help a person in the class, your community or the planet?

IN PRACTICE

There is some belief that assessment practices are changing. Gewertz and Robelen (2010) report that the United States Department of Education has awarded $330 million in grants to states who collaborate in designing better ways of measuring student learning. The grants went to two groups of states that sought the money under the federal *Race to the Top* program, spawned by the federal economic-stimulus law. The goal was to create transformative education by giving teachers immediate, meaningful feedback about students' understanding and to measure a more complex range of student skills. Both winning groups' plans stated that they would combine results from performance-based tasks administered throughout the academic year with more traditional end-of-the-year measures for school accountability purposes. Both wanted to examine more than student recall of facts. They were also interested in students' strengths in analyzing material and applying their knowledge.

The Ontario Ministry of Education (2010) developed the report *Growing Success: Assessment, Evaluation and Reporting in Ontario Schools*, in which it argues that any new approaches to assessment must provide opportunities and challenges to all educators for the benefit of all students. The document introduces a comprehensive policy for assessment, evaluation and reporting of student achievement in Kindergarten to Grade 12 Ontario schools. It calls for greater consistency in assessment, evaluation and reporting practices among schools.

The primary purpose of assessment and evaluation is to improve student learning. To ensure assessment, evaluation and reporting are valid, reliable and improve learning for all students, teachers should use core practices that: 1) are fair, transparent and equitable for all students; 2) support all students, including those with special education needs, language of instruction needs (English or French) and cultural needs, including First Nations, Métis and Inuit; 3) are carefully planned to relate to curriculum expectations, learning goals and to the interests, learning styles and preferences, needs and experiences of all students; 4) are communicated clearly to students and parents throughout the school year; 5) are ongoing, varied and administered over time to provide opportunities for students to demonstrate their learning; 6) provide clear, specific, meaningful and timely descriptive feedback that supports improved learning and achievement; and 7) develop students' self-assessment skills to help them assess their own learning, set specific goals and plan future learning (Ontario Ministry of Education, 2010).

Growing Success: Assessment, Evaluation and Reporting in Ontario Schools notes that equal is not always equitable: some students need different supports. Principals should lead the development of appropriate procedures for teachers to create environments where all students feel valued, confident and courageous. The document lists and explains the following crucial learning skills and work habits: responsibility, organization, independent work, collaboration, initiative and self-regulation.

Growing Success: Assessment, Evaluation and Reporting in Ontario Schools further outlines three categories of competency: 1) using tools interactively (the ability to use language, symbols and text interactively; the ability to use knowledge and information interactively; and the ability to use

technology interactively); 2) interacting in heterogeneous groups (the ability to relate well to others; the ability to cooperate and work in teams; and the ability to manage and resolve conflicts); and 3) acting autonomously (the ability to act within the bigger picture; the ability to form and conduct life plans and personal projects; and the ability to defend and assert rights, interests, limits and needs).

Growing Success: Assessment, Evaluation and Reporting in Ontario Schools organizes goals into three knowledge and skills *areas*: 1) student development; 2) interpersonal development; and 3) career development. It also lists the following knowledge and skills *categories*: 1) Knowledge and Understanding—subject-specific content acquired in each grade/course (knowledge), and the comprehension of its meaning and significance (understanding); 2) Thinking—use of critical and creative thinking skills and/or processes; 3) Communication—conveying meaning through various forms; and 4) Application—use of knowledge and skills to make connections within and between various contexts.

Education Services Australia (n.d.) provides a link to the *Assessment for Learning* website, which offers teachers information on assessment theory and practical strategies related to formative assessment activities or tasks. Assessment theory is provided through professional learning modules housed on a website and designed for individual teacher use. The modules provide information and strategies related to topics, such as strategic questioning, peer feedback, student self-assessment and the development of success criteria and rubrics.

Looney and Poskitt (2005) note that New Zealand is a bicultural nation where the Maori community has grown increasingly influential. The Ministry of Education found that significant disparities in achievement exist in New Zealand's schools. To address this imbalance, the Ministry of Education developed, implemented and embedded formative assessments into national policy. One initiative was the Maori Mainstream Programme, which arose from the unequal power relations within society. In this framework, the importance of culture and relationships are key. This program encourages teachers to consider their own cultural preconceptions and to build a learning environment where students can safely express their personalities. Thus, in New Zealand, formative assessment is not a separate, national policy initiative but is embedded into several national policies, including guidance in the curriculum framework, the National Administration Guidelines, and examination requirements (the National Certificate of Educational Achievement), as well as several national professional development and innovation initiatives. Further, the New Zealand Ministry of Education has developed an extensive website for teachers that provides them with information on what is assessment, provides information on assessment for the classroom and assessment standards, including student exemplars that illustrate student learning and achievement in answer to the question, "What is quality work?" (New Zealand Ministry of Education, n.d.).

In support of a Curriculum for Excellence, Learning and Teaching Scotland, the Scottish Qualifications Authority and the Government of Scotland have developed the National Assessment Resource, a website intended to "provide a single place in which assessment materials for Curriculum for Excellence can be stored" (Education Scotland, n.d., para. 3). The website includes assessment materials for teachers and educators at the early learning levels as well as exemplars, in the form of short videos, of assessment in practice.

The France Ministry of Education (2012a) introduced seven competencies into the education system and with that introduction came the development of *Le livret de competences*, a personal portfolio that tracks students' ability to demonstrate the competencies. All students are required, since 2008, to have a personal portfolio that is currently being piloted electronically. On the website, éduscol, teachers find tools for evaluating the competencies and guidelines for assessment. These documents have been in place since 2011 for the elementary levels and development continues for secondary levels (France Ministry of Education, 2012b).

CONSIDERATIONS FOR CURRICULUM

The Importance of Assessment

More than 15 years ago, Rogers' (1996) working group defined assessment as the process of collecting and interpreting information that could: 1) inform students and their parents about the progress they are making toward attaining the knowledge, skills, attitudes and behaviours to be learned; and 2) inform personnel who make educational decisions. Their report supported fair and equitable assessment for all students.

The Assessment Reform Group (2002) notes, however, that how students are assessed will impact how they learn. According to these researchers, "Pupils need to know how their learning is progressing. Teachers also need to know how their pupils are progressing, to guide both their own teaching and the pupils' further learning" (p. 1). The issue, as the researchers see it, is not whether there should be assessment, but how students should be assessed. Assessment can contribute to the gap between high and low achieving students.

The Assessment Reform Group (2002) outlines what improves or hinders student motivation in assessment, as well as implications for teachers' work. They conclude that negative results on tests can be reduced by not focusing on teaching test content. Rather, they outline these positive actions: 1) provide student choice and help them become more accountable for their learning; 2) help students know the purpose of learning and give feedback about their learning and assessment activities, so they can understand where they were successful and where further improvement is required; 3) encourage students to assess their work in relation to what they have learned and encourage them to collaborate and share each others' achievements. In terms of teacher professional development, results suggest that teachers should be aware of the limited validity of tests, understand that assessment can negatively impact student motivation, look for ways to mitigate this impact, and develop assessments that use results to improve student motivation.

Camara (2007) discusses how the increased significance of assessments has resulted in a greater need for ethics and accountability. Camara sees a lack of regulation and accountability in assessments and describes recent attempts to increase accountability. He believes test-making should be an ethical activity, citing developers' responsibility to ensure validity and reliability, and justifies the need for standards when using "educational and psychological testing."

Stiggins (2008) calls for re-evaluating, redefining and redesigning assessment. He believes assessment results "must go beyond merely providing *judgements* to providing *rich descriptions* of student performance ... If assessments are to support improvements in student learning, results must inform students how to do better the next time" (p. 3). Stiggins believes assessments must evolve from being isolated occasional events attached to the end of teaching to ongoing interrelated events that reveal changes in student learning over time. As well, assessments must move beyond merely informing the instructional decisions of teachers and school leaders to informing student decisions. In the future, assessment systems must be designed to serve diverse purposes and meet the information needs of all decision makers, including students.

Stiggins (2008) believes schools should be places where all students have an opportunity to learn. He believes assessment serves two purposes: to gather evidence that informs instructional decisions and to encourage student learning. He believes assessment should ask different questions at different levels and that assessment *for* learning helps students gain self-efficacy and resilience. To summarize, Stiggins believes out-of-balance assessment systems must be replaced with those that support and verify learning. To attain such balance, classroom assessment practices must strategically use quality assessments that help students believe in themselves. Such usage will help schools realize profound achievement gains. Finally, he believes it is time to replace intimidation, as the prime motivational force, with the promise of academic success for all learners.

Santiago, Herman, Donaldson and Shewbridge (2011), in their Executive Summary of the Organisation for Economic Co-Operation and Development's *Reviews of Evaluation and Assessment in Education Australia*, suggest the following, in terms of assessment systems: 1) establish national strategies for strengthening the linkages to classroom practice; 2) further develop articulations within the overall evaluation and assessment framework; 3) maintain the centrality of teacher-based student assessment while ensuring the diversity of assessment formats; 4) strengthen teacher appraisals; 5) define the strategic purposes and scope of school evaluation; 6) continue efforts to meet information needs for national monitoring and further exploring results at a systemic level (pp. 9–11).

As a result, programs of study must be designed to address these questions:

1. Do programs of study identify significant learning goals and the full range of expected performance standards?
2. Do programs of study reflect a coherent view of learning and how learning develops?
3. Are there common assessment indicators, expectations or outcomes?
4. Do assessments provide relevant information for decision making?
5. Do programs of study enable all students to demonstrate what they know and how they have progressed?
6. Do assessments support their intended use by the intended users?
7. Do programs of study, including assessments, support a range of different learners?

Assessments: Approaches and Strategies

Technology can be one way in which assessments can change. Barrett (2009) encourages e-portfolios to engage assessment and speaks to two aspects of e-portfolios: 1) product (the showcase approach) and 2) process (the workspace approach). She believes an e-portfolio can exist in one environment that is student-centred and can be personalized and allow for communication, and the other environment that "harvests" achievement data. An e-portfolio is electronic evidence that shows a student's learning journey over time. Portfolios can relate to specific academic fields or represent a student's lifelong learning. The key aspect of an e-portfolio is the reflection of evidence. E-portfolios are combinations of process (a series of activities) and product (the end result of the process).

Barrett (2009) sees that two approaches, expressive and structured, exist for designing an e-portfolio. An *expressive approach* permits students to make choices about the visual presentation and multimedia components and helps lead them toward ownership for their work. The *structured* approach means a preset database allows for easier data collection and analysis. The underlying difference between the two is the intrinsic motivation and attitudes students will have as they relate to the approaches. The expressive (choice and voice) approach allows for social networking, while the structured approach limits creativity and diminishes the intrinsic value placed on the work products.

Bennett (2002) describes the ever-increasing reliance upon computers and virtual space in the workforce, post-secondary institutions and secondary schools. Bennett believes a change in testing requires a change in learning goals—programs of study and pedagogy must be updated to reflect 21st century realities. Bransford, Scardamalia and Quellmalz (2010) look at innovative ways to develop 21st century skills in students, both individually and in groups, considering both formal and informal learning opportunities. They believe the goal of developing 21st century skills is to equip students to live productive and satisfying lives in a society where goals emerge, problems are real-world and information technology plays an increasing role. They believe adapting education to meet 21st century needs cannot be achieved by just developing skills but also requires the development of values and habits, and the acquisition of disciplinary and world knowledge.

Dunn, Parry and Morgan (2002) explore difficulties in implementing criterion-referenced assessment, including difficulties articulating clear and appropriate standards; problems with the alignment of criteria with other elements; and the competence and confidence of educators who exercise professional judgement. They argue that quality and authenticity in criterion-referenced assessment are elusive goals and that understanding its guiding principles is not enough. Criterion-referenced assessment must be placed in its disciplinary context. Hall, Sparks, Spero and Van Kuren (2005) note the need for greater professional development for those involved in developing and using assessment and the need for flexibility while maintaining assessment integrity (reliability and validity).

Feedback is an important element in helping people to learn and teach, and is an essential aspect of assessment *for* learning. Effective feedback is focused on the task and provides hints, clues, ideas or strategies, rather than giving praise. The teacher's role in formative assessment is more than promoting content learning. Teachers must help students understand goals, make judgements about their learning

in conjunction with these goals, and help students develop operational strategies as they monitor their own learning. Being able to take corrective action will make students less dependent on teachers.

Ruiz-Primo (2011) discusses the effect of assessment conversations on student learning and focuses on how teachers and students use *potential assessments* (informal formative assessment) to find levels of student understanding. Specifically, Ruiz-Primo discusses classroom assessment conversations (dialogic interactions) at the centre of informal formative assessments. These assessment conversations help make student thinking explicit in unobtrusive ways and allow student thinking to be examined, questioned and shaped as students construct learning. Ruiz-Primo sees informal formative assessment at the centre of effective instructional activities, and assessment conversations as an important part of informal formative assessment practices.

In the United States, Heritage (2010) is of the opinion that measurement remains the predominant paradigm for formative assessment. She suggests that the process of formative assessment should be situated within a learning paradigm; it is not an instrument but an enabling process for learning. It is, in essence, a key professional skill for teachers.

Heritage (2010) theorizes that, despite pioneering efforts of the Council of Chief State School Officers and other organizations, the promise formative assessment holds for teaching and learning might be lost. The core problem lies in the widespread false assumption that formative assessment is a specific kind of measurement instrument rather than a process fundamental and indigenous to teaching and learning. This distinction is critical, both for understanding how formative assessment functions and for realizing its promise for students and society. Black and Wiliam (1998) suggest that effective formative assessment involves: 1) adjusting teaching and learning in response to assessment evidence; 2) students receiving feedback about their learning that is coupled with advice on what they can do to improve; and 3) student participation in the process through self-assessment.

Benchmark assessments are periodic examinations administered to students to measure their understanding, knowledge or skills at given times. Test content and construction are determined by what users want to demonstrate with the results obtained. Herman, Osmundson and Dietel (2010) discuss the organizational necessities and requirements to create and sustain benchmark assessments. They mention coherent, comprehensive and continuous as three types of systems. A *coherent system* matches with the chosen learning goals. The *comprehensive system* deals with a vast range of skills, yet still yields useful data. A *continuous system* runs year-round and constantly provides new data.

Benchmark assessments lie somewhere between typical formative classroom assessment and an annual state or provincial assessment. Data from benchmark assessments can be amalgamated on multiple levels to influence curriculum and policy anywhere along the spectrum from the classroom to the district. The data is not used to directly influence the classroom, but is still used within the school. The article suggests three key questions for consideration: 1) What is the purpose of the assessment? 2) What constitutes a benchmark assessment? (e.g., information that needs to be included); and 3) What organizational supports are needed from the inside and outside to sustain the new standard?

Benchmark assessments can be used as follows: 1) to clarify expectations about the skills students should possess; 2) to direct future curriculum development and instruction; 3) to assist with modifications to curriculum, if needed; and 4) to provide forecasting data. They warn, however, that organizations should not try to create one assessment to serve multiple purposes because the more purposes one assessment tries to serve, the more each purpose is compromised.

Validity reveals whether or not an assessment is actually measuring what it intends to measure. Validity is not an all-encompassing concept, because the fact that an assessment instrument is valid for one purpose does not make it valid for another. To determine the quality of a benchmark assessment, a purpose for the assessment is essential. Alignment communicates if the assessment content mirrors the assessment goals of the program of studies. The key questions here are: 1) What skills do students need to possess?; 2) How far reaching are the school and district goals for learners?; and 3) What does the current program of studies look like?

To align programs of study, four suggestions are offered: 1) local curriculum should not diverge much from the current programs of study; 2) the distribution and range should be similar to the current program of studies and according to grade level; 3) multiple learning types (higher-order thinking and problem solving) should be considered for each grade level; and 4) a balanced representation of learning goals should be included in the various items on the assessment.

Reliability is present when an assessment item gives the same result repeatedly over multiple trials. Reliability is not a substitute for validity, and an assessment item can be reliable in consistently producing wrong answers, while not measuring its intended target. *Fairness* considers the accessibility of benchmark assessments for all students. Bias is present when assessment elements interfere with a student's ability to perform during the test. A potential indicator of bias is when students with the same knowledge and skills have highly varied assessment scores. One important question for assessment stakeholders to ask is, "How useful will this assessment be in helping us to accomplish our intended purposes?"

There is no perfect benchmark assessment and trade-offs are always likely. The key is to find a balance in assessment that developers and stakeholders can agree upon and live with. Organizations should follow four steps to attain effective benchmark assessments: 1) start by drafting a plan of action; 2) determine how data will be analyzed and communicated; 3) provide training for all involved; and 4) allow time for data analysis and usage.

Chappuis, Chappuis and Stiggins (2009) note that instructional decisions based on quality assessments and a balanced assessment system effectively promote student learning. They believe good assessments must satisfy five key standards of quality: 1) clear purpose; 2) clear learning targets; 3) sound assessment design; 4) effective communication of results; and 5) student involvement in the assessment process. Assessment literate educators must consider balance and understand what formative and summative assessments are appropriate at all three levels of assessment (classroom, periodic interim/benchmark, and annual standardized testing). They believe building assessment systems with assessment literate users will better attend to issues of quality learning for students.

Thompson, Johnstone and Thurlow (2002) discuss the following seven principles of universal design related to large-scale assessments:

Principle 1: Equitable Use
The design is useful to people with diverse abilities. They suggest the following: provide the same means of use for all users; avoid segregating or stigmatizing users; provide privacy, security and safety equally to users; and make the design appealing.

Principle 2: Flexibility in Use
The design accommodates a wide range of individual preferences and abilities. Thompson, Johnstone and Thurlow (2002) suggest the following: provide choice in methods of use; accommodate right-handed or left-handed access; facilitate the user's accuracy and precision; and provide adaptability to the user's pace.

Principle 3: Simple and Intuitive Use
Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills or current concentration level. Thompson, Johnstone and Thurlow (2002) suggest the following: eliminate unnecessary complexity; be consistent with user expectations; accommodate a range of literacy and language skills; arrange information consistent with its importance; and provide effective prompting and feedback.

Principle 4: Perceptible Information
The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities. Thompson, Johnstone and Thurlow (2002) suggest the following: use different modes for redundantly presenting essential information; provide adequate contrast between essential information; maximize legibility; differentiate elements in ways that can be explained; and provide compatibility of techniques or devices used by people with sensory limitations.

Principle 5: Tolerance for Error
The design minimizes hazards and the adverse consequences of accidental or unintended actions. Thompson, Johnstone and Thurlow (2002) suggest the following: arrange elements to minimize hazards and errors; provide warnings about hazards and errors; and discourage unconscious action in tasks that require vigilance.

Principle 6: Low Physical Effort
The design can be used efficiently and comfortably and with a minimum of fatigue. Thompson, Johnstone and Thurlow (2002) suggest the following: allow users to maintain a neutral body position and use reasonable operating forces; and minimize repetitive actions and sustained physical effort.

Principle 7: Size and Space for Approach and Use

Appropriate size and space is provided for approach, reach, manipulation and use, regardless of the user's body size, posture or mobility. Thompson, Johnstone and Thurlow (2002) suggest the following: provide a clear line of sight to important elements for any seated or standing user; make it easy to reach components while comfortably sitting or standing; accommodate variations in hand and grip size; and provide adequate space for the use of assistive devices or personal assistance.

Assessment of Competencies

Hayes Jacobs (2009) discusses upgrading the curriculum by using an upgrade model to show educators manageable steps for leading to a 21st century infused curriculum. Hayes Jacobs encourages teachers to start with the program of studies, rather than with technology. Instead of integrating technology, teaching teams should examine curriculum maps to find entry points for upgrading. Hayes Jacobs believes focusing on assessment helps teachers make a natural shift to content and skills, and that starting with assessment is the most successful way to move teachers into 21st century teaching and learning. Teachers actively work with student assignments to demonstrate learning—a safer entry point than changing practice. Hayes Jacobs notes that assessment gives teachers insights into what students are learning and the progress they are making. It also helps teachers focus on what students will produce to demonstrate their learning and new understandings.

Competency is not concrete. Different historical eras, obviously, call for different kinds of competence. For example, Silva (2009) outlines the controversy over the need for 21st century learning in the high school system, and notes that assessment is a particular focus of this controversy. Silva notes that the phrase "21st century skills" is broad and vague, having many synonyms. Tullis (2010) poses the question, "How does one measure immeasurable 21st century skills?" and profiled Tucson, Arizona as a model for implementing and assessing 21st century skills in the curriculum. Tullis covered strengths and challenges facing 21st century assessment and notes that assessment involves real-world problems that teachers must assess without conventional tests (true or false and multiple-choice questions).

In the *Authentic Assessment Toolbox*, Mueller (n.d.) notes the difference between authentic assessment and traditional assessment. Mueller believes that authentic assessment asks students to perform real-world tasks requiring them to demonstrate and apply meaningful and essential knowledge and skills. He notes that authentic assessment springs from the reasoning that a school's mission is to develop productive citizens. To be productive, an individual must be able to perform meaningful tasks in the real world. Therefore, schools must help students become better at performing tasks they will encounter when they graduate, and to determine success, the students need to perform meaningful tasks that replicate real-world challenges to determine if they can do them.

Tullis (2010) reports that, in the Catalina Foothills School District, the new district strategic plan has identified 12 skills, such as teamwork, self-direction and leadership, as 21st century learning skills. Core subjects remain but some content mastery has been eliminated to make way for the new skills to be developed. For example,

> to become more adept at 'systems thinking,' defined by the district as the ability to 'see a whole, a web of relationships, rather than focusing only on the detail of any particular piece,' students are taught to recognize patterns of change over time. In literature, that translates to identifying variations in character traits; in math, it means learning to see changes in a bank account balance and then to graph them (p. 1).

The report points out that these are not new skills, because they have been incorporated into lessons for years by teachers. What is different is that all students will receive the new curriculum in a formal way. Rubrics describing student expectations have been developed for every subject and for every grade in each of the 12 learning skills. These rubrics establish what critical thinkers, problem solvers or self-directed learners look like. The report notes that devising assessments that align with 21st century skills is "the next logical step … It's an ongoing effort … [as teachers are being trained to] … create assessments that use real-world tools and are relevant and purposeful to our students" (Tullis, 2010, p. 1).

Assessing competencies is a consideration promoted by Redfield, Roeber and Stiggins (2008), who believe assessment should serve student learning and be transparent. They call for building assessment systems to guide educational improvement and believe that building these components calls for establishing guiding principles and a shared vocabulary. Redfield, Roeber and Stiggins (2008) advise that assessment systems should be guided by the four principles of purpose, assessment adequacy, communication of results, and supports. For them, the purpose of assessment must be clearly articulated at each level of the system and such assessments should help meet the specified purposes of each component within the system as a whole. They also believe that results of these assessments must be communicated in a timely and understandable way, with adequate supports provided so that the system's purposes can be met.

Standards-based science education, which emphasizes monitoring and accountability, is becoming a key part of globalizing science education and is used by different countries to determine their educational systems' effectiveness. International testing programs, such as Programme for International Student Assessment, help countries compare students to a common standard. DeBoer (2011) believes rising standards and international educational competition is partly driven by a belief that economic success depends on citizens who are knowledgeable about science and technology. DeBoer asks if it is wise to discuss what international standards for global citizenship in science education might look like, and examines current practices in different countries to show what areas of agreement and differences exist. Finally, DeBoer recommends that conversations should begin to work toward creating the knowledge and competencies international citizens should have. These conversations should also provide space for individual countries to pursue unique goals.

Idrissi, Bennani and Hachmoud (2009) believe 21st century skills build from simple to complex and offer a continuum to assess student learning. They divide each 21st century skill into components and provided an assessment continuum upon which to assess students' progress. For example, "Basic Literacy" is divided into reading, writing, speaking/listening, numeracy, information and technology. Although they use a continuum of progress that goes from novice, basic, proficient to advanced, a number of different continua would undoubtedly be acceptable.

Brahim, Mohammed and Samir (2010) note that to operationalize a competency-based approach within e-learning curricula, one must improve the quality of education by providing adaptive learning environments. These environments should meet each learner's customized educational needs. They believe individualized learning pathways require knowledge of the learner and must identify and map which competency gaps to fill. To diagnosis and measure personal competency gaps, they suggest implementing formative assessment that focuses on individualized goals through the use of competency maps.

Paquette (2002) also stresses individualization and defines *competency* as a statement of principle that determines a relationship between a public target or "actor," knowledge and a skill. What suits one learner does not necessarily appeal to another. Competencies emphasize individualization of learning for learners. Such individualizing presupposes knowledge of learners, particularly of their performances relative to benchmarks of targeted goals. Teachers, thus, must be able to identify which individual competency gaps to fill and to derive a map of competencies that invites individual formative assessment.

Darling-Hammond (2010b) reports that, although large-scale testing in some countries still focuses on recall and recognizing discrete facts, many countries are moving to more sophisticated approaches that require students to analyze and apply knowledge and to communicate extensively, both orally and in written formats. This paper focuses on test efforts from Australia, Finland, Singapore and the United Kingdom, all of which make use of projects, scientific investigations and product development. These four nations also use on-demand and curriculum-embedded tests. Testing is not seen as a separate element of education but as assessment *of* learning and *for* learning. It is hoped that this approach will provide opportunities for strengthening both the teaching and learning of 21st century skills as well as their assessment. A growing emphasis on school-based performance assessment should strengthen teaching and curriculum equity by encouraging students to engage in similar activities.

Hipkins (2007) recommends considering different assessment strategies for evaluating 21st century skills. Her suggestions are not intended to be exhaustive but rather to provide a flavour. Students could use *journals* to set clear competency learning goals and to record their progress toward them while, at the same time, reflecting on ongoing learning needs. Students could use *learning stories* to document their use of particular competencies and how they adapt to challenges they face. Students could use *portfolios* to document and provide evidence of learning over time rather than a single snapshot. Students could use *rich tasks,* which are both complex and multifaceted and achieved over long periods of time (usually several years) as evidence.

Baartman, Bastiaens and Kirschner (n.d.) suggest that viewing assessment as an instructional design problem, rather than a measurement problem, can be useful. They suggest a series of design questions to categorize requirements for Competency Assessment Programmes.

- *What is assessed?* Assessment should address whole competencies and not be divided into smaller parts to be assessed separately, since competencies are an integrated whole of knowledge, skills and attitudes.

- *How to assess?* Assessment should be multimodal (use of a number of different assessments combined) and make use of scoring criteria that describe what a learner is expected to be able to demonstrate.

- *When to assess?* Competency-based education is individualized so learners should be able to identify when they want to be assessed in order to use the feedback to influence future learning directions. Assessment can be done before, during or after the learning.

- *Why assess?* Formative assessment is used to provide feedback about the learning process to the learner. Summative assessment is used to certify that learning has taken place. Both types of assessment should be criterion-referenced (assessment according to preset standards) rather than norm-referenced (assessment that compares learners to each other).

- *Who assesses?* Assessors can vary. At times, self-assessment and peer-assessment can be employed to help learners assess themselves or peers. At other times, usually during summative evaluations, external assessors may be more appropriate.

Baartman, Bastiaens and Kirschner (n.d.) also discuss what they refer to as *quality criteria* for assessment. Because competency-based education is based upon individual development and instruction is most often guided by the learners themselves, it is difficult to guarantee valid and reliable assessment. No single assessment method must meet all of the *quality criteria*; rather, the assessment program as a whole must meet the criteria. The criteria they identify are: 1) authenticity – the similarity of an assessment to the criterion situation; 2) cognitive complexity – assessment tasks should include higher cognitive skills; 3) meaningfulness – assessment programs should be valuable for both teachers and learners; 4) fairness – assessment should not be biased to certain groups of learners; 5) transparency – assessment should be clear and understandable to all participants; 6) educational consequences – the effects an assessment program has on learning and instruction; 7) directness – the degree to which teachers or assessors can interpret the assessment results; 8) cost and efficiency – a comparison of the benefits of an assessment to the time and resources required to carry it out; 9) reproducibility of decisions – decisions based on a competency assessment should be accurate and constant over time regardless of assessors, and 10) comparability – assessment should be carried out in a consistent way.

Silva (2009) discusses why schools must focus on the traditional basics and must ensure they are covering a suite of important thinking and reasoning skills. Critics suggest that these higher-order skills cannot be measured in reliable ways. What students can do with knowledge, rather than particular knowledge, is the essence of 21st century skills. Silva adds that many find the notion of 21st century skills vague or confusing, because "There are hundreds of descriptors of the skill set, including life skills, workforce skills, interpersonal skills, applied skills and non-cognitive skills" (Silva, 2009, p. 630). In addition, thinking critically, analytically and creatively are not unique to the 21st century. These skills "are not new, just newly important" (Silva, 2009, p. 631).

Teachers have complained that too much testing of the basics has narrowed the focus of the curriculum. However, new assessment models with the capacity to measure both content and skills are proving helpful. For example, in the College Work Readiness Assessment students use online documents (ranging from newspaper articles to research reports) to respond to a city overrun by problems (i.e., pollution, a growing immigrant population, defunct factories). Students wrestle with dilemmas and make judgements about economic, social and environmental impacts. The College Work Readiness Assessment is not only a student assessment tool but it is an implementation tool for school improvement (Silva, 2009).

To see changes in schools and in the manner in which students learn, more and varied assessment approaches and strategies need to be invoked, especially pertaining to the assessment of competencies (21st century skills). As Stiggins (2008) so eloquently stated, "We have emerged from the era of assessing merely to rank students based on achievement to asking the key question, 'Who has and has not met the standards?' (p. 2) and, most significantly, 'Why or why not?'"

BIBLIOGRAPHY

Alliance for Excellent Education. (2010). Policy brief: Principles for a comprehensive assessment system. Retrieved from http://www.all4ed.org/files/ComprehensiveAssessmentSystem.pdf

Assessment Reform Group. (2002). *Testing, motivation and learning*. Cambridge, England: Cambridge University, Faculty of Education.

Baartman, L. K. J., Bastiaens, T. J., & Kirschner, P. A. (n.d.). Requirements for competency assessment programmes. Open University of the Netherlands, Educational Technology Expertise Center.

Banta, T. W., Lund, J. P., Black, K. E., & Oblander, F. W. (1996). *Assessment in practice: Putting principles to work on college campuses*. San Francisco, CA: Jossey-Bass.

Barrett, H. C. (2009). Balancing the two faces of e-portfolios. Retrieved November 10, 2011, from http://electronicportfolios.com/

Bennett, R. E. (2002). Using electronic assessment to measure student performance (issue brief). Washington, DC: National Governors' Association Center for Best Practices.

Bennett, R. E. (2011). Formative assessment: A critical review. *Assessment in Education: Principles, Policy & Practice, 18*(1), 5–25.

Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., & Rumble, M. (2010). *Defining twenty-first century skills*. In P. Griffith, B. McGaw & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 17–66). New York, NY: Springer.

Black, P. J., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan, 80*(2), 139–148.

Blazer, C. (2010). Information capsule: Computer-based assessments. *Information Capsule Research Services*, *Vol. 0918*. Retrieved from drs.dadeschools.net/InformationCapsules/IC0918.pdf

Bransford, J., Scardamalia, M., & Quellmalz, E. (2010). *Classroom learning environments and formative evaluation*. Melbourne, Australia: Assessment & Teaching of 21st Century Skills.

Brahim, E. F., Mohammed, K. I., & Samir, B. (2010). A formative assessment model within the competency-based-approach for an individualized e-learning path. *World Academy of Science, Engineering and Technology, 64*, 208–212. Retrieved from http://www.waset.org/journals/waset/v64/v64-36.pdf

Burke, K. (2010). *Balanced assessment: From formative to summative.* Bloomington, IN: Solution Tree Press.

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*(3), 245–281.

Camara, W. J. (2007). Standards for educational and psychological testing: Influence in assessment development and use. Unpublished paper. Retrieved from http://teststandards.org/files/standards%20-%20influence%202007.pdf

Chappuis, S., Chappuis, J., & Stiggins, R. (2009). The quest for quality. *Educational Leadership, 67*(3), 14–19.

Corn, J. (2006). A tale of unintended consequences. *Educational Leadership, 64*(3), 74–78.

Crooks, T. (2011). Assessment for learning in the accountability era: New Zealand. *Studies in Educational Evaluation, 37*(1), 71–77.

Csapó, B., Ainley, J., Bennett, R., Latour, T., & Law, N. (2010). *Technological issues for computer-based assessment.* In P. Griffith, B. McGaw & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 143–230). New York, NY: Springer.

Darling-Hammond, L. (2010a). *Policy frameworks for new assessments.* In P. Griffith, B. McGaw & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 301–339). New York, NY: Springer.

Darling-Hammond, L. (2010b). *Performance counts: Assessment systems that support high-quality learning*. Washington, DC: Council of Chief State School Officers. Retrieved from http://www.hewlett.org/library/grantee-publication/performance-counts-assessment-systems-support-high-quality-learning

Darling-Hammond, L., & Pecheone, R. (2010). Developing an internationally comparable balanced assessment system that supports high-quality learning. Paper presented at the National Conference on Next Generation Assessment Systems.

DeBoer, G. E. (2011). The globalization of science education. *Journal of Research in Science Teaching*, *48*(6), 567–591.

DiMartino, J., & Castaneda, A. (2007). Assessing applied skills. *Educational Leadership, 64*(7), 38–42.

Dunn, L., Parry, S., & Morgan, C. (2002). Seeking quality in criterion-referenced assessment. Paper presented at the Learning Communities and Assessment Cultures Conference, August 28–30, 2002.

Education Scotland. (n.d.) National assessment resource: What is it? Retrieved from http://www.ltscotland.org.uk/learningteachingandassessment/assessment/supportmaterials/nar/whatisnar.asp

Education Services Australia. (n.d.) Assessment for learning. Retrieved November 26, 2011, from http://www.esa.edu.au/projects/assessment-learning

France Ministry of National Education. (2012a). Le socle de connaissance et de competences. Retrieved from http://www.education.gouv.fr/cid2770/le-socle-commun-de-connaissances-et-de-competences.html#Le livret personnel de compétences

France Ministry of National Education. (2012b). Éduscol: Portail national des professionnels de l'éducation. Retrieved from http://eduscol.education.fr/cid54094/college-outils-pour-evaluer-les-competences-socle.html

Gewertz, C., & Robelen, E. W. (2010). U.S. tests awaiting big shifts. *Education Week, 30*(3), 1, 18–19.

Goodson, I. (2005). Patterns of curriculum change. In A. Lieberman (Ed.), *The roots of educational change: International handbook of educational change* (pp. 219–229). Dordrecht, Netherlands: Springer.

Guskey, T. R. (2005). Formative classroom assessment and Benjamin S. Bloom: Theory, research, and implications. College of Education, University of Kentucky. Online Submission paper presented at the Annual Meeting of the American Education Research Association (Montreal, Canada, April 11–15, 2005).

Guskey, T. R. (2007). Closing achievement gaps: Revisiting Benjamin S. Bloom's "learning for mastery." *Journal of Advanced Academics, 19*(1), 8–31.

Hall, T., Sparks, N., Spero, I., & Van Kuren, L. (2005). Universal design for assessment. *Soapbox Digest, 4*(1). Retrieved from http://www.edvantia.org/products/pdf/SoapBox-4-1.pdf

Hayes Jacobs, H. (2009). Upgrading the curriculum: 21st century assessment types and skills. In H. Hayes Jacobs (Ed.), *Curriculum 21: Essential Education for a Changing World* (pp. 18–29). Alexandria, VA: ASCD.

Heritage, M. (2010). *Formative assessment and next-generation assessment systems: Are we losing an Opportunity?* Paper prepared for the Council of Chief State School Officers. Retrieved December 6, 2011, from http://www.edweek.org/media/formative_assessment_next_generation_heritage.pdf

Herman, J. L. (2010). Coherence: Key to next generation assessment success. Los Angeles, CA: University of California. Retrieved from http://www.cse.ucla.edu/products/policy/coherence_v6.pdf

Herman, J. L., Osmundson, E., & Dietel, R. (2010*). Benchmark assessment for improved learning (an AACC policy brief)*. Los Angeles, CA: University of California. Retrieved from http://www.cse.ucla.edu/products/policy/R1_benchmark_polbrief_Herman.pdf

Hipkins, R. (2007). *Assessing key competencies: Why would we? How could we?* Wellington, New Zealand: Learning Media Limited.

Idrissi, M. K., Bennani, S., & Hachmoud, A. (2009). An ontology for the formalization of the competences-based approach. In A. Méndez-Vilas, A. Solano Martín, J. A. Mesa González & J. Mesa González (Eds.), *Research, reflections and innovations in integrating ICT in education* (pp. 1260–1264). New York, NY: Springer.

James, M., Black, Pl, McCormick, R., Pedder, D., & Wiliam, D. (2006). Learning how to learn, in classrooms, schools and networks: Aims, design and analysis. *Research Papers in Education, 21*(2), 101–118.

Keeley, P. (2011). Formative assessment probes: How far did it go? *Science and Children, 48*(5), 24–26.

Lane, S. (2004). Validity of high-stakes assessment: Are students engaged in complex thinking? *Educational Measurement: Issues and Practice, 23*(3), 6–14.

Leighton, J., & Gierl, M. (Eds.). (2007). *Cognitive diagnostic assessment for education: Theory and applications.* Cambridge, England: Cambridge University Press.

Looney, J., & Poskitt, J. (2005). New Zealand: Embedding formative assessment in multiple policy initiatives. In Organisation for Economic Co-operation and Development, *Formative assessment: Improving learning in secondary classrooms* (pp. 177–190). Retrieved from http://web.mac.com/antoinebodin/pro/EVALUATION_-_Questions_generales_files/formative_assessment_oecd.pdf

Meijer, J. (2007). Cross-curricular skills testing in the Netherlands. *The Curriculum Journal, 18*(2), 155–173.

Mislevy, R. J., Behrens, J. T., Bennett, R. E., Demark, S. F., Frezzo, D. C., Levy, R., Robinson, D. H., Rutstein, D. W., Shute, V. J., Stanley, K., and Winters, F. I. (2007). On the roles of external knowledge representations in assessment design. Retrieved December 6, 2011, from http://www.cse.ucla.edu/products/reports/R722.pdf

Mueller, J. (n.d.). Authentic assessment toolbox. Retrieved December 12, 2011, from http://jfmueller.faculty.noctrl.edu/toolbox/whatisit.htm#top

National Education Association. (2005). Balanced assessment: The key to accountability and improved student learning. Washington, DC: National Education Association.

NCREL/Metiri Group. (2003). Appendix: The enGauge 21st century skills continua of progress (pp. 1–53).

New Zealand Ministry of Education. (n.d.). Assessment online. Retrieved from http://assessment.tki.org.nz/.

Nichols, P. D., Meyers, J. L., & Burling, K. S. (2009). A framework for evaluating and planning assessments intended to improve student achievement. *Educational Measurement: Issues and Practice, 28*(3), 14–23.

Ontario Ministry of Education. (2010). Growing success: Assessment, evaluation and reporting in Ontario schools. First edition, covering grades 1–12. Retrieved November 6, 2011, from www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf

Organization for Economic Co-operation and Development. (2005). Policy brief: Formative assessment: Improving learning in secondary classrooms. Retrieved December 12, 2011, from http://www.oecd.org/dataoecd/19/31/35661078.pdf

Organization for Economic Co-operation and Development. (2010). PISA 2009 results: What students know and can do: Student performance in reading, mathematics and science (Volume I). Retrieved December 5, 2011, from http://www.oecd.org/document/53/0,3746,en_32252351_46584327_46584821_1_1_1_1,00.html

Paquette, G. (2002). *Modélisation des connaissances et des compétences*. Sainte-Foy, QC: Presses de l'Université du Québec.

Parsons, J., McRae, P., & Taylor, L. (2006). *Celebrating school improvement: Six lessons from Alberta's AISI projects*. Edmonton, AB: School Improvement Press.

Pellegrino, J. W., & Quellmalz, E. S. (2011). Perspectives on the integration of technology and assessment. *Journal of Research on Technology in Education, 43*(2), 119–134.

Pinkham, C., E., Wintle, S. E., & Silvernail, D. L. (2008). *21st century teaching and learning: An assessment of student website evaluation skills.* Center for Education Policy, Applied Research, and Evaluation University of Southern Maine and Sanford Junior High School. Retrieved December 5, 2011, from http://maine.gov/mlti/resources/21st_Century_Teaching_and_Learning_Website.pdf

Redfield, D., Roeber, E., & Stiggins, R. (2008). Building balanced assessment systems to guide educational improvement. Paper presented at the June 2008 National Conference on Student Assessment, Council of Chief State School Officers, Orlando, FL.

Reeves, D. B. (Ed.). (2007). *Ahead of the curve: The power of assessment to transform teaching and learning.* Bloomington, IN: Solution Tree Press.

Reeves, D. B. (2010). A framework for assessing 21st century skills. In J. Bellanca & R. Brandt (Eds.), *21st century skills: Rethinking how students learn (*pp. 305–326). Bloomington, IN: Solution Tree Press.

Rogers, W. T. (1996). Principles for fair student assessment practices for education in Canada. *Assessment in Education: Principles, Policy & Practice, 3*(3), 1–21.

Rothman, R. (2010). *Policy brief: Principles for a comprehensive assessment system*. Washington, DC: Alliance for Excellent Education. Retrieved from http://www.all4ed.org/files/ComprehensiveAssessmentSystem.pdf

Ruiz-Primo, M. A. (2011). Informal formative assessment: The role of instructional dialogues in assessing students' learning. *Studies in Educational Evaluation, 37*(1), 15–24.

Santiago, P., Donaldson, J., Herman, G., & Shewbridge, C. (2011). OECD reviews of evaluation and assessment in education: Australia. Retrieved from www.oecd.org/edu/evaluationpolicy

Scardamalia, M., Bransford, J., Kozma, B., & Quellmalz, E. (2010). *New assessments and environments for knowledge building.* In P. Griffith, B. McGaw & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 231–300). New York, NY: Springer.

Silva, E. (2009). Measuring skills for 21st-century learning. *Phi Delta Kappan, 90*(9), 630–634.

Stiggins, R. (2006). *Balanced assessment systems: Redefining excellence in assessment*. Portland, OR: Educational Testing Service. Retrieved November 26, 2011, from http://www.ride.ri.gov/highschoolreform/DOCS/Alignment%20Workshop%20Resources/Stiggins_Balanced_Assessment_Systems.pdf

Stiggins, R. (2008). *Assessment manifesto: A call for the development of balanced assessment systems*. Portland, OR: Educational Testing Service.

Teaching and Learning Research Programme. (2006). Learning how to learn, in classrooms, schools and networks. Retrieved December 6, 2011, from http://www.tlrp.org/dspace/retrieve/1771/Research+Summary+%283%29V2.pdf

Thompson, S. J., Johnstone, C. J., & Thurlow, M. L. (2002). *Universal design applied to large-scale assessments (synthesis report 44)*. Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes. Retrieved November 26, 2011, from: http://education.umn.edu/NCEO/OnlinePubs/Synthesis44.html

Tillema, H., Leenknecht, M., & Segers, M. (2011). Assessing assessment quality: Criteria for quality assurance in design of (peer) assessment for learning–A review of research studies. *Studies in Educational Evaluation, 37*(1), 25–34.

Townsend, D., Adams, P., & White, R. (2010). Successful assessment for learning projects from AISI cycle 3. Retrieved from http://education.alberta.ca/media/6412192/research_review_assessment_2010.pdf

Tullis, P. (2010). An 'a' in abstractions. *THE Journal, 37*(3), 26–32.

University of Alberta. (1993). Principles for fair student assessment practices for education in Canada. Edmonton, AB: Joint Advisory Committee. Retrieved from http://www2.education.ualberta.ca/educ/psych/crame/files/eng_prin.pdf

Volante, L. (2010). Assessment of, for, and as learning within schools: Implications for transforming classroom practice. *Action in Teacher Education, 31*(4), 66–75.

Wiggins, G. (2006). Healthier testing made easy: The idea of authentic assessment. Retrieved May 21, 2011, from http://www.edutopia.org/authentic-assessment-grant-wiggins

Wiliam, D. (2006). Does assessment hinder learning? Presentation at ETS Europe Breakfast Seminar, July 11, 2006.

Wilson, M., Bejar, I., Scalise, K., Templin, J., Wiliam, D., & Irribarra, D. T. (2010). *Perspectives on methodological issues*. In P. Griffith, B. McGaw & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 143–230). New York, NY: Springer.

Wisconsin Department of Public Instruction, Office of Educational Accountability. (2009). Balanced assessment system. Madison, WI: Wisconsin Department of Public Instruction, Office of Educational Accountability. Retrieved from http://dpi.wi.gov/oea/pdf/bas.pdf

Wisconsin Response to Intervention Center. (n.d.). Overview: Balanced Assessment. Retrieved November 6, 2011, from http://www.wisconsinrticenter.org/parents-and-family/understanding-rti/femodule/ba-overview.html

CHAPTER 10: FROM KNOWLEDGE TO ACTION: FINAL THOUGHTS

"All our final decisions are made in a state of mind that is not going to last."
Marcel Proust

This report is organized according to the following chapters: 1) Curriculum Development Processes; 2) Competencies; 3) Ways of Knowing; 4) Breadth and Depth; 5) Interdisciplinary Learning and Interdisciplinary Curriculum; 6) Flexible Timing and Pacing in a Variety of Learning Environments; 7) Responsive Curriculum for a Digital Age; 8) Student-centred/Personalized Learning; and 9) Assessment. What follows are final thoughts on each of these chapters.

1. Curriculum Development Processes

In writing about curriculum development, the key question is, "What is curriculum?" As has been noted, curriculum stems from the Latin word for *currere,* referring to the course of actions and experiences through which children grow to become mature adults. Curriculum is a large construct that is more than just programs of study or content. This review suggests that curriculum has at least four goals: 1) curriculum is influence—it works to shape behaviour; 2) curriculum is encounter—it is a place where people and ideas meet; 3) curriculum is relationship—the work of curriculum is to create networks of people and knowledge; and 4) curriculum is politic—it embraces the reasons why things are done. Simply stated, curriculum is about students engaged in school and learning as a way to improve human life.

Curriculum is a concept that occurs both in and out of school, although this work has centred upon what happens in schools. *The Curriculum*, written in 1918 by John Franklin Bobbitt, was the first textbook published about curriculum. Bobbitt described curriculum as the course of deeds and experiences through which children pass to become the adults they should be to succeed in society. He defined curriculum as encompassing the entire scope of formative deeds and experiences that occur in and out of school. He included experiences that were unplanned and undirected, and experiences intentionally directed for the purposeful formation of adult members of society. This is "age-old curriculum thinking."

This review of curriculum development processes comes with a reminder that curriculum is much more than subject-area content. For those who engage in curriculum development, a series of crucial questions about the purpose of schooling needs to be asked. A key question is of course, "What do all students need to learn to be successful?" But the questions must not end there. Curriculum developers also need to ask: 1) What is the best of the past?; 2) What global considerations must students, who now enter school, face when they graduate?; 3) How do we wish to live as a society?; and 4) How will what we do in schools shape the future of students and who they become as active members of society?

These are philosophical questions that all nation states ask as they seek to find answers. As one studies international curriculum, one finds that all international curricula share: 1) a rationale for study; 2) general goals for students (e.g., responsible citizenship); 3) learning outcomes, expectations (common educational), standards, objectives and competences; 4) learning materials for students and teachers; 5) subject-area content to be covered; and 6) curriculum standards (e.g., assessment).

Alberta is no different. Alberta's educational task is to develop a modern, world-class curriculum that will inspire and challenge all learners and prepare them for the future. To engage this curriculum process, it should be recognized that:

- curriculum can make a difference in the lives of Alberta's children
- research informs action
- research plus informed policy should end in curriculum action.

Research has shown that there is generally a similar pattern used for curriculum development (i.e., for most jurisdictions, this means programs of study). To meet the needs of all students, what needs to be considered in the Alberta context, as a mainstay, is a simultaneous design, development and implementation process, in both English and French, that considers continual enhancements to curriculum (programs of study, assessment, and learning and teaching resources). As a result, new development processes that involve constant monitoring and evaluation of success will also require new management skills and long-term collaborative and interdependent approaches that can support innovation through capacity building, greater experimenting (e.g., prototyping) and customizing, new collaboration models (e.g., co-creation) and learning from experience.

Most importantly, though, is the treasure at the end of the curriculum rainbow—student learning.

2. Competencies

Competencies are defined in *Inspiring Action on Education* (2010b) as interrelated attitudes, skills, and knowledge, which are applied to particular contexts grounded in successful learning and living. *Inspiring Action on Education* sees competencies as essential for life and citizenship, and notes that adaptability and flexibility, reasoning, responsibility and resiliency are enduring characteristics to help Albertans become engaged thinkers and ethical citizens with an entrepreneurial spirit (three *Es*). Literacy and numeracy are considered to be foundational to student learning.

Competencies are practical and measure those skills needed for successful living, learning and working. Competencies transcend subject-area boundaries and are interrelated. Competencies include the attitudes, values, skills and knowledge developed over time that all students need.

For Albertans, success in the 21st century is the ability to adapt to changing circumstances, situations and contexts. *Inspiring Action on Education* believes competent learners are self-directed, creative, critical thinkers and problem solvers, who are also socially and environmentally responsible and globally aware. Learners are empathetic, open-minded, ethical and digitally literate, and they are able to communicate using a variety of methods across a range of subject areas and disciplines.

Because society is changing at a rapid pace, the future of today's learners cannot be predicted with certainty. As such, Alberta students need to learn in ways that develop their capacity to discern and react to novel and complex situations. Dealing with an unpredictable future necessitates an approach that must move away from "prescriptiveness" and embrace the principle of diversity and variation, while providing students with the attitudes, values, skills and knowledge they need to learn to be able to live and work in the future.

From a curriculum perspective, competencies serve to develop learning programs that can better meet the needs of diversity in learning, as students gain competency at their own rate and in their own unique ways, thus supporting the six core values underlying the three *Es*: opportunity, fairness, citizenship, choice, diversity and excellence.

3. Ways of Knowing

For centuries Western education (especially in Europe, North America and South America where culture and society have been greatly influenced by traditions rooted in Greek and Roman culture and in Christianity) has had one view of learning. As a result, education systems have been built on a singular way of organizing knowledge, creating schools and building curriculum. But, recent and accepted insight suggests that there is more than a singular way to envision the world and to build curriculum and instruction based upon that vision. Today, more organic, dynamic, transforming, responsive and multidimensional understandings are accepted within schools and built within education systems. Today, many systems not only embrace new peoples and their ideas but celebrate them. These *ways of knowing* add to and complement a rich tradition of educational thought that has been accepted as central to society and culture. In Western and Northern Canada, for example, education systems are beginning to base their standards, expectations, values and beliefs about education on those that are rooted in Western and Northern Canadian experiences and perspectives, including those of First Nations, Métis and Inuit peoples.

Indigenous *ways of knowing* represent ancient wisdom and traditions, are holistic in nature, are fluid and contextual, and encompass Aboriginal traditions, experiences, culture, experimentation, visualization and intuition. These *ways of knowing* transcend and extend the scientific and historical traditions that are so prevalent in Western education. They link the cultural diversity found within communities with the culture of the disciplines that have enabled society's prosperity and cultures to progress in ways that have enriched citizens. These *ways of knowing* celebrate difference.

Some of these *ways of knowing* are circular and begin with the individual, and some begin with nature. They celebrate learning that is intergenerational and envision the universe in ways that consider and respect deeply ethical and ecological creativity. Some *ways of knowing* place people at the centre of all learning through a collective consciousness and wisdom, where learning is seen as authentic and universal.

Ways of knowing recognize a kaleidoscope of ways of seeing the world, where a variety of views and understandings work to further develop and engage thinkers and to develop them into ethical citizens who engage the world with entrepreneurial spirits. Such ways of knowing allow more personal, meaningful and experiential insights that become directly connected to the learner in contexts that emerge from sharing knowledge between people and, in the case of Indigenous peoples, with the land.

It is important that educators recognize their biases and are willing to see the connections of these biases to curriculum development. In the future, when opportunities arise for curriculum change, it will be critical for curriculum developers and teachers to consider that students come to the education system and to learning with a set of beliefs, values and different *ways of knowing* (e.g., Indigenous, gender-related, subject/discipline, embodied, intuitive) that need to be recognized, acknowledged, valued and nurtured within curriculum and, ultimately, learning.

4. Breadth and Depth

For curriculum to help students learn effectively in an ever-changing and complex world, it needs to have both breadth and depth in content and skill development. Such curriculum must build on agreed-upon foundations that give students the solid background knowledge and skills they need to live well in society and to pursue further learning. Because knowledge builds upon knowledge, curriculum must provide students with the solid learning foundation and background they need to think deeply and critically. Such curriculum, as it has been emerging over the recent past, must provide both common and individual learning to all students. Such a curriculum task is not easy.

Curriculum breadth and depth is needed because life is complex and ever changing. It is simply not enough to understand only the "surface" of something. Instead, to deeply and broadly understand (depth and breadth), further investigation or exploration is needed. Breadth is the general knowledge that is traditionally included in subject areas or disciplines found in curriculum; depth involves those important analytical and critical connections requiring skills, such as critical thinking and interdisciplinary connections, which expand both the disciplines and metacognitive skills that learners need in order to embrace disciplined knowledge.

Curriculum has traditionally been made up of overarching themes (breadth) defined by specific learning outcomes that may lead to deep understanding (depth). These two curriculum concepts—breadth and depth—create a dynamic relationship that encourages learners to take significant knowledge that has been acquired and apply it to real-life situations. For a curriculum to be both broad and deep it must include a range of interconnected concepts, which are relevant and meaningful to students and enable them to acquire and apply knowledge more deeply in their interest areas. Engaging breadth and depth in curriculum creates a dynamic tension between and among integrated disciplines. Curriculum that is broad and deep is organized for all students and, simultaneously, organized for each student.

Curriculum that is broad and deep must be designed and implemented with integrity. Assessing, in a formal way, the importance of curriculum breadth and depth will help education systems better create effective curriculum. Assessment of curriculum breadth and depth also helps education systems gather the evidence they need to see if desired curriculum goals are accomplished. From what systems discover, programs of study can be revised to improve both learning and teaching. Better understanding of breadth and depth can help systems discover both what works well and what needs work.

To achieve this goal, curriculum developers will need to be cognizant that it is not an "either or" situation; rather, there will always need to be a balance between when breadth is needed and when depth can happen, bearing in mind that without breadth of knowledge and skills, deep learning is less likely to occur.

5. Interdisciplinary Learning and Interdisciplinary Curriculum

Interdisciplinary learning should not seem new; however, it often does. Traditionally, educators have worked to break the disciplines into content pieces suitable for students in classes and courses. Hence, to recombine content into a whole instead of the sum of the parts seems odd. Recent research and educational theories suggest that bringing together diverse disciplines into a comprehensive world helps students develop meaningful understandings of the complex associations that actually and realistically make up the world. Interdisciplinary learning draws from two or more disciplines in ways that help students extend their learning and access higher-order thinking.

Research suggests that interdisciplinary learning:

- contributes to the development of the students' intrinsic motivation, self-regulation and self-efficacy, and allows them more freedom and creativity in their learning
- encourages more authentic community engagement to help students foster independent, self-directed and connected learning
- develops a greater understanding and respect for knowledge, by working more closely with community experts to create and draw upon attitudes, values, skills and knowledge from multiple disciplines and in ways that allow a greater understanding of the place and importance of knowledge, including how a subject or content area mirrors the needs of the local community and cultures
- empowers student voice by engaging students in learning that is respectful, seeks their opinion, and is relevant and meaningful
- encourages other ways of learning and other *ways of knowing*, including those of First Nations, Métis and Inuit peoples,
- allows students to see practical connections between what they learn and real-world situations.

Research also suggests that interdisciplinary learning creates and renews a number of curriculum possibilities, including different and more creative time allocations for curriculum content, invitations for sharing workspaces and the collaborative sharing of resources, allowing teachers to research, plan and prepare instruction so as to participate more actively in student learning and their own professional development.

Interdisciplinary curriculum also has the potential to create opportunities for learners to build bridges between subjects and add relevance and authenticity to their own learning experiences. Interdisciplinary experiences enhance student engagement and student learning, and serve to bridge knowledge and meaning making with 21st century skills and attitudes. A 21st century education depends on integrative curriculum that unites core academic subjects, interdisciplinary themes and competencies with instructional approaches in which pedagogies, technologies, resources and contexts work together to prepare students for life. An interdisciplinary curriculum can facilitate this type of learning by being designed so as to permit integration in a seamless fashion, moving away from the boxed notion of subject areas and disciplines to learning that resides in real-world contexts and involves students using competencies to engage in meaningful learning.

6. Flexible Timing and Pacing in a Variety of Learning Environments

What does it mean for curricula to have flexible timing and pacing? How can the variety of learning environments be improved if time and pace have the ability to be shaped? Given technological improvements that have offered educators abilities they could not have foreseen (even a few years ago), it is now possible to create student learning experiences both within and outside traditional schooling and traditional days or years to occur at any time and any pace. These changes include both face-to-face learning or anytime online learning; i.e., learning that can become both synchronous and asynchronous, as needed. Furthermore, such learning is no longer an "either or" scenario; rather, it is becoming a blended experience that allows students and schools to become knowledge co-creators, using current and emerging technologies.

How will flexible timing and pacing influence education? It will allow students to assume greater ownership for their educational choices and readiness. It will allow students to learn and influence their own learning—whether broadly or deeply and within interdisciplinary experiences—in more effective ways. Teachers, as facilitators, mentors and coaches, can help students engage in a variety of learning opportunities, including problem-based and project-based learning, which is more fruitfully enabled by the rich possibilities inherent in current information and communications technologies and the learning environments these technologies help to create. Such environments are in and of themselves flexible and promote the use of a variety of different and engaging assessment practices, learning opportunities and teaching resources.

Flexibility in timing and pacing might also enhance better relationships among students, teachers and educational communities, so as to offer possibilities that sustain the interest of individuals and groups of students as they progress toward personal and provincial goals, interests and required capabilities.

Flexible timing and pacing also allows for the creation of differentiated learning and teaching resources that provide scaffolding of learning to meet diverse learning needs.

Curriculum developers need to consider that, when developing learning programs, time should not be the driver but rather learning diversity should be the focal point. When time is viewed differently, changes in pacing can be more easily implemented. Pacing respects an inclusive learning model and, as such, impacts "how much content" can be inserted in learning programs. Varying learning environments also play a key role in supporting flexible timing and pacing. Providing students with different places and spaces to engage in learning also enhances their educational experience. Thinking in fresh ways about reshaping schools and school curricula demands preparation and research; otherwise, the known is reiterated.

7. Responsive Curriculum for a Digital Age

Responsive curriculum and instruction honours and encourages schools, parents, families and communities to collaborate in ways that help students become more engaged in their own individual *ways of knowing* and ways of learning, as they more deeply explore and come to understand bodies of knowledge within local and global contexts.

A responsive curriculum:

- includes competencies that meet student learning needs and offer students opportunities for interdisciplinary learning and inquiry
- is flexible enough to provide learners with opportunities to broadly explore knowledge and gain deeper conceptual understanding
- encourages broad collaboration between educational partners (teachers, students, parents and the community) that works to better develop learning experiences for students
- facilitates the development of student-centred/personalized learning that recognizes student interests and capabilities
- enables student-to-student and student-to-teacher collaboration
- is current, relevant, adaptable and accessible in traditional and non-traditional learning environments to all learners in a variety of formats
- builds assessments that respond to the need to measure the variety of ways students might succeed and aligns this success more directly with learning outcomes in meaningful, clear, dynamic, timely, ongoing and embedded real-world contexts
- recognizes and supports a variety of ways of learning, with assessments that provide better evidence of what students can do.

A responsive curriculum requires that its development be iterative, continuously informed and revised based on feedback from its principal users—students and teachers. It must be: 1) flexible; 2) emergent rather than rigidly predefined; 3) tolerant of diversity and differences; 4) meaningful to students; and 5) open to input from its users. For this to occur, students need to move from consumers of information to active participants in the production of information, and, as a consequence, teachers will need to move from deliverers of knowledge to collaborators in knowledge creation. Assessment will play a key role in determining responsiveness, as it will need to represent the process of meaning making and knowledge construction, thus changing the current notion of "what is assessment" and "what is standardization." When these factors come into play, it will become apparent that curriculum is more responsive and evolving to meet ever-changing needs.

8. Student-centred/Personalized Learning

Personalized learning means something more than customized or individualized learning. Personalized learning puts the student at the centre of the learning process. Education leaders and experts agree that the current educational model has difficulty in meeting the personalized needs of students and that a systemic redesign is needed. Educational leaders believe student-centred/personalized learning is now the future of education, especially as more schools move toward utilizing existing and future technology.

Unfortunately, the current paradigm of the education system dates from the Industrial Revolution where learning has traditionally been associated with requiring students *to gain* information, rather than encouraging students *to learn*.

Theories and research on what is student-centred/personalized learning has generated a number of insights for curriculum development. Student-centred/personalized learning is predicated on a belief system where every student matters, and where attention needs to be paid to individual motivation and ways of learning (learning styles and preferences). From this work it can be seen that student-centred/ personalized learning can create more meaningful, authentic, holistic, deep, engaging and purposeful connections. It can also inspire teachers and students to redefine learning so as to promote educational change that uses a "one-size-fits-one" versus the traditional "one-size-fits-all" approach. This approach supports students by scaffolding learning outcomes and resources in ways that allow for student creativity, student voice and a personalized student learning path, which is guided by students' ideas, interests, choices and co-investment in learning that instills student ownership for learning decisions.

Student-centred/personalized learning also becomes a social activity where students develop relationships and come to co-create knowledge in a dynamic, interactive process that uses feedback to support their learning. Student-centred/personalized learning is based upon recognizing that students are individuals who have personal strengths and that learning spaces can be created to meet their needs and interests while promoting both intergenerational and lifelong learning.

A "tight" curriculum, based on accountability, does not necessarily effectively support meaningful personalized learning. To increase student motivation and achievement that leads to higher self-

confidence and more positive feelings about school, curriculum needs to broaden the what, when, where, how and at what pace students achieve defined learning outcomes. As such, curriculum development needs to give students the opportunity to build on individual strengths and achievements, to pursue their passions and interests, and to learn in ways that are consistent with their individual ways of learning. In the end, a curriculum that focuses on both learners and learning helps to offset alienation and helps students to feel more connected to learning and the world around them.

9. Assessment

For schools to work, it is important to know whether they have, in fact, accomplished their purpose—to increase student learning. Assessment is the best way to do this. An education system, such as the one in Alberta, that seeks to continuously improve, wants to understand how its schools are working and how students are learning. Is it formalized test scores or do teacher insights spell the better way? Or is it some combination of standardized and teacher assessments? How can classroom teachers really know how their work is progressing? Such questions must be addressed if an understanding of student learning is to be achieved.

There are many kinds of assessments. Some assessment is useful for one purpose but does not provide useful information for another. Most education systems believe that diversified measures are necessary to understand the wide variety of goals of any education system. It is a challenge to design an assessment system that effectively balances the strengths of summative and formative assessment in order to address instructional accountability and student learning success.

Formative and summative assessments have distinct uses and limitations. Summative assessment, used at the end of a particular point in learning, is cumulative in nature, but it may come too late to give teachers timely information to influence student learning. Formative assessments, on the other hand, help teachers assess student learning at the time when it is occurring and help teachers shape instruction to improve learning. Research on using assessment to improve learning suggests that using various forms of both formative and summative assessment creates a well-balanced assessment program to help make better decisions about student learning.

Learning occurs best when learning outcomes, instruction and assessment align. Assessment can take a multitude of forms—diagnostic, classroom-based formative and summative, standardized tests—that measure student proficiency of the defined learning outcomes. However, to achieve alignment, a comprehensive and coherent assessment system needs to find balance between different formative and summative assessments (e.g., standardized, classroom) to meet diverse learning needs and to ascertain that the learning outcomes have been achieved. This involves the consideration of varied and numerous assessments that are purposeful, that can obtain effective results through quality criteria, and that have students involved in the assessment process so they can better understand themselves as learners.

In Closing

The Inspiring Education Initiative set the stage for educational transformation in Alberta. The concepts presented in this research paper support the values first identified in *Inspiring Education: A Dialogue with Albertans* (2010a, p. 6). Chapter 2 acknowledges the importance of competencies in the development of engaged thinkers and ethical citizens with an entrepreneurial spirit. Ways of Knowing (Chapter 3), Breadth and Depth (Chapter 4) and Interdisciplinary Learning and Interdisciplinary Curriculum (Chapter 5), Student-centred/Personalized Learning (Chapter 8) and Assessment (Chapter 9) speak to the importance of diversity, choice, opportunity and fairness in achieving excellence in learning for all students. Flexible Timing and Pacing in a Variety of Learning Environments (Chapter 6) and Responsive Curriculum for a Digital Age (Chapter 7) also stress the importance of choice, opportunity, citizenship and fairness. The integration of these concepts into Alberta curriculum will permit Alberta to achieve its transformational vision of an educated Albertan.

BIBLIOGRAPHY

Bobbitt, F. (1918). *The curriculum.* Boston, MA: Houghton Mifflin.

Alberta Education. (2010a). *Inspiring education: A dialogue with Albertans*. Retrieved from http://www.inspiringeducation.alberta.ca/LinkClick.aspx?fileticket=BjGiTVRiuD8%3d&tabid=37

Alberta Education. (2010b). *Inspiring action on education*. Retrieved from https://ideas.education.alberta.ca/media/2905/inspiringaction%20eng.pdf

Proust, Marcel. Quotes. Retrieved February 29, 2012, from http://thinkexist.com/quotes/marcel_proust/

APPENDIX A: GUIDING RESEARCH QUESTIONS

The following preliminary list of questions was created in June 2010 as a means to develop themes for research. These questions and subsequent stakeholder engagements and emergent research considerations will be used to review and revise the research themes.

1. Have researchers and/or jurisdictions identified the skills, knowledge and/or competencies that are newly required or are of significantly greater importance in the 21st century than they were before the year 2000? Have jurisdictions included these competencies in their curriculum? Have they evaluated the success of doing so?

2. Have researchers and/or jurisdictions defined a set of core competencies that learners will need to have and which are not subject specific? Have jurisdictions infused these into the curriculum? Have they done so across the subject areas? Have they evaluated the success of doing so?

3. Have researchers identified good combinations of breadth and depth in curriculum? Have jurisdictions moved to less breadth and more depth? Have they evaluated the success of doing so?

4. Have researchers identified and analyzed models for providing interdisciplinary curriculum and learning? Have jurisdictions implemented such models and approaches? Have they evaluated the success of doing so? How have these learning experiences been assessed?
   a) Have researchers identified ideal approaches to the support of student-centred/personalized learning in the curriculum? Have jurisdictions implemented promising practices that have worked well? Have they evaluated success?
   b) Have researchers identified ideal approaches to the inclusion of different ways of knowing into the curriculum? Have jurisdictions implemented promising practices that have worked well? Have they evaluated success?

5. Have researchers and/or jurisdictions defined the concept “anytime, any place, any pace learning” (e.g., flexible timing and pacing through a range of learning environments)? Have jurisdictions developed curriculum so that it enables this to take place? Have they evaluated the success of doing so?

6. Have researchers assessed and/or jurisdictions been able to move to a situation where they update curriculum, as needed on a regular basis, triggered by new information and research? Has this involved one or more subject areas at a time? How have they been able to make this work? Have they evaluated the success of doing so?

7. Has *Setting the Direction* assembled the research needed to inform the needed curricular response to its directions? If not, have researchers identified ideal promising practices? Have jurisdictions implemented promising practices? Have they evaluated the success of doing so?

8. Have researchers identified ideal approaches to the facilitation of learner transitions to post-secondary and to the world-of-work? Have jurisdictions implemented promising practices that have worked well? Have they evaluated success? (Transitions are included in CALM as well.)

9. Have researchers and/or jurisdictions assessed and/or implemented an approach whereby curriculum is built in a manner involving elements connected together to create a comprehensive learning experience on a technological infrastructure that allows teachers and learners to access a rich suite of curricular resources (learning and teaching resources, assessment, programs of study outcomes) appropriate to any point in the program of studies, in order to facilitate the personalization of learning? Have they evaluated the success of doing so?

10. What impact on student achievement does the research indicate about an approach to assessment that is deliberate and makes planned use of formative assessment practices? How does the research define curriculum and assessment alignment, and what does it say about how this will transform teaching and learning? What will be the professional learning opportunities required to support this transformation in assessment? What does the research say about approaches to assessment? How does the implementation of approaches to assessment improve student achievement? What evidence is there in the research that supports the implementation of approaches to assessment that engage students in their learning and that clarify for students the next steps in their learning? Forty percent of Cycle III AISI projects focused on assessment. What can we learn from these projects? What jurisdictions have embraced this approach and what can we learn from them? How did these jurisdictions make it happen? What did they do to engage their teachers in the transformation? What is happening in other areas of the world in regards to assessment? Have other countries embraced this transformation and, if so, how? Current research shows improvement in student achievement in countries like New Zealand, Australia, Singapore and South Korea. Have these countries embraced this notion? Is there a correlation between their gain in student achievement and the implementation of a particular approach to assessment?
    a) Have researchers identified ideal approaches to the assessment of competencies? Have jurisdictions that have explicitly embedded competencies into their curriculum implemented promising practices that have worked well? Have they evaluated success?

11. Have researchers or jurisdictions examined/implemented consistency in format and content? Is there anything that can be learned about the appropriate mix of consistency and flexibility for variations in subject requirements?

12. What is the current state of the art in terms of curriculum development process? In terms of curriculum products?

13. Have jurisdictions been able to complete curriculum revisions more quickly than before using various approaches? What have those approaches been? Have they evaluated the success of doing so?

14. Have researchers examined approaches to having curriculum redevelopment or updating projects proceed in a more synchronous manner (e.g., coincident development of English and French curriculum; development of assessment and learning and teaching resources related to programs of study outcomes soon after the individual or subset of outcomes has been identified)? Have jurisdictions been able to do things this way? Have they evaluated the success of doing so?

15. Have researchers assessed and/or jurisdictions implemented flexible programs of study standards; e.g., by having a mandatory portion and a portion that can be developed at the local level, using local context? Have they evaluated the success of doing so? Have they been able to ensure that learning has occurred? What is an optimal level of local content? How would provincial assessments be constructed given this local component? Would moving in this direction assist in meeting the types of local needs now met through locally developed courses (LDCs), and are there jurisdictions that have used this approach in conjunction with a reduction in the need for and the number of LDCs?

16. What are the pitfalls in not doing adequate research? Does an extensive research program delay project schedules?

17. Is there any operational research that can be used to inform the approach to be taken to the level and nature of project documentation needed (e.g., business case for large scale change approved by Assistant Deputy Minister vs. manager approval for small scale changes) based on the size of curriculum updating/redesign projects?

18. Have researchers assessed and/or jurisdictions moved from direct development of curriculum components ("rowing") to establishing standards; and acquiring, adapting and/or obtaining development from others, such as stakeholders, partners, the private sector, with the Department playing more of a contract management role? Have they evaluated the success of doing so?

19. Have researchers and/or jurisdictions assessed and/or implemented a move toward an approach whereby any partner can develop/modify any component/module of the curriculum and propose it for addition/change to the curriculum? How have they vetted proposals? Have they evaluated the success of doing so?

20. Have jurisdictions moved to a funding model which would recognize the contributions of various members of the partnership that did the development work? Have they evaluated the success of doing so?

21. Have researchers and/or jurisdictions assessed and/or implemented a decision to broaden the definition of stakeholders, whose input is sought on curriculum; e.g., business and industry, researchers, post-secondary? Have they evaluated the success of doing so?

22. Have researchers and/or jurisdictions assessed and/or implemented a process of developing curriculum in partnership with education stakeholders, publishers and developers rather than basically in-house? Have they evaluated the success of doing so?

23. Have researchers examined an approach to implementation, which involves implementation support resources being available in virtual and real space to allow stakeholders and partners to engage in dialogue and learning opportunities? Have jurisdictions put such an approach in place? Have they evaluated the success of doing so?

APPENDIX B: RESEARCH ROUNDTABLES

Three research roundtables[12] were held in the spring of 2011 as part of Curriculum Redesign. The roundtables brought together education partners and stakeholders to share, interpret, review and discuss *research*[13]*, literature review and article summaries*[14] and share practical experiences and knowledge. The roundtables provided and opportunity to develop common understandings of key concepts indentified in *Inspiring Education: A Dialogue with Albertans* and *Inspiring Action on Education* for consideration in future curriculum development. The key concepts addressed at each roundtable can be found in the pages that follow.

The two goals of the research roundtables were:

1. To move toward a common Alberta understanding of the key concepts that are foundational to the redesign of standards and guidelines for the development of provincial curriculum.
2. To add to the pool of research available to inform Action on Curriculum and to further ensure that curriculum redesign approaches are research-based.

The process objectives of the research roundtables were:

1. To explore and share research findings among education partners/stakeholders, academics, practitioners and department staff.
2. To support the principle of co-creation by involving a wide range of participants who can then build collaborative, co-creative relationships.

[12] The data contained in this document has been taken directly from the *Summary of Findings: Research Roundtables 1, 2 and 3* that was approved for posting on the Alberta Education website.

[13] For the purpose of the research roundtables, *research* was defined as the gathering of data, information and facts in order to discover (new) information to reach a new understanding. This definition was derived from Cambridge Dictionaries Online (http://dictionary.cambridge.org/dictionary/british/research_1) and Experiment-Resources.com (http://www.experiment-resources.com/definition-of-research.html#ixzz1VPMinEpI).

[14] These approved summaries of qualitative and quantitative studies, scholarly reviews, and expert opinions, and will be made available in the Final Report.

DESIGN OF THE ROUNDTABLES

A working group consisting of representatives from external stakeholder groups and ministry staff provided leadership for the planning and organization of each of the roundtables. The working group members collected and shared literature reviews of research related to key concepts for discussion at the roundtables. An appreciative inquiry approach[15] was used to engage in a dialogic process with participants.

The following three phases of appreciative inquiry were adapted to structure the roundtables consisting of up to eight participants, a facilitator and a recorder at each table.

Discovery: Delegates identify what they know about the key concepts by sharing their stories, personal experiences or research.

Dream: Delegates imagine the possibilities as they relate to the key concepts and create images of what the future would look like once attained.

Design: Delegates co-create common understandings for the key concepts.

Prior to each roundtable, delegates were asked to review articles and article summaries provided to them through Moodle™. They were also asked to bring to the roundtables any literature reviews of research they had collected, or information they had on research activities that they may have been personally involved with related to the key concepts. Over the two-day experience, delegates were engaged in a variety of planned activities to facilitate understandings of the key concepts. These included reviewing article summaries, listening to keynote addresses, viewing video clips and PowerPoint presentations, engaging in table conversations and participating in panel discussions.

During the roundtables, delegates worked together in assigned groups with a facilitator to co-develop a common understanding for each key concept.

COLLECTION AND ANALYSIS OF FINDINGS

Information was collected during the roundtables through delegate notes and illustrations and recorders' notes of the table conversations. Collaborative online tools (Titan Pad™ or Google Docs™) were used by the table recorders to electronically capture the participant discussions as they occurred. Following each roundtable, the common themes/understandings from the table dialogues were compiled and documented as *Event Overviews*.

[15] Appreciative Inquiry is an approach based on the strengths of a system or an organization. The approach looks to appreciate the knowledge that people have through an analysis of the current system and to leverage the strength of this knowledge through exploration and deep inquiry in an environment of collaboration. The approach looks to move change through the power of knowledge and to dream and design a future that is created and understood by all.

The findings that follow are organized according to key concept, a summary of the process for exploring the key concept, followed by the common understandings for the key concept derived from a collation of the information collected from table dialogues. Each common understanding represents an analysis of the ideas and themes that emerged from the table dialogues around each key concept.

Roundtable 1

Key Concept: Competencies

Process for Exploring the Key Concept

Delegates prepared for the roundtable by reading literature reviews and article summaries of research and other relevant documents posted on the conference Moodle™. The readings included Alberta Education's *Inspiring Action on Education* (2010) and The Alberta Teachers' Association's *Changing Landscapes for Learning Our Way to the Next Alberta*. During the discovery and dream phases, delegates shared experiences and articles about competency development, and reviewed the competencies and attributes of an educated Albertan outlined in *Inspiring Action on Education* (2010) (Figure 1 on page 7) and imagined a future where competencies had been fully implemented in provincial curriculum. Ideas from the discover and dream phases were used to draft the common understanding.

A Common Understanding of Competencies

A competency is an interrelated set of attitudes, skills and knowledge that is drawn upon and applied to a particular context needed for successful learning and living.

Delegates gave feedback that all of the competencies described in *Inspiring Action on Education* (2010) are essential for an educated Albertan in the 21st century and critical for realizing the vision of an engaged thinker and ethical citizen with an entrepreneurial spirit.

Delegates further characterized competencies as:

- essential for life and citizenship and developed over a lifetime
- transcending subject-area boundaries
- inclusive of the attributes of flexibility, adaptability and resiliency for managing change
- encompassing of responsibility and stewardship in the global context
- focusing on the importance of personal well being throughout schooling and life
- recognizing the foundational nature of literacy and numeracy for all competency development.

Key Concept: Literacy and Numeracy

Process for Exploring the Key Concept

In advance of the roundtable, delegates were asked to read two Alberta Education documents, *Literacy First: A Plan for Action (2010)* and *Numeracy: A Discussion Paper (draft 2011).* Delegates were encouraged to read summarized information on literacy and numeracy from a wide variety of other sources provided on the Moodle™ and to bring and share their own literature reviews of research on these concepts. Delegates considered questions such as: How are literacy and numeracy foundational to learning*?* and reflected on the definition of literacy in *Literacy First: A Plan for Action (2010).* They identified ideas that would be important in the development of a common understanding of numeracy.

A Common Understanding of Literacy

Literacy is acquiring, creating, connecting and communicating meaning in a wide variety of contexts (*Literacy First: A Plan for Action*, 2010).

Delegates described literacy and numeracy as:

- foundational to the development of all competencies
- linked by the use of symbols, sets of lenses, operations and applications for functioning in a verbal or numeric world.

A Common Understanding of Numeracy

Numeracy is the ability and confidence to deal effectively with the quantitative aspects of life (at school, at home, at work, and in the community) and to appreciate the impact of the application of mathematics in today's world.

Delegates further characterized numeracy as:

- the ability to process, communicate and interpret mathematical information in a variety of contexts
- the practical understanding of ways in which information is gathered by counting and measuring
- what one does to get through everyday life; it is needed every day to function
- skills that include analyzing, computation, estimation and measurement.

Key Concept: Interdisciplinary Learning

Process for Exploring the Key Concept

During the discovery phase, delegates viewed the video, *Common Sense: An Overview of Integrated Studies*[16], and described tasks and activities that connect two or more discipline areas of study. Based on personal experiences and a review of the descriptions and definitions in literature reviews and articles, delegates identified what was most helpful in developing a common understanding of interdisciplinary learning within an Alberta context. During the dream phase, delegates described the learning possibilities for students experiencing interdisciplinary learning. From these descriptions, they identified themes of interdisciplinary learning for developing a common understanding.

A Common Understanding of Interdisciplinary Learning

Interdisciplinary learning brings together diverse disciplines in a comprehensive manner, enabling students to extend their learning, access higher-order thinking skills and develop meaningful understandings of complex interactions amongst themselves, their community and the world around them.

Delegates further characterized interdisciplinary learning as:

- learning beyond the classroom through everyday learning activities that integrate subject/discipline areas through real-life applications
- drawing from the perspectives of two or more disciplines to foster critical thinking and independent and self-directed learning
- supporting authentic community engagement that creates an opportunity to draw upon attitudes, skills and knowledge from multiple disciplines within real-life contexts
- greater understanding of the place and importance of a subject and how the subject lives in the local community and culture, enabling respect for the voice of culture and community.

The understandings of interdisciplinary learning developed during Roundtable 1 were used to inform exploration of the key concept of interdisciplinary curriculum during Roundtable 2.

It should be noted that the findings from Research Roundtable 1 confirmed the support for competencies and strengthened the descriptions of the competency groupings that were used to develop *The Framework for Student Learning: Competencies for Engaged Thinkers and Ethical Citizens with an Entrepreneurial Spirit.* The input from Roundtable 1 and other engagements with stakeholders over the past year have been used to design a revised graphic of a framework for student learning (Figure 2 below). The student, placed in the centre, reflects the focus of education. Revised titles of two competency categories clarify their scope. Enlarged font size for literacy and numeracy emphasizes their foundational nature. Blurred lines between sections of the graphic better convey the interconnected nature of the competencies.

[16] Edutopia. *Common sense: An overview of integrated studies* (http:www.edutopia.org/integrated-studies-overview-video). Downloaded free-of-charge at http://itunes.apple.com/itunes-u/integrated-studies/id3955440443

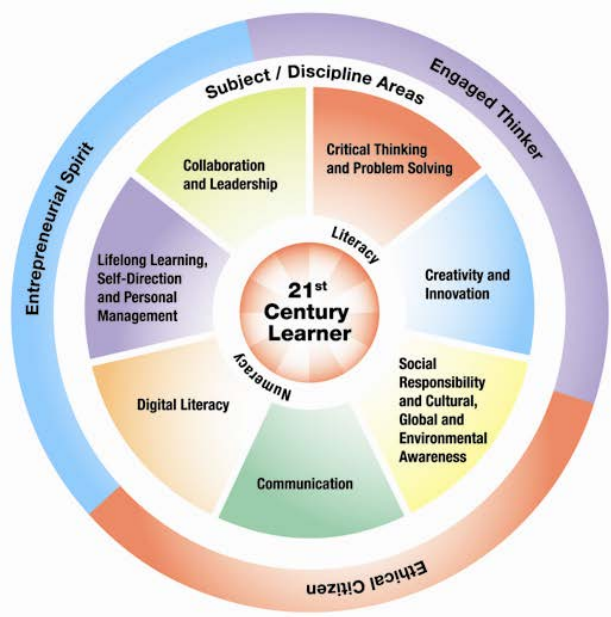

Figure 1: Draft graphic from *Inspiring Action on Education* (2010)[17]

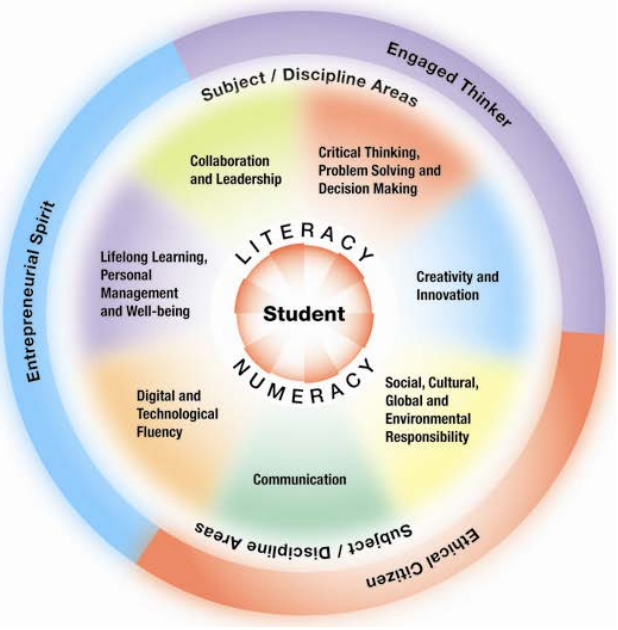

Figure 2: Revised graphic from *Framework for Student Learning: Competencies of Engaged Thinkers and Ethical Citizens with an Entrepreneurial Spirit* (2011)

These are two of many possible graphics that could be used to illustrate Alberta's framework for student learning.

Roundtable 2

Key Concept: Ways of Knowing

Process for Exploring the Key Concept

The discovery phase began with a personal story on indigenous ways of knowing from Dr. Betty Bastien of the University of Calgary. At their tables, delegates shared their own personal stories about learning acquired in non-traditional ways that had a profound impact on their lives. Delegates then highlighted key ideas in article summaries and literature reviews of research that could be used to inform the concept of ways of knowing. They shared and analyzed these ideas with others at the table, considering which could provide a deeper understanding of the concept. During the dream/design phase, keynote speaker Dr. Dwayne Donald of the University of Alberta, presented how he saw "ways of knowing" becoming an integral part of curriculum and delegates created a visual representation of their table's understanding of ways of knowing.

A Common Understanding of Ways of Knowing

Ways of knowing is about learning that is experiential and meaningful to the individual and to the community to which he or she belongs. It is about balance and the connections that exist between the learner, the context in which learning occurs, and the fluidity of knowledge shared and gained through relationships. It is holistic, organic and transforming as the learner becomes one with their world.

[17] Alberta Education. (2010). *Inspiring action on education*. Edmonton, AB: Alberta Education, p. 9.

Delegates further characterized ways of knowing as:

- fluid and contextual, encompassing traditions, experiences, culture, experimentation, visualization and intuition – linking the cultural diversity within a community with the culture of a discipline in a manner that enriches both
- circular and beginning with the individual – learning that is intergenerational, based on relationships, time and place
- in balance with a sense of place, intellect and emotions, and the universe that considers ethics and ecology through respect and creativity – people are at the centre through their collective consciousness and wisdom; learning is authentic and universal
- a kaleidoscope of ways of seeing the world, where there are various and shifting views and understandings that further develop the engaged thinker, who is an ethical citizen with an entrepreneurial spirit
- personal, meaningful, experiential and connected to the learner in contexts that come from the sharing of knowledge between people and the land
- based on students' relationships and experiences between the spiritual and physical aspects of their lives; built on foundations from the past, but not held back by it.

Delegates recommended that the key concept of ways of knowing needs to be considered within other facets of learning as it relates to learning preferences or modalities. It was suggested that an exploration of the distinction between ways of knowing and ways of learning would be useful.

Key Concept: Student-centred/Personalized Learning

Process for Exploring the Key Concept

The discovery phase began with an invitation to share a personal story about a learning experience that was personalized. Delegates described what the experience looked like and how it made them feel as learners. Delegates identified the key ideas presented in the article summaries, shared them with the members at the table and worked together to group them by themes. Each table of delegates used these themes to come to understanding of the key concept and consider the essential design features required for future curriculum that could help enable more student-centred/personalized learning.

A Common Understanding of Student-centred/Personalized Learning
Student-centred/personalized learning focuses on learners—their individual needs, passions, interests and learning abilities— encompassing meaningful connections, engaging learning experiences and flexible learning environments while supporting choice, collaboration, student voice and shared ownership (co-investment) in learning.

Delegates further characterized student-centred/personalized learning as:

- making meaningful connections that are authentic, holistic, deep in nature, engaging and purposeful
- providing flexible learning environments that are responsive to the learner: an approach that supports students through scaffolded learning outcomes and resources

- allowing for student voice, where the "journey of learning" is guided by their passions, interests and choices, and where they are co-investors in their learning, taking ownership for the decisions they make regarding their learning
- a social activity where students develop relationships and co-create knowledge in a dynamic, interactive process in which feedback is given to support their learning
- premised on students' strengths and paced to meet their needs and interests while promoting intergenerational (lifelong) learning.

Key Concept: Breadth and Depth

Process for Exploring the Key Concept

During the discovery phase, delegates reflected on "when it is important to know a lot about something" and "when it was helpful to know a few things about a broad range of topics." Delegates listened to keynote speaker, Dr. Rita Irwin of the University of British Columbia, shared learnings from a review of article summaries, and used a metaphor—*The Tree of Knowledge*—to define depth and breadth. Delegates placed their ideas on the tree diagram in the following manner:

- roots: what students need to know in depth
- branches: what students need to know in broad terms
- trunk: what could pertain to both breadth and depth.

Delegates used the metaphor to develop their understanding of the key concept.

A Common Understanding of Breadth and Depth
Breadth resides in the bodies of knowledge (disciplines) that allow for broad exploration and learning. *Depth* of understanding relates to the analytical connections and critical thinking required for deep engagement. Together, breadth and depth are in a constant, dynamic relationship interconnecting knowledge and skill development and leading to significant, relevant and meaningful learning.

Delegates further characterized breadth (broad exploration) and depth (deep understanding) as:

- an ever changing state, with the "surface" or the start of something (a path, a road, a journey) being breadth, and further investigation or explorations (under water, over a hill, down a path) as depth
- breadth being the general knowledge, subjects and disciplines found in curriculum with depth as a focus on the analytical, critical connections, critical thinking, and inter-subject connections which expand across both discipline and metacognitive skills
- overarching themes (breadth) defined by learning outcomes that lead to deep understanding (depth)
- a dynamic relationship that encourages significant learning and real application
- a range of interconnected concepts that are relevant and meaningful to students, enabling them to acquire and apply knowledge more deeply in their interest areas
- the engagement of a dynamic tension (disequilibrium) between and among integrated disciplines.

Key Concept: Interdisciplinary Curriculum

Process for Exploring the Key Concept

Delegates used self-assessment to rate their understanding of this key concept, then described what they may have experienced or observed as an interdisciplinary learning experience within curriculum. To further their comprehension of the concept, delegates reviewed article summaries and participated in an interdisciplinary learning activity intended to provide a common experience. A draft description of the key concept of interdisciplinary learning from Research Roundtable 1 was used to further develop an understanding of interdisciplinary curriculum.

A Common Understanding of Interdisciplinary Curriculum
An interdisciplinary curriculum is built on big ideas and questions that bridge subject/discipline areas enabling integrated, relevant, authentic learning experiences related to real-world problems and contexts. It is flexible and responsive to student needs, and permits students to make meaningful connections and to develop competencies needed for living, learning and working.

Delegates further characterized interdisciplinary curriculum as:

- the opportunity to build bridges between subject/discipline areas and to bring relevance and authenticity to the learning experiences of students
- experiences that allow students to see the practical connections to real-world problems and examples
- an integrated approach to developing competencies that draws upon differences in individuals, content and situations
- the ongoing use of assessment tools that involves an informative process, enabling learners to better understand themselves and their needs
- flexible, responsive and collaborative, using common language and clear, “user-friendly” outcomes that focus on big ideas and key questions.

Roundtable 3

Roundtable 3 provided delegates with a choice of engaging in one of two concept groupings.

Group 1 discussed the following key concepts:

- Flexible Timing and Pacing in a Variety of Learning Environments
- Curriculum Responsive to the Student, the Student’s Learning Environment and Evolving Societal Needs (Responsive Curriculum)

Group 2 discussed the following key concepts:

- Assessment of Competencies
- Assessment

The overarching nature of responsive curriculum provided a connection and culmination to concepts discussed in all three roundtables.

Key Concept: Flexible Timing and Pacing in a Variety of Learning Environments

Process for Exploring the Key Concept

In the dream/design phases, delegates imagined the possibilities related to the concepts and created scenarios or images of what the future would look like once flexible timing and pacing in a variety of learning environments was attained. Using templates, triads reflected on what curriculum might look like in 2020 and developed profiles of student learning in 2020, based on a provided demographic. Beginning with a student image and descriptions of the student, a template was used to describe the optimal learning experience through an identification of the timing, pacing and learning environment that they felt would best meet the student's learning needs. Profiles were shared between twinned tables. Based on the work accomplished in the discovery and dream phases, table delegates co-created their understanding for the key concept.

A Common Understanding of Flexible Timing and Pacing in a Variety of Learning Environments
Student learning experiences can occur within and beyond the traditional school (any place) and outside the traditional school, day or year (any time) through face-to-face or online learning (synchronous and asynchronous), or as a blended experience enabling the co-creation of knowledge using current and emerging technologies as tools. Individual ways of knowing and ways of learning (progressive flexibility) are taken into consideration with the time and pace (rate and duration) that learning occurs.

Delegates further characterized flexible timing and pacing in a variety of learning environments as:

- students taking greater ownership (choice and readiness to learn) for their own learning
- teachers becoming facilitators, mentors, coaches and guides
- problem- or project-based learning, which is enabled by rich information and communication technology environments with flexible assessments and learning and teaching resources
- enhanced relationships among students, teachers and the community
- facilitation of student progression at a level suitable to their learning needs, capabilities, interests and passions
- aggregation and disaggregation of learning outcomes, assessments and learning and teaching resources to permit scaffolding at a time, a pace and in a setting that optimizes student potential and engagement to meet their needs.

Key Concept: Responsive Curriculum

Process for Exploring the Key Concept

In the exploration phase delegates reflected on the keynote by Dr. Mary Ann Wolf of the Alliance for Excellent Education and the Education Development Center, Washington, D.C., on how curriculum that is responsive to the needs of students' learning today and in the future subsumes all concepts being discussed during the three roundtables, including assessment and how student engagement can be supported by various technology tools and systems. During the dream phase, delegates imagined the possibilities related to the concept of responsive curriculum to create what the future might look like. Delegates read a scenario describing the new 2020 Alberta curriculum. They assumed different roles such as teacher/administrator, student, parent, community member, employer or post-secondary educator and identified, from their role's perspective, programs of study, assessment, and learning and teaching resources. Each table member shared their ideas, and common elements were captured on a template by the official recorder. In the design phase delegates created a common understanding for the concept of responsive curriculum and used a template to identify the characteristics of programs of study, assessment, and learning and teaching resources that would be included in a responsive curriculum.

A Common Understanding of Responsive Curriculum

Curriculum (programs of study, assessment, learning and teaching resources) that is responsive to the student is flexible, allowing students to bring their ways of knowing and ways of learning to explore broadly and gain deeper understandings of bodies of knowledge. Curriculum that is responsive allows students to apply these understandings within dynamic local and global contexts.

Programs of study enable student-centred/personalized learning and identify enduring understandings and developmental learning outcomes that encompass competencies to meet the learning needs of all students.

Assessments measure the levels of a student's success as aligned with learning outcomes, are meaningful, clear, dynamic, timely, ongoing, and embedded in real-world contexts.

Learning and teaching resources provide students with equitable opportunities to engage in broad exploration of bodies of knowledge and deep understanding of concepts. These learning and teaching resources provide a range of authentic and relevant experiences that can be holistic, experiential, interactive and hands-on.

Delegates further characterized programs of study as:

- providing opportunities for interdisciplinary learning and inquiry
- relevant and responsive learner outcomes reflecting emerging events, technologies, community and societal needs
- flexible to enable broad exploration and deep understanding of concepts

- supporting a collaborative approach among teachers, students, parents/caregivers and the community to develop learning experiences for meeting local needs.

Delegates further characterized assessments as:

- supportive of all learning styles
- accessible for all students
- evidence of student learning supported in a variety of ways including self, peer and teacher assessments; rubrics; tests (print and online); performance assessments and teacher-recorded observation
- available in print or digital formats
- formative assessment, collected over a period of time, promoting dialogue between the student and the teacher and among peers in facilitating mastery of learning outcomes
- summative assessment, collected at a single point in time, providing evidence of cumulative learning of broad exploration of bodies of knowledge and deep understanding of concepts
- students demonstrating contextual learning; accessing and analyzing information to represent what they know.

Delegates further characterized learning and teaching resources as:

- facilitating the development of individual learning paths that are student-centred and personalized, recognizing student interests, passions and capabilities
- enabling student-student/teacher collaboration
- adaptable and accessible in traditional and non-traditional learning environments to all learners in a variety of formats
- print and digital formats including interactive digital objects and audio and accessed on an ongoing basis
- open and multiple modes of access and delivery
- current, relevant and accessible, to enable a new level of responsiveness to the world in which students live.

Key Concept: Assessment of Competencies

Process for Exploring the Key Concept

In the dream/design phases delegates explored future possibilities and envisioned a common understanding for the assessment of competencies through a set of key stages from Kindergarten to Grade 12. Each table was assigned a competency and asked to consider the stages required to demonstrate a developmental progression of competence as well as provide descriptors of what is most important for students to know and be able to do at each stage to help describe the indicators for the competency. The template included a description of the competency from *Inspiring Action on Education* (2010).

A Common Understanding of Assessment of Competencies

Competence is evident in a student's ability to apply attitudes, skills and knowledge in relevant contexts. Since the learner moves through a developmental progression of cognitive, affective and psychomotor development, assessment of competencies is ongoing. Learning is assessed as students demonstrate the degree to which a competency is developed. A continuum is used to identify and describe the progression of levels of competence within a competency.

Delegates further characterized assessment of competencies as including competency models that:

- have a range of categories and levels
- include clear assessable targets for learning
- consider the developmental characteristics of learners.

Key Concept: Assessment

Process for Exploring the Key Concept

The dream/design phases were supported by the assessment research report, *Successful Assessment for Learning Projects from Alberta Initiative for School Improvement (AISI) Cycle 3*, which identifies change in teaching practice and improving student learning in Alberta. Dr. David Townsend of the University of Lethbridge shared the key findings from the report describing a broad range of success indicators and stories to demonstrate how assessment can support students' learning and "learning how to learn for a lifetime." In the dream phase, delegates described what they imagined assessment will look like in 2020 through the lens of a teacher/administrator, a student, a parent, a community member, an employer or post secondary educator. They addressed assessment processes and approaches, the evidence required to guide learning and teaching, and discussed what the reports would look like that reveal student understanding, learning styles and preferences in a responsive curriculum. In the design phase, delegates reflected on the data they collected in the dream phrase of assessment and provided, as a table group, a common understanding of assessment when considering assessment processes, evidence, criteria and reports.

A Common Understanding of Assessment

Assessment that supports student-centred learning is flexible and multifaceted. It represents the opportunity to ensure that students are integral to the assessment process and indicates that learning is progressing based upon reliable, valid data. Both formative and summative assessments (for, of, as), embedded within learning, are necessary at a level suitable to the students' needs and abilities to capture what students know, are able to do, and reflect on as they learn. Provincial assessment determines if students are learning what they are expected to learn and whether or not they have achieved the standards. Results are reported and used to shape improvement in learning at all levels across the system.

Delegates further characterized assessment as:

- being adaptable and responsive to current and developing research theory and practice
- developed to demonstrate the acquisition of competencies and subject discipline content
- personalized and authentic engagement that:
  - reflects the needs of the learner
  - makes available a variety of assessment types; e.g., performance assessment, self assessment, tests
  - informs the learner where they are and the next steps in their learning process
- outlining clearly articulated criteria that:
  - define the purpose for assessing
  - are fair, technically sound and valid
  - ensure high quality evidence of learning
  - provide exemplars of student work
  - provide relevant and meaningful feedback
  - provide clear timely reporting that adds value for learning and teaching
  - consider the balance and integration between learning and assessment
- creating a dialogue among learners, teachers, parents, administrators and other stakeholders.

Deciding What Students Should Learn

How School Programs Are Developed in Alberta

1998

ALBERTA EDUCATION CATALOGUING IN PUBLICATION DATA

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The primary intended audience for this document is:

Administrators	
Counsellors	
General Audience	✓
Parents	
Students	
Teachers	

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WHAT ARE THE PROGRAMS OF STUDY?

Provincial programs of study are legal documents stating what students are expected to learn and be able to do in all subjects and grades. Their primary purpose is to set learner outcomes and high standards for all Alberta students.

School boards and their staff select teaching approaches, instructional materials, grouping methods and schedules that will meet the learning needs of their students. But the Minister of Education, through powers granted under section 25 of the *School Act*, establishes learner expectations and standards of achievement for all students in the province.

Although education is a provincial responsibility, educators and government leaders from across Canada are now participating in joint initiatives so they can more effectively meet their common program goals. The provinces and territories of Canada are working cooperatively on curriculum projects that set out common learner outcomes in various subject areas.[1] These common learner outcomes then become the foundation for provincial programs of study. Common learner outcomes help students to develop similar knowledge and skills so they can make smooth transitions if they move from one jurisdiction to another. Common outcomes also allow for the sharing of resource materials that will support programs in several jurisdictions.

In Alberta, there are programs of study for elementary, junior high school and senior high school students. In addition, Alberta has an approved *Kindergarten Program Statement*. A program of studies contains two types of information:

- a philosophy of learning
- general and specific learner expectations, or outcomes.

The **philosophy** includes "belief statements": why the program is offered, what the program is all about, and the basic principles about how students are to achieve the required knowledge, skills and attitudes. For example, a program of studies for mathematics may explain the broad concepts underlying the study of mathematics, how students learn mathematical concepts, and how mathematics knowledge, skills and attitudes can be used in everyday life outside the classroom.

[1] Alberta participates in cooperative curriculum projects through the *Western Canadian Protocol for Collaboration in Basic Education*, involving Manitoba, Saskatchewan, Alberta, British Columbia, Yukon Territory and the Northwest Territories; and the *Pan-Canadian Protocol for Collaboration on School Curriculum*, involving the ministers of education of all provinces and territories.

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The **learner expectations** or **outcomes** are clear and detailed statements of the knowledge, skills and attitudes that students are expected to learn in each subject at each grade or level. For example, by the end of the Grade 6 language arts program, students are expected to compose stories with various elements like setting, theme, main characters and conclusion, using proper sentence structure, spelling, grammar and punctuation. In mathematics, these same students are expected to understand and name numbers greater than a million; to add, subtract, multiply and divide; and to measure time, length, capacity, mass, perimeter, area, volume and angles. The science and social studies programs are usually organized by topic. Through these programs, students acquire specific knowledge about several topics, develop such skills as problem solving, and cultivate positive attitudes.

The *Curriculum Handbook for Parents* series provides summaries of the programs of study. See the For More Information section at the end of this booklet.

WHAT RESOURCES SUPPORT SCHOOL PROGRAMS?

To offer instruction in any subject area at any grade level, teachers and other educators begin with the programs of study. The programs of study are the primary references; they establish clear directions about learner outcomes. But an effective learning/teaching process also requires many kinds of resources for students and teachers alike, for example, materials such as textbooks, videos, audiocassettes, manipulatives and computer software. These are sometimes called "instructional materials."

Potential materials are reviewed by Alberta Education, and those meeting provincial criteria become authorized as either student or teaching resources.

RESOURCES FOR STUDENTS

Student resources are categorized as follows:

- **Basic** learning resources address the majority of learner outcomes in a program of studies.
- **Support** learning resources address some of the learner expectations in one or more program of studies or help students to pursue particular interests and talents.
- Distance learning materials[2] meet student needs when:
  - small schools wish to offer a broader range of learning opportunities
  - a required, or desired, course will not fit into a student's regular school timetable
  - students wish to work through a course at their own pace with the guidance of a teacher
  - students who have left school wish to continue studying independently
  - students who are unable to attend school need instructional materials
  - parents who are offering a home education program require materials.

[2] Distance learning materials include student basic, or student support, or teaching resources that are usually developed by Alberta Education, sometimes in cooperation with a publisher, to support independent studies, instruction in small schools or alternative delivery of programs (virtual schools).

RESOURCES FOR TEACHERS

Teachers may use some or all of the following resources to help them plan and deliver effective lessons:

- guides to standards and implementation for revised and new programs of study
- teacher materials to make effective use of student resources
- materials on adapting the programs of study for special needs students
- publications providing ideas for lessons, activities, and appropriate and effective teaching methods
- publications on learning theory; e.g., the development of thinking skills.

RESOURCES FOR STUDENT EVALUATION AND ASSESSMENT

Alberta Education develops:

- provincial student achievement tests at grades 3, 6 and 9 and diploma examinations in Grade 12 to provide information about how well students have met the learner expectations outlined in the programs of study for language arts, mathematics, science and social studies
- diagnostic assessment materials to help teachers recognize when learning difficulties are present or when more challenging activities might be required so that they can adjust instruction accordingly
- classroom assessment materials to help teachers determine student progress in achieving the provincial learner expectations for language arts, mathematics, science and social studies.

Many of the resources for teachers also include suggested evaluation strategies.

WHAT GOES INTO THE MAKING OF A PROGRAM?

Before revising or developing a program of studies, Alberta Education carefully considers these fundamental questions.

- What do students really need to learn?
- What are student needs?
- What are the needs and expectations of society as a whole?
- What is the nature of the subject area?
- What is the nature of the learning environment?

WHAT STUDENTS REALLY NEED TO LEARN

The Alberta government has defined what all students must know and be able to do. These expectations are incorporated in the three-year business plan for education[3] in Alberta. Expectations are reviewed regularly to ensure that they continue to reflect the essential knowledge, skills and attitudes that Alberta students should develop. Common learning outcomes, developed in consultation with other provinces and territories, provide the foundation for some of Alberta's programs. As well, through the consultation process used to develop programs of study, many people have an opportunity to present their suggestions on what students should learn to be well-prepared for the future.

STUDENT NEEDS

The programs of study are designed to accommodate:

- student needs and abilities—intellectual, social, emotional and physical—at different ages and stages of growth
- student cultural differences
- connections among school subjects, between grades, and between school and the workplace.

[3] *The Government of Alberta's 3-Year Plan for Education*. This publication is updated annually.

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SOCIETAL NEEDS AND EXPECTATIONS

The programs of study are designed to reflect:

- the general consensus of Albertans about appropriate roles and responsibilities for parents, teachers and all others who are directly involved in the education of students
- Canada's linguistic and cultural diversity, and the nation's common goals
- the rapid pace of change—economic, technological, social, cultural and political—provincially, nationally and around the world
- other important provincial, national and global issues.

The programs of study also reflect provincial government documents and guidelines. These include the *School Act*, education policies and regulations set by the Minister, the business plan for Alberta Education, and interprovincial agreements on program development.[4]

NATURE OF THE SUBJECT AREA

Each program of studies:

- provides a foundation of knowledge and understanding of the major ideas in a subject area
- incorporates new discoveries and theories that are generally accepted by experts in the field
- addresses skills that are fundamental to success in learning a subject, and indicates the most appropriate level at which the skills are to be acquired
- addresses how the study of a subject contributes to student growth and development.

NATURE OF THE LEARNING ENVIRONMENT

The home, school and community all contribute to learning and can create an "environment" for learning. Therefore, a program of studies is designed to accommodate:

- various types of instructional approaches
- available facilities, equipment and learning resources
- various ways of delivering a program to students, including new technologies and use of community resources; e.g., distance learning, workplace learning.

[4] The business plan and specific documents on program development are available from Alberta Education. See the For More Information section at the end of this booklet.

WHEN DO WE REVISE PROGRAMS AND DEVELOP NEW ONES?

Typically, a program is revised, or a new one developed, when:

- there are major changes in education policy[5]
- the Minister of Education receives recommendations for change from a public advisory group
- the needs of students and society have changed
- new knowledge becomes available—about a subject area or about how students learn and develop
- the program is no longer consistent with other programs and a need for change is identified within Alberta, regionally or across Canada[6]
- the program design is out of date
- the resources are out of date
- significant numbers of students are not performing at expected levels of achievement.

It is important to maintain a balance when considering changes to existing programs; changes are made when the need becomes apparent, but at the same time students, teachers and other Albertans need time and resources in order to adjust to the changes. Programs cannot change annually, nor can they remain static for long periods of time. In some instances, a program is reviewed, but only minor changes result. An example of a minor change would be the addition or deletion of knowledge content, or a change in the grade placement of knowledge content. These minor changes rarely affect the role of teachers as they do not require changes in teaching practices.

[5] For example, Alberta Education's *Framework for Enhancing Business Involvement in Education*, 1996 and *People and Prosperity: A Human Resource Strategy for Alberta*, 1997, called for school programs that do more to help students develop employability skills and prepare for various careers.

[6] Alberta participates in the *Western Canadian Protocol for Collaboration in Basic Education* and the *Pan-Canadian Protocol for Collaboration on School Curriculum*.

HOW DO WE DEVELOP PROGRAMS?

Developing a new provincial program of studies is a major undertaking involving many people. Three main groups play a direct role in the process.

- Staff of Alberta Education provide leadership. It is their job to move the project ahead, on time and on budget, and still develop a product of the highest quality possible. As representatives of the Minister of Education, they ensure that programs reflect the government's policies and guidelines. They also coordinate the collection of information and research for programs and resources.

- Advisory groups provide input throughout the program development process. Most advisory groups are made up of teachers, school and school board administrators, people from post-secondary institutions, business and other community members and organizations.

- Teachers share their practical knowledge about a subject area, about the needs of students at specific ages and grade levels, and about effective teaching methods. Teachers do much of the hands-on work. For example, they help to develop learner outcomes for students, and they review and validate draft programs and potential resources.

All Albertans are invited to review draft programs and provide their advice and comments at meetings, forums, workshops or by telephone, fax, letter or email. See the How You Can Help section at the end of this booklet.

Alberta Education staff carefully consider the comments from the advisory groups and from other Albertans. In most cases, suggestions are reflected in the new program of studies, but on some occasions not all of the ideas presented are included in the final program. In such cases, Alberta Education staff who are responsible for preparing the program indicate the reasons for not addressing the advice received.

The development process and timelines vary from one program to another. Usually, there are seven stages, but these stages may be combined or overlapped for some projects. For example, one part of a program may still be in the development stage while another part is being validated. The stages usually include:

- Stage 1: New Policies and/or Reviews
- Stage 2: Work Plan
- Stage 3: Development
- Stage 4: Validation
- Stage 5: Authorization
- Stage 6: Implementation
- Stage 7: Maintenance and Evaluation.

STAGE 1: NEW POLICIES AND/OR REVIEWS

Sometimes changes in programs are the result of a new government policy, the report of a task force or other advisory group, or a new interprovincial initiative. In other cases, reviews are carried out on a current program to help find out if the program of studies needs to be changed, and if so, what kind of changes are required. The plan for a program review outlines:

- reasons for doing a review
- major issues and questions to be addressed about the program of studies, resources for students and teachers, and student evaluation
- methods to be used to collect necessary information
- who will take part in the review
- timelines and communications plans.

The first questions to be asked in a review are: should the program and resources be:

- kept as they are
- kept, with minor revisions
- revised
- replaced
- discontinued?

To answer these questions, information is collected using some of the following procedures.

- *Albertans from across the province help to identify the needs of students and set directions for the future.*

  Albertans are in the best position to say what our students need. They can also provide good advice about which needs should be met through a program of studies, and which needs should be met by other programs, by the total school program or by agencies and groups outside the school.

  Through notices on the Internet, at meetings, or in letters to groups, Albertans are invited to provide their comments and ideas. Students, teachers, parents, principals, superintendents, school trustees, educational associations, post-secondary institutions, business and industry, government departments, and community members and agencies, are all encouraged to participate.

  Albertans help to answer questions about how well a program of studies and its resources are currently meeting student needs and how they could be improved. Here are some sample questions Albertans might be asked.

  – "Are the knowledge, skills and attitudes in the program of studies the most important ones for students to learn?"

  – "Is the program providing the knowledge, skills and attitudes students need for responsible citizenship, daily life, further education and entry into the workplace?"

  – "Are there gaps between what the program expects students to learn, and what students are actually learning and achieving?"

  – "If there are gaps, how can they be eliminated?"

  – "Do the resources help teachers prepare lessons and select approaches that meet student needs?"

- *Alberta Education collects further information to support the decision-making process.*

  Additional information-gathering steps may include:

  – meetings, interviews, questionnaires

- reviews of current research on student learning and development, societal changes and new knowledge in a subject area
- reviews of current information about successful teaching methods and approaches
- reviews of programs being used in other parts of Canada and in other countries
- discussions with other Canadian provinces and territories
- reviews of results from provincial student evaluation programs and the ideas of teachers who have been directly involved in the evaluation process
- reviews of information collected through visits to schools and classrooms.

Staff at Alberta Education compile the information collected, summarize the findings and then determine the appropriate next steps.

STAGE 2: WORK PLAN

Whether the decision is to revise an existing program or to develop an entirely new one, a work plan is prepared. For interprovincial projects, the work plan is usually prepared by the lead jurisdiction, in cooperation with the other provinces and territories participating in the project. A work plan addresses the following:

- reasons for revising the program or developing a new one
- background information—the results of provincial and interprovincial consultations, and research that supports proposed changes or new directions
- a description of what the program will look like—key features or major changes being proposed
- the proposed development process:
  - a list of the major tasks
  - information about who is to be responsible for the completion of tasks
  - the timelines and budget for each task
  - strategies for receiving formal and systematic advice throughout development
  - what standards will be used to measure how well the program meets student needs

- an analysis of the ways in which the program might affect:
  - resources for students and teachers
  - student evaluation resources
  - school facilities and equipment, including technology
  - community resources
  - the need for teacher inservice
- a communications plan.

STAGE 3: DEVELOPMENT

Although Alberta Education is responsible for managing program development, school boards sometimes take on this role in cooperation with the department. Teachers do much of the practical work. They provide advice about the program of studies and help to review or develop resources, especially resources for distance learning and student evaluation. However, most student resources and teacher instructional manuals are prepared by publishing companies. Publishers are invited to submit resources to support the revised or new program, and all materials are assessed according to the same criteria.

Advisory groups are set up to review the draft program and resources, make recommendations and guide the activities of program developers. A key role of the advisory groups is to ensure that the program of studies and resources are consistent with the work plan.

The advisory groups also help to ensure that the draft program of studies meets the following requirements:

- inclusion of statements about students and learning, general learner expectations and specific learner expectations or outcomes
- consistency with learning and teaching theory
- consistency with current government policy
- accommodation of student differences, needs and abilities.

Educators and other interested Albertans also provide suggestions for drafts of a program of studies and its resources. Their comments and advice are used to revise the documents, to choose or prepare more appropriate resources and to set standards for student performance.

STAGE 4: VALIDATION

Validation involves:

- internal screening by Alberta Education
- external or "field" review processes to obtain ideas and suggestions from teachers and other Albertans.

Alberta Education's internal screening process considers these questions.

- Are essential knowledge, skills and attitudes addressed adequately in the program of studies and resources?
- Do the program of studies and resources match the intellectual, social, emotional and physical needs and abilities of students of that age at that level?
- Do the resources accommodate various student learning styles and rates of learning?
- Do some of the resources address students with special needs; e.g., students who have learning or developmental disabilities, or who are gifted?
- Are the resources based on sound instructional design?
- Do the program of studies and resources comply with government policy on promoting respect for and understanding of Alberta's and Canada's cultural diversity?

All interested parties throughout the province have an opportunity to review draft materials to ensure that they meet the needs of students and their communities. This external review varies according to the situation. In some cases, it may include a pilot or actual use of the draft program of studies and resources in a few classrooms. The time involved for the external review ranges from a few months to a full school year or longer. The results of external reviews are studied carefully before any further changes are made.

STAGE 5: AUTHORIZATION

Under section 25 of the *School Act*, the Minister of Education approves all programs of study and authorizes them for use in Alberta schools. The Minister is responsible for making the final decision about key issues.

- Does the program fully meet the needs of students and society?

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- Does the program reflect the views and expertise of Albertans?

- Is it feasible to offer the program in schools throughout the province?

Alberta Education staff also consider the information collected on resources during the review and validation process, and they determine which ones are to be placed on the provincial list of authorized materials to support a revised or new program of studies.

STAGE 6: IMPLEMENTATION

From the earliest stages of the development process, Alberta Education strives to keep teachers and other Albertans well-informed about potential changes. A program of studies, and information on resources, is distributed well in advance of program implementation dates. Also, the program of studies, and resource information, is posted on the Internet. Most teachers are quite familiar with program changes because of their involvement in one or several of the development and validation phases; or in workshops, seminars and orientation sessions.

Who is responsible for introducing a new program of studies to the schools? It is a shared responsibility of Alberta Education, school boards and classroom teachers.

- Alberta Education makes a new program of studies and resource listings available to schools throughout the province. The department may organize orientation sessions and workshops for teachers and school board staff and sometimes produce materials to support implementation, or provide program information to administrators and counsellors.

- School boards across the province support professional development for teachers, including the introduction of a new program. There may be a variety of networks and workshops designed to share ideas, strategies and materials. School boards and their staff also determine which resources they will use in their schools to support a new program. They may select materials from the provincial resources list or select other support materials of their own choosing.

- The Alberta Teachers' Association specialist councils and other education partners typically play an active role at this stage. These education partners may assist by providing resources and workshops to help teachers implement a new program.

STAGE 7: MAINTENANCE AND EVALUATION

Even after a program is designed, developed, validated, authorized and implemented, it is open to further review. Minor revisions may be needed over time. For example, teachers or members of the general public may have concerns about how well a program is meeting the evolving needs of students. Also, a process is in place for periodic review and minor updates to provincial programs of study, as well as those developed in cooperation with other provinces and territories.

Alberta's programs are not only excellent, but well-received regionally, nationally and internationally. Yet, there is always room for improvement. Albertans continue to provide comments and suggestions to improve programs and resources. If significant weaknesses are noted, the cycle begins again.

The support and interest of people inside and outside the education system is always welcomed and appreciated. Many Albertans have made a significant contribution to our excellent school programs by sharing their advice and ideas.

You can get involved, by:

- providing input when the provincial government conducts comprehensive reviews of education and/or consults with Albertans about new policies
- reviewing draft programs of study
- attending meetings, conferences or seminars about proposed programs
- contacting Alberta Education, by telephone, fax, letter or email, to express your views.

FOR MORE INFORMATION

If you have questions about any topic or document cited in this booklet, or about other aspects of Alberta's Kindergarten, elementary, junior high or senior high school programs, call or write:

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Telephone: 403–427–2984
Fax: 403–422–3745
Email: curric.contact@edc.gov.ab.ca
Call Toll Free: 310–0000

COMMENTS

Your comments are important to us. Complete and fax or mail the Feedback form provided on the following page, **OR** send a message to the curriculum contact at the email address above.

FEEDBACK

Deciding What Students Should Learn: How School Programs Are Developed in Alberta, 1998

We would like to know what you think about this booklet. Are you a:

____ Parent ____ School Administrator

____ Teacher ____ District Administrator

____ Other (please specify) _____

1. I found this booklet:
   _____ extremely informative _____ somewhat informative
   _____ informative _____ not very informative.

2. How could this booklet be improved?

_____

_____

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_____

3. Other comments and suggestions.

_____

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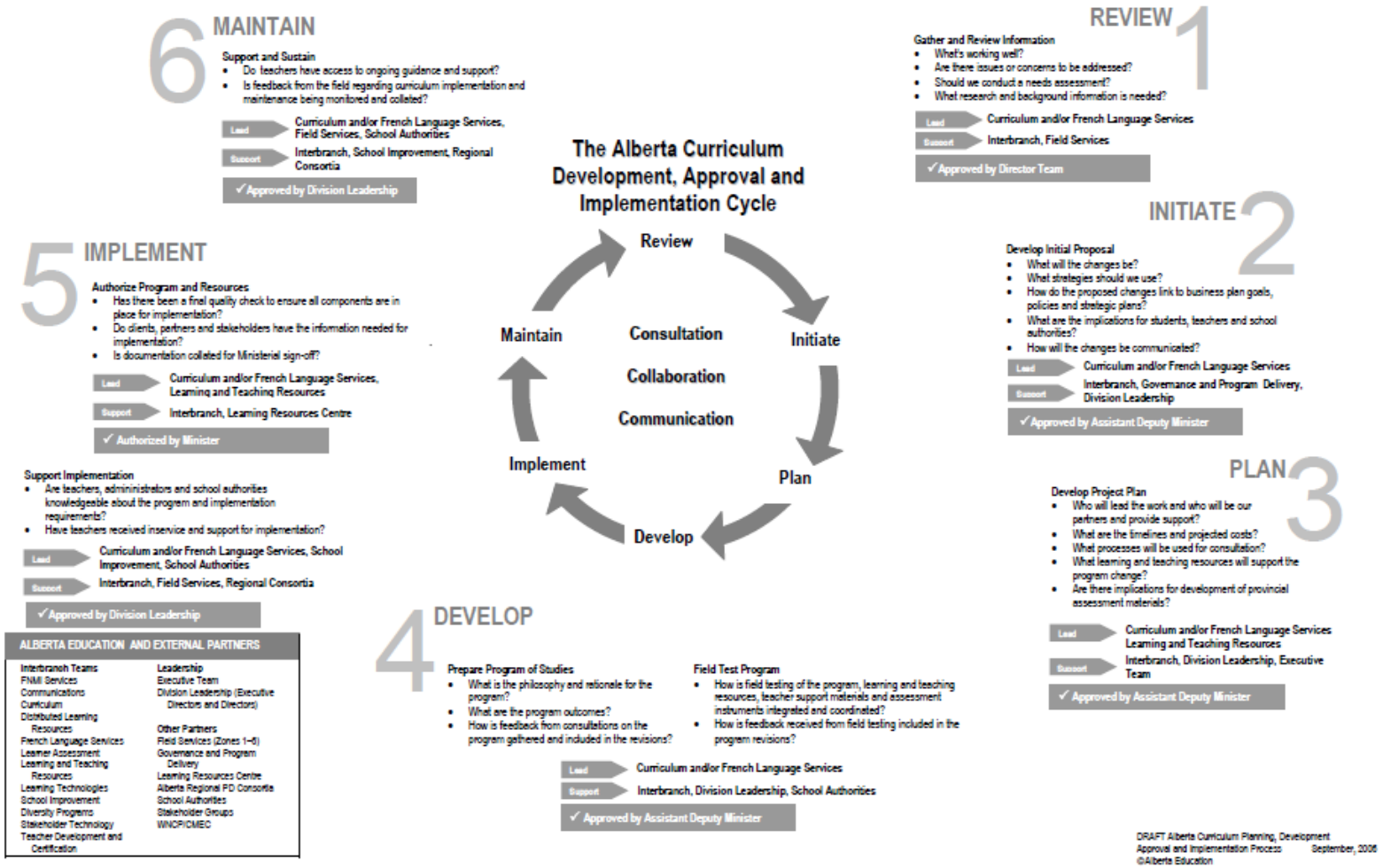
Thank you for your feedback.

Please return this response sheet to:

Director
Curriculum Standards Branch
Alberta Education
11160 Jasper Avenue
Edmonton, Alberta, Canada, T5K 0L2
Fax: 403–422–3745

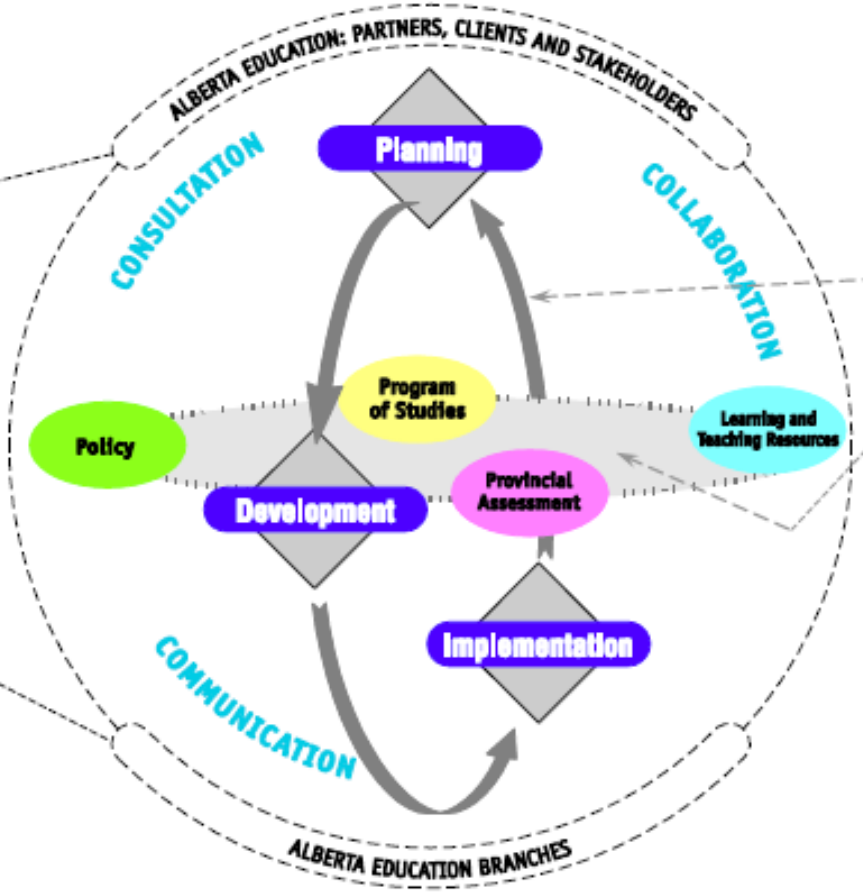
APPENDIX D: COLLABORATIVE PLANNING, DEVELOPMENT AND IMPLEMENTATION FRAMEWORK



Collaborative Planning, Development and Implementation Framework

- Students
- Teachers
- Parents
- Administrators
- School Jurisdictions and Authorities
- Educational Organizations (e.g., ATA, ASBA, ASBOA, CASS)
- Post-secondary Institutions
- Business and Industry
- Alberta Regional Professional Development Consortia
- Cross-Ministry/Government Partners
- Community
- Interjurisdictional (e.g., WNCP)

- First Nations, Métis and Inuit Services
- Communications
- Curriculum
- Distributed Learning Resources
- Field Services (Zones 1–6)
- French Language Services
- Governance and Program Delivery
- Learner Assessment
- Learning and Teaching Resources
- Learning Technologies
- School Improvement
- Diversity Programs
- Stakeholder Technology
- Teacher Development and Certification



This three-dimensional depiction of Alberta Education's interbranch work illustrates the central role of collaboration, consultation and communication with internal and external partners in the successful planning, development and implementation of policy, programs of study, provincial assessment and learning and teaching resources.

The vertical arrows identify the three major aspects of preparing policy, programs of study, provincial assessments and learning and teaching resources:

- Planning
- Development
- Implementation.

The horizontal "plate" shows the interrelationships among policy, programs of study, provincial assessment and learning and teaching resources. The work plans of each interbranch team contribute to the larger cycle:

- Governance and Program Delivery Branch provides leadership for policy.
- Curriculum Branch and French Language Services Branch provide leadership for programs of study.
- Learner Assessment provides leadership for provincial assessment.
- Learning and Teaching Resources Branch, French Language Services Branch, Learning Technologies Branch and Distributed Learning Resources Branch provide leadership for the selection and/or development of learning and teaching resources.
- School Improvement Branch and Field Services work with Alberta Education branches and education partners to support implementation.

DRAFT 06/09/2006

Alberta EDUCATION

Collaborative Planning, Development and Implementation Framework for Alberta Curriculum[1]
Approval of Processes and Products

Processes	Products and Product Elements	Quality Criteria	Collaborations/Consultations	Communications	Approval Levels
REVIEW **Initiate Review of Program**	The rationale for reviewing a program is related to: ▪ need to review and revise current policy ▪ new education policy (e.g. FNMI) ▪ recommendations for change from a public advisory group or forum (e.g. ACOL) ▪ changing needs of students and society ▪ new research and understandings about a subject area or about how students learn and develop ▪ findings of a review by System Improvement and Reporting ▪ currency of program design ▪ relevancy and availability of learning and teaching resources for meeting the needs of students ▪ student completions and achievement ▪ continuity and consistency within a program and among programs ▪ interjurisdictional partnerships (e.g., WNCP) ▪ enrolments and enrolment patterns ▪ requests for teacher support ▪ post-secondary acceptance of program.	Scope of input and quality of information from a variety of sources. Clarity of reasons provided in review proposal. Collaboration among branches. Linkage to the overall planning, policy and operational activities of the department and schools. Use of data to detect trends. Early identification of trends, strengths, issues and concerns. Information facilitates interpretation and follow-up action.	**Lead Branches:** Curriculum/French Language Services/Learning and Teaching Resources **Partners:** Interbranch Team[2] PDS Leadership Team[3] Field Services System Improvement and Reporting (SIG) Other ministries/governments[4]	**Focus:** ▪ opportunities to provide input **Media:** ▪ memos, reports, meetings with internal partners	**Approve Process:** Deputy Minister/ Assistant Deputy Minister (Program Development and Standards)/ Executive Directors/Directors

1. Curriculum is the comprised of Programs of Study, Learning and Teaching Resources and Assessments in English and in French.
2. The Interbranch Team includes representatives from: Aboriginal Services, Communications, Curriculum, French Language Services, Diversity Programs, Learning and Teaching Resources, Distributive Learning Resources Branch, Learning Technologies Branch, School Improvement, Special Programs, Stakeholder Technology, Teacher Development and Certification, Learner Assessment.
3. PDS Leadership Team is comprised of Curriculum, French Language Services, Learning and Teaching Resources, Learning Technologies and International Education.
4. Other ministries could include Advanced Education, Children's Services, Health and Wellness, Community Development, and Human Resources and Employment for specific program initiatives. In addition, Interjurisdictional Partnerships; e.g., Western and Northern Canadian Protocol (WNCP), Council of Ministers of Education, Canada (CMEC).

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REVIEW (continued) **Conduct Needs Assessment**	The needs assessment includes: ▪ literature review of curriculum ▪ information on local implementation and enrolment patterns ▪ input from stakeholders gathered with tools such as questionnaires and consultation meetings ▪ survey of developments and trends in other provinces and countries ▪ analysis of student results on provincial, national and international assessments ▪ review of available learning and teaching resources.	Clarity of questions Survey methods and instruments not leading or time consuming. Adequate time is provided for a reflective response. Input from all clients and stakeholders is considered. Stakeholder satisfaction at the responsiveness of the education system to needs and concerns.	**Lead Branches:** Curriculum/French Language Services/Learning and Teaching Resources **Partners:** Interbranch Team PDS Leadership Team Field Services Accountability and Reporting Communications Library Services Partners from other ministries Interjurisdictional partnerships (e.g., WNCP)	**Focus:** ▪ potential purpose, scope and timing of needs assessment **Media:** ▪ Alberta Education Web site ▪ *Connection* ▪ Directors' Report ▪ consultation meetings	
Recommend Action	Decision to proceed to planning stage (i.e. to develop an initial proposal) will depend on: ▪ congruency of findings with current program and needs of students ▪ alignment with government and department business plan goals, division and branch strategic plans.		**Groups that may provide input:** Stakeholders, Clients and Partners[5] Advisory Groups (e.g., PAAC)		**Approve Action:** Executive Director (Program Development and Standards)/ Directors

5. Stakeholders, clients and partners include school jurisdictions (administrators, teachers, students), parents, post-secondary educators, education organizations (ATA, ASBA, CASS, etc.), business and industry, community agencies, Alberta Regional Professional Development Consortia, professional organizations.

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INITIATE **Write Initial Proposal**	The initial proposal includes: ▪ the scope and nature of proposed changes to the program (as the scope of changes increases, the amount of time allowed for development increases as well as the amount and nature of consultation required) ▪ potential implications for school programming ▪ impact on provincial assessments ▪ post-secondary transitions and stakeholder awareness and acceptance ▪ alignment with business goals and plans, and cross-government initiatives ▪ alignment with other curriculum revisions and initiatives ▪ proposed budget, timelines, milestones, staffing needs ▪ roles and plans for involving partners and stakeholders ▪ communications plan ▪ identification of support sections in the program of studies; e.g., indicators ▪ need for learning and teaching resources (including student and teaching resources: basic, support, distributive learning) ▪ need for implementation support, e.g. guides to implementation, professional development ▪ recommended advisory committee structure.	Proposed changes reflective of strengths and concerns identified in the needs assessment. Proposed development activities are aligned with the business plan and government initiatives. Linkage to the overall planning, policy and operational activities of the department and schools. Collaboration among branches.	**Lead Branch:** Curriculum/French Language Services/Learning and Teaching Resources **Partners:** Interbranch Team Communications Partners from other ministries Interjurisdictional partnerships (e.g., WNCP) **Groups invited to provide input:** Stakeholders, Clients and Partners Advisory Groups (e.g., PAAC)	**Focus:** ▪ potential scope and nature of anticipated changes ▪ opportunities to provide input (scope of consultations)	**Approve Process:** Executive Director (Program Development and Standards)/ Directors

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PLAN **Develop Detailed Project Plan**	The detailed project plan to include: ▪ a model for developing the program of studies/initiative ▪ plan for consultation: determine the number and nature of consultations required to effectively consult stakeholders, based upon the nature and scope of proposed changes (1-Star Change, 2-Star Change, 3-Star Change[6]) and advisory committee input (refer to the *Consultation Best Practices and Resources* document). ▪ plan for field testing ▪ discussion of pathways, anticipated standard, nomenclature ▪ integration with other curricula/initiatives ▪ facilitating post-secondary transition and acceptance ▪ plan for developing and/or obtaining learning and teaching resources (Call For Resources, Request For Proposals, custom development, partnership, in-house development) ▪ projected implementation plan and schedule taking into consideration: o provincial assessment o other programs/initiatives under development o priorities and plans of other branches o costs to school jurisdictions with respect to facilities, learning and teaching resources, technology requirements, and teacher inservice needs o Providing Access for all Learners (PAAL) ▪ budget projections (including consultation costs, resource development and implementation support costs, ministry human resource requirements), timelines, roles and responsibilities ▪ communication plan.	Scope of inputs. Clarity of questions posed. Collaboration among partner branches.	**Lead Branch:** Curriculum/French Language Services/Learning and Teaching Resources **Partners:** Learner Assessment Learning Technologies Interbranch Team Communications Executive Team **Groups invited to provide input:** Program Advisory and Development Committees Stakeholders, Clients and Partners Advisory Groups	**Focus:** ▪ summary of the project plan including scope of changes and plans for consultations ▪ timelines and implementation dates ▪ joint communication from key partners **Media:** ▪ Letters/reports to stakeholders ▪ Web site update ▪ *Connection* ▪ Parent brochure ▪ Information sessions in zones, conferences and conventions	**Approve Process and Product:** Assistant Deputy Minister (Program Development and Standards) [Executive Team review] **Approve Implementation Schedule:** Assistant Deputy Minister (Program Development and Standards) **Approve Communication Plan:** Director (Communications)

6. 1-Star indicates a minor change in curriculum and minimal content change. 2-Star indicates a moderate change, including new content materials. 3-Star indicates a major change, including a change in teaching pedagogy or teaching practice.

Processes	Products and Product Elements	Quality Criteria	Collaborations/Consultations	Communications	Approval Levels
PLAN (continued) **Decide on Project Management**	Program Managers, Resource Managers and other staff selected and oriented to the department, branch and project: ▪ policy and procedures knowledge ▪ cross-branch, intergovernmental project awareness. Interbranch Teams work collaboratively in coordinating work across branches. Alberta Education staff write program outcomes, develop resources and provincial assessments with the input and participation from stakeholders. Advisory Committees provide advice on programs of study, learning and teaching resources, appropriate amount of stakeholder consultations and program implementation. External committees are structured to facilitate: ▪ input from a variety of stakeholders, some with general and some with specific knowledge, representing clients with diverse needs ▪ balanced representation from geographical areas of the province and from large and small, private/public/separate schools/francophone/French Immersion ▪ participation by representatives from partner branches.	Involvement of staff in planning, implementation, recruitment and selection. Potential for training, professional growth, learning activities.	**Lead Branch:** Curriculum/French Language Services/Learning and Teaching Resources **Partners:** Interbranch Team Human Resources Clients, Partners and Stakeholders	**Focus:** ▪ updates ▪ orientation to project **Media:** • memos/reports/ meetings with internal partners	**Approve Process and Product:** Executive Director (Program Development and Standards)/ Directors

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Processes	Products and Product Elements	Quality Criteria	Collaborations/Consultations	Communications	Approval Levels
DEVELOP					
Prepare Discussion/ Consultation Draft of Program of Studies	Prepare one or more discussion/consultation draft(s) of the program of studies (English and/or French) for internal and external review. The drafts of the course/program of studies include: ▪ a proposed name for the program ▪ a program philosophy and rationale and vision statement ▪ general and specific (learner) outcomes. The drafts of the course/program of studies may also include: ▪ illustrative examples ▪ indicators ▪ standards ▪ other elements essential for clear communication of the program intents.	The draft program of studies takes into account: ▪ needs, abilities, interests and learning characteristics of students ▪ learning and teaching research ▪ potential barriers to success ▪ cultural contexts and community perspectives including FNMI ▪ smooth articulation from grade to grade ▪ consistency in design, terminology and the level of expectations ▪ linkages to other programs ▪ direction for design of resources and assessments and instructional planning.	**Lead Branch:** Curriculum/French Language Services/ Learning and Teaching Resources **Partners:** Interbranch Team Communications Partners from other ministries **Groups invited to provide input:** Program Advisory and Developmental Committees Stakeholders, Clients and Partners Interjurisdictional partnerships	**Focus:** Draft course/program of studies is made available to major stakeholder groups for discussion and response. **Media:** ▪ mailout/web posting with a response questionnaire, survey form ▪ regional meetings, symposia, conventions and conferences ▪ ATA News ▪ *Connection*	**Approve Process and Product:** Directors
Conduct Consultations on Draft of Program of Studies	Response questionnaire/survey form (English and/or French) ▪ posted on-line ▪ provides opportunity for involvement of stakeholders, clients and partners. Focus Group Sessions (English and/or French): ▪ face-to-face meetings ▪ provide opportunities for input from a variety of stakeholders. External Advisory Committees provide recommendations.				
Prepare Consultation Report on Draft of Program of Studies	Prepare report (English and French). Use of electronic means to communicate; e.g. email. Summary of feedback with recommendations for revising program of studies shared with stakeholders, particularly those who provided feedback.	Questionnaire not leading or time consuming, and allows for reflective feedback. Focus groups include opportunities for dialogue and discussion.			

Collaborative Planning, Development and Implementation Framework for Alberta Curriculum
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Processes	Products and Product Elements	Quality Criteria	Collaborations/Consultations	Communications	Approval Levels
DEVELOP (continued) **Conduct Needs Assessment of Learning and TeachingResources to Support Implementation**	Conduct a needs assessment of learning and teaching resources (English and/or French) to support implementation.	The needs assessment takes into account: ▪ needs, abilities, interests and learning characteristics of students ▪ learning and teaching research ▪ potential barriers to success ▪ cultural contexts and community perspectives including FNMI ▪ smooth articulation from grade to grade ▪ consistency in design, terminology and the level of expectations ▪ linkages to other programs ▪ direction for design of resources and assessments and instructional planning.	**Lead Branch:** French Language Services/ Learning and Teaching Resources **Partners:** Curriculum Branch Interbranch Team Communications Partners from other ministries **Groups invited to provide input:** Stakeholders, Clients and Partners Interjurisdictional Organizations	**Focus:** Resources are made available to major all schools. **Media:** ▪ regional meetings, symposia, conventions and conferences ▪ ATA News ▪ *Connection*	**Approve Process and Product:** Directors
Review and/or Develop Learning and Teaching Resources	Develop a prospectus for the development of guides to implementation and/or other implementation tools accessible in appropriate formats: online, print, CD-ROM or any combination thereof. Develop a *Call for Resources* or a *Call for Proposals* to review, select and authorize resources. Develop and field test resources. Review and select resources (published and/or custom developed publisher resources).				

Collaborative Planning, Development and Implementation Framework for Alberta Curriculum
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Processes	Products and Product Elements	Quality Criteria	Collaborations/Consultations	Communications	Approval Levels
DEVELOP (continued)					
Prepare Validation/Publishers Draft of Program of Studies	The validation/publishers draft of the course/program of studies (English and/or French) is prepared ▪ to share with publishers and developers of resources ▪ for field testing of program, learning and teaching resources and provincial assessments with students and/or teachers.	The input of a variety of stakeholders, clients, and partners is considered in the revision process. The timelines provide adequate opportunities for input into revising the program of studies based on feedback.	**Lead Branches:** Curriculum/ French Language Services/Learning and Teaching Resources/Learner Assessment Branch **Partners:** Interbranch Team **Groups invited to provide input:** Program Advisory and Developmental Committees Stakeholders, Clients and Partners Advisory Groups	**Focus:** ▪ validation draft of program of studies **Media:** ▪ memos/reports/ meetings with internal partners ▪ Web site	**Approve Process and Product:** Directors (Curriculum, French Language Services, Learning and Teaching Resources)
Field Test of Program of Studies, Learning and Teaching Resources and Provincial Assessments (where applicable)	▪ Purpose is to assure that course/program of studies, teaching and learning materials and provincial assessment materials are suitable for implementation in the classroom. ▪ The field test includes input from teachers, jurisdiction curriculum leaders, advisory and developmental committees, and students, if appropriate. ▪ The review may be extensive or limited depending on the extent of the change and the need to obtain critical information on resources under development.	Collaboration among branches: ▪ simultaneous selection/development of learning and teaching resources ▪ development/field testing of provincial assessments, where applicable ▪ final planning for support for implementation.			

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DEVELOP (continued) **Field Test Program of Studies, Learning and Teaching Resources and Provincial Assessments (where applicable)**	Plan is coordinated for field test in consideration of: ▪ size and scope of the review ▪ selection of teachers/jurisdictions/sites based on factors such as urban/rural, public/private/separate, large/small schools ▪ timelines, schedule of activities ▪ orientation and support of teachers and school system leaders; i.e., superintendents, principals, coordinators ▪ implications for students, especially those in grades 3, 6 and 9 ▪ collection and analysis of feedback ▪ financial implications for schools and Alberta Education ▪ plans for communicating with parents and community. The summary report may include: ▪ suggestions for revisions to program of studies, draft teaching and learning materials and provincial assessment materials ▪ recommendations for teacher support in implementation ▪ recommendations for communication to stakeholders, clients and partners.	Processes take into account, and are specifically linked to, department business goals and operational plans and government policy, and the operations and plans of schools. The input of a variety of stakeholders, clients, and partners has been considered in the revision process.	**Lead Branches:** Curriculum/Learning and Teaching Resources/French Language Services **Partners:** Learner Assessment Interbranch Team **Groups invited to provide input:** Program Advisory and Developmental Committees Other Advisory Groups (e.g., PAAC) Publishers and Developers of Resources	**Focus:** ▪ Field test teachers provide feedback and are kept apprised of changes. ▪ Students and parents involved in program review understand the purpose and procedure. **Media:** ▪ letters, emails, faxes, telephone calls, (possible school visits) ▪ information brochure ▪ regional information sessions, symposia and presentations at conferences and conventions	**Approve Process:** Executive Director (Program Development and Standards) **Approve Product:** Directors (Curriculum, Learning and Teaching Resources, French Language Services) *Minister, Deputy Minister, Assistant Deputy Minister are kept informed of any potential issues that arise during the validation.*
Analysis of development process	Analysis of curriculum development process and outputs, identification of lessons learned.		**Lead Branches:** Curriculum/Learning and Teaching Resources/French Language Services Managers/Assistant Directors/Directors		

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AUTHORIZE **Authorize Program of Studies (English and/or French)**	Documentation to include: ▪ program of studies ▪ link to Alberta Education program policies and business plan goals ▪ briefing note with summaries of feedback/recommendations from the field, advisory groups and internal partners, availability of learning and teaching resources, provincial assessments and support for implementation. Upon approval, the program of studies is available for optional or mandatory implementation. The program of studies being replaced is withdrawn.	Processes take into account, and are specifically linked to, department business goals and operational plans and government policy.	**Lead Branch:** Curriculum/French Language Services **Partners:** Interbranch Team	**Media:** ▪ parent handbooks ▪ Program of Studies ▪ *Guide to Education* ▪ Web site ▪ *Connection*	**Approve Product:** Minister **Approve Process:** Assistant Deputy Minister (Program Development and Standards)/ Executive Director (Program Development and Standards)/ Directors
Authorize Basic Resources (English and/or French) **Approve Support and Teachers Resources (English and/or French)** **Ensure Accessibility to Guides to Implementation and/or Other Implementation Tools**	Basic learning and teaching resources are reviewed, selected and authorized for use by schools. Basic learning and teaching resources are available for purchase well in advance of implementation. Support resources for students and teachers are reviewed, selected and authorized for use by schools. Guides to implementation and/or other implementation tools are approved for use by schools.	Processes take into account, and are specifically linked to, business plans and government policy.	**Lead Branch:** Learning and Teaching Resources/French Language Services **Partners:** Interbranch Team **Groups invited to provide input:** Publishers and Developers of Resources Learning Resources Centre Program Advisory and Developmental Committees Publishers and Developers of Resources Clients, Partners and Stakeholders	**Focus:** ▪ announcement regarding learning and teaching materials **Media:** ▪ Web site ▪ *Connection*	**Approve Product and Process:** Executive Director (Program Development and Standards)/ Directors (Learning and Teaching Resources, French Language Services)

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Processes	Products and Product Elements	Quality Criteria	Collaborations/Consultations	Communications	Approval Levels
AUTHORIZE **Authorize Program of Studies (English and/or French)**	Documentation to include: ▪ program of studies ▪ link to Alberta Education program policies and business plan goals ▪ briefing note with summaries of feedback/recommendations from the field, advisory groups and internal partners, availability of learning and teaching resources, provincial assessments and support for implementation. Upon approval, the program of studies is available for optional or mandatory implementation. The program of studies being replaced is withdrawn.	Processes take into account, and are specifically linked to, department business goals and operational plans and government policy.	**Lead Branch:** Curriculum/French Language Services **Partners:** Interbranch Team	**Media:** ▪ parent handbooks ▪ Program of Studies ▪ *Guide to Education* ▪ Web site ▪ *Connection*	**Approve Product:** Minister **Approve Process:** Assistant Deputy Minister (Program Development and Standards)/ Executive Director (Program Development and Standards)/ Directors
Authorize Basic Resources (English and/or French) **Approve Support and Teachers Resources (English and/or French)** **Ensure Accessibility to Guides to Implementation and/or Other Implementation Tools**	Basic learning and teaching resources are reviewed, selected and authorized for use by schools. Basic learning and teaching resources are available for purchase well in advance of implementation. Support resources for students and teachers are reviewed, selected and authorized for use by schools. Guides to implementation and/or other implementation tools are approved for use by schools.	Processes take into account, and are specifically linked to, business plans and government policy.	**Lead Branch:** Learning and Teaching Resources/French Language Services **Partners:** Interbranch Team **Groups invited to provide input:** Publishers and Developers of Resources Learning Resources Centre Program Advisory and Developmental Committees Publishers and Developers of Resources Clients, Partners and Stakeholders	**Focus:** ▪ announcement regarding learning and teaching materials **Media:** ▪ Web site ▪ *Connection*	**Approve Product and Process:** Executive Director (Program Development and Standards)/ Directors (Learning and Teaching Resources, French Language Services)

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AUTHORIZE (continued) **Conduct Final Quality Check**	The following are in place: ▪ program of studies ▪ learning and teaching resources ▪ guides to implementation and/or other implementation tools ▪ revised provincial assessments, where applicable ▪ plan for teacher orientation/professional development ▪ communication plan.	Branches provide information and update on components required for program implementation.	**Lead Branch:** Curriculum/Learning and Teaching Resources/French Language Services **Groups invited to provide input:** Advisory Groups Alberta Regional Professional Development Consortia	**Focus:** ▪ program of studies ▪ learning and teaching materials ▪ provincial assessments **Media:** ▪ Web site ▪ *Connection*	
IMPLEMENT **Communicate Directions** **Print and Distribute Program of Studies (English and/or French)** **Communicate Information About Developed and Authorized Resources** **Implement Program**	All individuals and groups who will be affected by the implementation of the course/program of studies have the information needed. Each jurisdiction and school has access to the program of studies, the implementation schedule and other relevant information. (Simultaneous implementation in English and French is undertaken where feasible.) Each jurisdiction and school has access to the Alberta Education Web site, that includes the Learning Resources Database, Guides to Implementation and/or other implementation tools. The new/revised program is offered to students.	Accessibility of information. Collaborative efforts.	**Lead Branches:** Curriculum/Learning and Teaching Resources/French Language Services **Partner Branch:** Interbranch Team Communications	**Focus:** ▪ program of studies ▪ information about learning, teaching and provincial assessment materials, and implementation **Media:** ▪ Web site postings ▪ mailout of hardcopy or CD ▪ communiqués, such as letters to superintendents, information brochures for parents ▪ *Connection*	**Approve Product and Process:** Directors (Curriculum/Learning and Teaching Resources/French Language Services/ Communications)

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Processes	Products and Product Elements	Quality Criteria	Collaborations/Consultations	Communications	Approval Levels
IMPLEMENT (continued) **Orient Teachers**	Teachers are knowledgeable about the program, learning, teaching and provincial assessment resources and implementation requirements.	All partners have the information needed to provide orientation to teachers.	**Lead Branch:** School Improvement/ Curriculum/Learning and Teaching Resources/French Language Services **Partners:** Interbranch Team Alberta Regional Professional Development Consortia **Groups invited to provide input:** Program Advisory and Developmental Committees Stakeholders, Clients and Partners, Advisory Groups, Publishers, and Developers of Resources.	**Media:** Letters and other communications to: ▪ school jurisdiction ▪ administrators ▪ teachers ▪ parents	**Approve Product and Process:** Executive Director (Program Development and Standards)
MAINTAIN **Sustain Support for Implementation** **Monitor, Assess, Troubleshoot, Adapt**	Teachers have access to ongoing guidance and support for implementation: ▪ jurisdictions have the information they need ▪ liaison with stakeholders e.g., post-secondary institutions is ongoing. Feedback from schools and community is monitored in relation to: ▪ appropriateness of program for students and community ▪ currency and availability of learning and teaching resources ▪ maintaining guides to implementation and other implementation tools ▪ alignment of assessment materials to the curriculum standard.	Accessibility of information. Collaborative efforts. Community satisfaction that student needs are being met. Accessibility of information. Responsiveness to concerns and requests.	**Lead Branches:** Curriculum/Learning and Teaching Resources/French Language Services **Partners:** Interbranch Team **Groups invited to provide input:** Alberta Regional Professional Development Consortia Stakeholders, Clients and Partners Advisory Groups	**Focus:** ▪ opportunities to provide input **Media:** ▪ posting on Web site ▪ information sessions at symposia, conferences and conventions	**Approve Process:** Executive Director (Program Development and Standards)