

Examining Nova Scotia's Learning Outcomes Framework and the Developmental  
Appropriateness of Specific Curriculum Outcomes

by

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## ABSTRACT

In 1994, the Atlantic provinces came together to develop the Atlantic Canada Framework for Essential Graduation Learnings, an educational framework that aimed to improve the quality of education for students in Nova Scotia. Currently in Nova Scotia, 25-32% of students are not meeting academic expectations in math and literacy and students performed lower than several other provinces in Canada on standardized academic tests. Nova Scotia's Learning Outcomes Framework is rooted in outcome-based education (OBE), an educational framework that has little reported success in the public education systems of other countries. Members of the public, educators, and academics in Nova Scotia have voiced concerns about the Learning Outcomes Framework and its impact on student learning and teacher workload. One concern by Nova Scotians is the developmental appropriateness of the specific outcomes. The present study reviewed the literature on OBE and developmentally appropriate education. Following the reviews, select specific outcomes from the Learning Outcomes Framework were compared to a Piagetian theory of cognitive development to generate recommendations for educators and other educational professionals to improve student achievement in Nova Scotia.

## **Chapter 1: Literature Review of Outcome Based Education**

### **The Current State of Public Education in Nova Scotia**

The Atlantic Canada Framework for Essential Graduation Learnings in Schools was implemented in 1994 to improve the state of education for all students in the Atlantic provinces; however, the organization of Nova Scotia's curriculum is currently being reconsidered following public criticism and recent poor performance of students on standardized tests. Every year, fewer Nova Scotian students meet national standards in literacy and mathematics skills (Nova Scotia Department of Education and Early Childhood Development, 2015) and the number of students who do not meet grade-based expectations are alarming. The number of students meeting expectations on provincial assessments in reading, writing, and mathematics has steadily decreased since 2009. On the most recent provincial assessment of student achievement in Nova Scotia, 32% of grade three students did not meet the provincial assessment expectations in reading (Nova Scotia Department of Education and Early Childhood Development, 2015). In addition to falling literacy and math scores, several other concerns with Nova Scotia's public education system have been identified (e.g., focus and structure of curriculum, large number of outcomes, preparedness of graduating students, and developmentally inappropriate outcomes) which led to a broad public consultation on the future of public education in the province in 2014.

In January 2015, the Honourable Karen Casey, Nova Scotia's Minister of Education and Early Childhood Development, released *3 Rs: Renew, Refocus and Rebuild, Nova Scotia's Action Plan for Education*, a document developed from the results



of the Report of the Minister's Panel on Education (2014) which engaged in public consultation on public education throughout the fall of 2014. The action plan acknowledges that the public education system in the province has been losing credibility in the eyes of Nova Scotians for decades (Nova Scotia Department of Education and Early Childhood Development, 2015). The lengthy document proposes four pillars of public education that will be the foundation of change: (1) a modern education system; (2) an innovative curriculum; (3) inclusive school environments; and (4) excellence in teaching and leadership (Nova Scotia Department of Education and Early Childhood Education, 2015). The Department of Education and Early Childhood Development in Nova Scotia aims to put the action plan in place by September 2015 (Nova Scotia Department of Education and Early Childhood Development, 2015). The recommendations were based on data from resources such as a recent survey of over 19 000 Nova Scotians, educational research, the Early Developmental Index (EDI), and Individual Program Plans (IPP; Nova Scotia Department of Education and Early Childhood Development, 2015). It is essential to examine the current structure for teaching and learning in the province along with its historical underpinnings to address several of the challenges currently facing students and teachers in Nova Scotia. By examining the foundations of Nova Scotia's public education system, it will be possible to develop a more streamlined set of recommendations to improve outcomes for students in this province.

### **Atlantic Canada Framework for Essential Graduation Learnings**

In the early 1990s, representatives from the Atlantic provinces came together to address the challenges facing the public school systems across the region. The Atlantic

Provinces Education Foundation (APEF) was formed by the Departments of Education in Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador and the Atlantic Canada Framework for Essential Graduation Learnings in Schools was published in 1996. The Atlantic Canada Framework for Essential Graduation Learnings states that several societal factors led to the need for an updated conceptualization of the education system; these factors included the information explosion (i.e., increased access to data through the internet), technological developments, new research on learning styles, the recognition of the need for lifelong learning, changes in patterns and characteristics of school populations, and the increased emphasis on accountability (APEF, 1996a). The decision to make changes in the education system was supported in part by the results from royal commission reports on Nova Scotia's education system and endorsed by the Atlantic premiers of 1994 (APEF, 1996a). With the input of the public, the APEF (1996a) created the Atlantic Canada Framework for Essential Graduation Learnings in Schools, a curriculum with a set of clearly articulated statements describing what students are expected to know and do by graduation from high school. The Atlantic Canada Framework for Essential Graduation Learnings in Schools aimed to improve the quality, relevance, and effectiveness of the curriculum to ensure all students across the Atlantic provinces receive the same level of education, and to meet the needs of both students and our changing society (APEF, 1996a).

There are six key areas of learning identified in the Essential Graduation Learnings document with specific, cross-curricular goals pertaining to the knowledge, skills, and attitudes students will demonstrate by the end of high school. The key areas are aesthetic expression (e.g., "Demonstrate understanding of the ideas, perceptions, and

feelings of others as expressed in various art forms”), citizenship (e.g., “Explain the significance of the global economy on economic renewal and the development of society”), communication (e.g., “Explore, reflect on, and express their own ideas, perceptions and feelings”), personal development (e.g., “Make appropriate decisions and take responsibility for those decisions”), problem solving (e.g., “Use a variety of strategies and perspectives with flexibility and creativity for solving problems”), and technological competence (e.g., “Locate, evaluate, adapt, create and share information using a variety of sources and technologies”; p. 11). The Essential Graduation Learnings were created as a way to clarify overall expectations within education systems in Atlantic Canada and to prepare students to be life-long learners (APEF, 1996a).

Following the development of the Essential Graduation Learnings, the APEF created a common curriculum to be used by all Atlantic Provinces called the Foundation Documents. These documents were developed for each of English language arts, social sciences, mathematics, and science and begin with a set of Atlantic Canada Common Curriculum Outcomes. Three types of outcomes are found in each foundation document: the Essential Graduation Learnings, *general curriculum outcomes*, and *key-stage curriculum outcomes*. General curriculum outcomes differ from Essential Graduation Learnings because they are statements that articulate what students are expected to know and be able to demonstrate upon completion of study in specific area of study within the curriculum (APEF, 1996a). Key-stage curriculum outcomes elaborate on necessary outcomes in each subject at key points during a students’ education (i.e., grades three, six, nine, and 12). The outcomes in the Foundation Documents were created to reflect Essential Graduation Learnings so that the Essential Graduation Learnings are

accomplished as a result of meeting the general and key-stage curriculum outcomes (APEF, 1996a). The Foundation documents note that some of the key-stage curriculum outcomes may look similar, but it is up to the teacher to recognize the increase in expectations for students at each key stage (APEF, 1996a). It is noted in the Foundation document for mathematics that teachers should also be aware of the cognitive stages of development to understand students' abilities to think mathematically (APEF, 1996c). According to the foundation document for the English language arts curriculum, a key-stage curriculum outcome for students by the end of grade three is that they "express and explain opinions about texts and types of texts and the work of authors and illustrators, demonstrating an increasing awareness of the reasons for their opinions" (APEF, 1996b, p.26). The end of each foundation document includes a set of principles to follow for creating a rich learning environment; a guide for the specific role of the student, teacher, principal, education system, community, and parent; a guide for the assessment and evaluation of the outcomes; a guide to reporting student progress; and information on useful resources (APEF, 1996b). The APEF states that the purpose of the general and key-stage outcomes is to ensure a smooth transition between grades; however, APEF does not clearly indicate how it will do so (APEF, 1996a). A second purpose is to create a common foundation for each province's curriculum (APEF, 1996a). Therefore, the Foundation Documents guide the development of the provincial, *specific curriculum outcomes* (APEF, 1996a).

### **Nova Scotia's Learning Outcomes Framework**

Each Atlantic province created specific curriculum outcomes based on the general and key-stage curriculum outcomes in the Foundation Documents. The *Learning*

*Outcomes Framework* documents were developed by the Nova Scotia Department of Education and Early Childhood Development “to help all students develop to their full potential cognitively, affectively, physically, and socially and to help all students acquire the knowledge, attitudes, and skills necessary for them to continue as thinking, learning, physically active valued members of society” (Nova Scotia Department of Education and Early Childhood Development, 2013, p. 3). These provincial curriculum documents include the general curriculum outcomes followed by several specific curriculum outcomes describing what each student in Nova Scotia is required to know and be able to do at the end of each grade. A number of specific curriculum outcomes correspond to each of the general curriculum outcomes. For example, there are 10 general curriculum outcomes that students should achieve in English language arts by the end of high school, and there are 34 specific curriculum outcomes that students should achieve by the end of grade one (Nova Scotia Department of Education and Early Childhood Development, 2014a). One of the general curriculum outcomes for English language arts is, “Students will be expected to select, read, and view with understanding a range of literature, information, media and visual texts” (APEF, 1996b). A corresponding specific learning outcome for grade one students in Nova Scotia indicates that students will “describe their own reading and viewing processes and strategies” (Nova Scotia Department of Education and Early Childhood Development, 2014a).

Nova Scotia teachers and members of the public have access to curriculum documents through Nova Scotia’s DOE website. According to the Atlantic Canada Framework for Essential Graduation Learnings in Schools, teachers are provided with the common Atlantic Foundation Documents for given teaching subjects. In addition,

teachers receive support documents, including the province's specific curriculum outcomes documents (e.g., the Nova Scotia Learning Outcomes Framework), along with additional support for academic programming at different levels of schooling. With these documents, teachers are expected to program academic material to reference the outcomes and design assessments that measure each student's achievement of the pre-stated criteria.

The Atlantic Canada Framework for Essential Graduation Learnings in Schools (1996a) notes that the curriculum was developed "within an outcomes framework" (p. 13). The Foundation Documents also state that the curriculum is defined in terms of outcomes (Nova Scotia Department of Education and Early Childhood Development, 2014a). The terminology used by the APEF within the common curriculum guides and Nova Scotia's Department of Education and Early Childhood Development curriculum documents align with the theory of Outcome Based Education (OBE) that was developed by William Spady in the early 1990s.

### **The Origins and Philosophy of Outcome Based Education**

Dr. William Spady originally trained as sociologist and is a professor of education and a self-proclaimed developer of OBE. Spady published two books outlining the OBE framework, including his 1994 book, *Outcome-Based Education: Critical Issues and Answers*. Spady describes OBE as a total school system that is entirely future oriented (Spady, 1994). He claims that the purest form of OBE prides itself as being separate from traditional, non-OBE education systems that use predefined curricula or syllabi (Spady, 1994). OBE can be viewed either as a philosophy for education, a systematic structure for education or as a classroom practice for education (Killen, 2000). Spady wrote extensively about his philosophical framework for OBE; however, he wrote little to guide

teachers, schools, and education systems through in the practical application of OBE (Berlach & O’Niell, 2008). Due to the ambiguity of its terms and attributes, the philosophy of OBE is difficult to define and apply in practice (Berlach, 2004).

**Development and theory of OBE.** OBE was first developed in the United States when the education system was under social and political pressure in the 1960s and 1970s to make a change so that students left the education system prepared to be American citizens. Unlike the Canadian education system, which is under provincial jurisdiction, the American education system is federally regulated. At the time, the United States was determined to regain technological superiority following the Soviet Union’s launch of Sputnik (Alderson & Martin, 2007). A number of events occurred to initiate the development of a new method of educating students. First, the US federal government established a definite role in the education system and required states to meet standards on yearly tests of academic achievement. Second, the difficulty that the baby boomers experienced when seeking employment after graduation led to a greater emphasis on holding teachers responsible to justify the investment of the public’s money into the education system (Alderson & Martin, 2007). Furthermore, it was argued that clearly articulated outcomes in terms of the material students should know as a result of planned learning experiences would serve as an accountability mechanism directly related to student performance on a set of outcomes (Willis & Kissane, 1997). Some American states introduced OBE in the early 1990s with the idea that the *quality* of education should be based upon the *outcomes* (i.e., output) of the students rather than the *content* to be acquired (Botha, 2002). The term OBE is no longer used in the US education system, yet similar qualities of OBE have carried through in Standards-Based Education and the

more recent Common Core Curriculum. Several Canadian education systems, including that in Nova Scotia, have since followed the lead of the United States and implemented an OBE framework.

When a new program or curriculum is designed in an education system, it is logical to discuss what students should be expected to do by the end of a learning experience (Lawson & Askill-Williams, 2007). In everyday language, “learning outcomes” are considered the outcomes or goals that have been achieved by the end of a learning experience; however, this is not true of learning outcomes in OBE (Allais, 2007). According to Spady’s 1994 definition of OBE, learning outcomes are not what *has been* achieved but rather what *should be* achieved according to a national or regional educational department (Allais, 2007). Learning outcomes are clear, tangible actions or demonstrations to be used within particular learning programs and in conjunction with creating curricula (Spady, 1994). Outcomes are conceptually linked items geared toward an endpoint of learning and based on a continuum (Willis and Kissane, 1997). Spady (1994) defined three types of OBE that use learning outcomes in different ways. *Traditional OBE* is essentially the same as traditional curriculum-based education systems, as it focuses on the mastery of curriculum and subject matter through academic learning outcomes (Spady, 1994). *Transitional OBE* uses overarching outcomes, such as critical thinking, problem solving, and communication skills, that are cross-curricular and not directly focused on the teaching subjects (Spady, 1994). Finally, *Transformational OBE* includes outcomes that are future-oriented and focus on the broad roles and abilities students will have by graduation for the purpose of being a contributing member of society (Spady, 1994). As well, when using a Transformational OBE framework, students



are not given a specific amount of time in which to achieve the outcomes. Spady is an advocate for Transformational OBE as the basis of an OBE system (Donnelly, 2007). Therefore, for the purposes of this review and study, the term OBE will be used to refer to the Transformational OBE system.

The OBE that Spady endorses is based on a *design back* method that allows the curriculum to have a high degree of coherence with the learning outcomes. The outcomes are created first by a national or regional educational department, and then the curriculum is created based on the outcomes (Lawson & Askill-Williams, 2007). In theory, teachers receive a set of outcomes for each subject and are required to create the curriculum (i.e., they are curriculum designers). For example, teachers will ask themselves, “What do I need to do to allow students to reach these objectives?” when programming for academics (Lawson & Askill-Williams, 2007). Spady’s philosophical model of OBE holds teachers and schools accountable for student achievement of the learning outcomes (Berlach, 2007). Spady (1994) emphasized that teachers and schools hold the power to create and control the conditions of success for students. Therefore, it is the responsibility of the teacher to ensure that all children accomplish the learning outcomes by designing the curriculum to fit the unique needs of each student (Alderson & Martin, 2007).

There are several premises on which Spady bases his philosophy of OBE. He argues that the time and way in which a learning outcome is achieved may vary for each student (Spady, 1994). He claims that students can be distinguished from one another by acknowledging that some students will achieve more complex outcomes than others (Alderson & Martin, 2007). Spady rejects the notion of a school year as a confined time in which to advance students and argues for the use of achievement-based progression

(Spady, 1994). In this model, failure to meet the outcomes is only a *delayed success* and students should be permitted as much time as needed to complete the outcomes (Spady, 1994); however, it has been suggested that eliminating the concept of failure from education might lead to the weakening of students' drive for success (Donnelley, 2007). The argument for achievement-based rather than time-based progression holds teachers accountable for catching up delayed students on an individual progression basis. However, some authors suggest that the adoption of achievement-based progression may have negative practical implications on entire education systems, including the time and resources needed to provide students alternative routes to outcomes (e.g., teacher support, lesson planning, evidence-based tools; Lawson & Askill-Williams, 2007).

**Practical implementation of OBE.** Spady (1994) identifies four principles as the defining features of the implementation of OBE. The first principle is *clarity of focus*. Teaching material and activities created by the educators must have a direct and systematic relationship to the clearly defined outcomes, both broad and specific. The second principle is *designing back*. The design of curriculum must move in the direction from the most general learning outcomes, to the more specific learning outcomes and then to the content presented in the classroom. Designing techniques for the assessment of the learning outcomes must also reflect a systematic design back from the learning objectives. Spady's third principle of OBE is a *high expectation for all students*. This principle states that although some students may achieve the learning objectives in different ways, all students should be challenged and provided with high standards of education. Finally, the fourth principle is that *teachers must provide expanded opportunities to allow for achievement of outcomes in a variety of ways*. As stated earlier,

some students may achieve the same learning outcomes using different routes, amounts of time or number of attempts. Educators should accommodate these students to ensure they achieve the outcomes.

For OBE to be implemented in the classroom, each educator must understand the philosophy of OBE (i.e., Spady's four defining features to organize the curriculum), instructional practices, and assessment of learning outcomes. In Nova Scotia, teachers are required to assess student performance to provide proof that students can demonstrate each specific outcome (APEF, 1996). The APEF Foundation Documents provide Nova Scotian teachers with some guidelines and strategies for the assessment, evaluation, and reporting of learning outcomes; however, there is no mention of Spady's four defining features of OBE in any APEF or document from the Nova Scotia Department of Education and Early Childhood Development.

At face value, Spady's four principles of OBE appear to be clear, simple, and practical aspects of education that may even lead to effective learning (Berlach, 2004). His principles are theoretically difficult to dispute. An attractive quality of the philosophy of OBE is that members of the public, educators, administrators, and educational experts can have a level of control over creating the overarching outcomes that describe what skills and knowledge graduating students should embody (Killen, 2000). Furthermore, within the theory of OBE, educators appear to have some freedom in terms of selecting the content and methods through which they will aid students in achieving the outcomes (Killen, 2000). With alignment and coherence between learning objectives, curriculum, content presented in the classroom, and assessment methods, Spady argues that OBE is likely to be more effective than other approaches such as syllabus based curricula, time-

based achievement or any other system that uses a design-*forward* approach (Lawson & Askeff Williams, 2007). Essentially, if OBE is viewed as a theory or philosophy of education, OBE can only be successful when the philosophy, systemic structure, and classroom practice are aligned (Killen, 2000). For the implementation of OBE to be consistent from theory to practice, teacher training must also be consistent with OBE theory (Killen, 2000). The OBE framework was implemented with variation in the public education systems of several countries outside of North America. Presently, OBE is being used successfully in some higher-education, technical and vocational programs.

### **Research Exploring the Implementation of OBE**

Models of OBE have been implemented in several countries including Australia, South Africa, New Zealand, Papua New Guinea, and in the United Kingdom. A review of the literature indicates that OBE improved student performance in some post-secondary education programs. For example, Akir, Eng, & Malie (2012) examined the impact of an OBE framework on grade-point average of students in 89 courses at a public university in East Malaysia. In comparison to non-OBE frameworks (i.e., teaching-learning approach), student academic performance was significantly higher in courses with an OBE framework (Akir et al., 2012). The researchers suggested that OBE led to students who were more active learners than those following conventional structures (Akir et al., 2012). Kaliannan & Chandran (2012) conducted entry and exit surveys for students enrolled in a course with an OBE framework at another university in Malaysia. Results suggested that the students were successful in meeting the desired objectives within the OBE framework (Kaliannan & Chandran, 2012). The study reported that the OBE framework allowed both students and teachers to assess their own performance and take

corrective actions when needed (Kaliannan & Chandran, 2012). These positive results have not been replicated in other studies of the application of OBE in higher education. For example, a Canadian study from Simon Fraser University identified several challenges for professors and students when OBE was introduced to an engineering course (Akhmadeeva, Hindy, & Sparrey, 2013). One of the major challenges outlined in the study was the practical implementation of OBE and ensuring that teaching methods lined up with the outcomes (Akhmadeeva et al., 2013).

**OBE in Australia.** The OBE approach in Australia was based on the OBE approach in the United States (Alderson & Martin, 2007). Similar to the Canadian model, the Australian education system is regulated by each state. In 1988, federal Minister for Employment, Education and Training, John Dawkins, pushed for states in Australia to generate key education competencies for all students to demonstrate upon exiting the public school system (Berlach, 2008). With an economic recession and highly competitive global economy, Australia's national interest was to create a more productive, literate, intelligent, and technologically sophisticated workforce (Berlach, 2008). Proponents of the transition to OBE in Australia predicted the change would be beneficial because they believed it would enhance the clarity and coherence of the material taught to students, ultimately improving the equity of the educational system (Lawson & Askill Williams, 2007). They believed that OBE would allow for the accountability and shared responsibility between the students and their studies, and the teachers and their teaching approaches, thereby aligning learning, teaching, and assessment (Lawson & Askill Williams, 2007). These ideas were largely fuelled by the push from the Australian federal government toward economic efficiency, including the

accountability of schools (Killen, 2000). Thus, schools were responsible for producing measurable outputs that could demonstrate the outcome of the public's money invested into the education system (Killen, 2000). Each state in Australia developed its own interpretation of OBE and the manner in which the model would operate in the state's education system (Berlach, 2008). Reports on the translation of OBE philosophy into the practice of curriculum design, teaching, and assessment in Western Australia outline several difficulties for professionals in education.

The implementation of OBE in Western Australia was met with tension from the beginning (Alderson & Martin, 2007). In 2005, dissatisfaction with OBE led a group of educators to create a website in protest of the new educational system called People Lobbying Against the Outcomes (PLATO; Berlach & McNaught, 2007). Some of the concerns teachers voiced addressed the excessive amount of documentation and time-consuming nature of OBE that results in the simplification of outcomes (Berlach & McNaught, 2007). Teachers also reported that they experienced difficulties knowing what material to teach without the guide of a syllabus (Berlach & McNaught, 2007). Despite the outcry from educators, the Curriculum Council and Department of Education and Training continued to reassure concerned educators and members of the public that Western Australia's OBE education system was thriving and going as planned (Berlach, 2007). According to Lawson and Askeff-Williams (2007), a major area of controversy surrounding OBE in Western Australia was assessment. Tests and marking schemes were not reliable, valid or related to the outcomes in a coherent manner (Lawson & Askeff-Williams, 2007). Moreover, the OBE framework lacked compatibility across learning areas (Lawson & Askeff-Williams, 2007).

A report of the implementation of OBE in Western Australia entitled, *Evaluation of the Curriculum Improvement Program Phase 2*, revealed more insights from teachers, school administrators, district offices, State School Teachers Union of Western Australia, and state executives (Louden, Chapman, Clarke, Cullity, & House, 2007). The majority of teachers (88.36%) and school administrators (86.13%) indicated that they experienced increased workloads with the introduction of OBE (Louden et al., 2007). Just over half of respondents (52.89%) rated the OBE framework as useful. In terms of student academic achievement, the majority of school administrators (60.4%) believed that the new framework had led to improved outcomes for students, while only 33.4% of teachers agreed (Louden et al., 2007). These negative reports by teachers were reflected in the high number of teachers leaving the education system in Western Australia.

In his 2004 paper, Berlach cited a document published by the Department of Education and Training of Western Australia (DETWA) reporting that 500 permanent teachers were exiting the education system annually. The report indicated that the main reasons for teachers leaving the department were *workload* and *change*. In 2008, the Australian Education Union published a survey to evaluate reasons for teacher attrition. The survey listed four main contributing factors to teacher attrition: behaviour management problems, heavy workloads, class sizes, and poor pay (Australian Education Union, 2008). Though this research from Western Australia cannot directly be attributed to the implementation of OBE in the education system, it also cannot be ignored. No follow up research has compared rates of teacher attrition before and after the discontinuation of OBE. Following the release of the *Evaluation of the Curriculum Improvement Program Phase 2* in 2007, OBE was abandoned in favour of a national

curriculum in Western Australia and other Australian states as well (Berlach & McNaught, 2007).

**OBE in South Africa.** OBE was introduced in South Africa in 1997 as a tool to move away from the inequitable effects of apartheid lingering in the education system (Allais, 2007). OBE promised several things to the South African education system, most notably to improve the quality of education for all students, to ensure that each student achieved success, and to encourage schools to be more accountable for the success of students (Botha, 2002). OBE would operate to benefit all students and to emancipate the country from the inequality that plagued the education system post-apartheid; as a result, education would no longer represent the vision of only one group of people (Botha, 2002). Other advocates of OBE in South Africa claimed that using outcomes would help to drive a more vibrant economy (National Curriculum Development Committee, 1996). Jansen (1998) did not agree with advocates of OBE and predicted that OBE in South Africa would not be successful because of inherent political objectives of introducing OBE that would not consider the fragile state of South African schools. Furthermore, Jansen (1998) highlighted that there was no evidence to suggest that using an OBE framework leads to change in national economies.

In March of 1997, the South African Minister of Education at the time announced the launch of Curriculum 2005, legislation for curriculum reform that would continue until the year 2005 (Botha, 2002). Curriculum 2005 was based on an OBE framework that began with statements of tasks students should be able to perform at the end of various learning experiences (Botha, 2002). Botha (2002) argued that the introduction of OBE in South Africa encountered several major problems including the inadequate



training of teachers and the lack of financial resources. His ideas were supported by the Chisholm Report of the Curriculum 2005 Review Committee published in 2000. The report identified several weaknesses in the implementation of OBE in South Africa including its lack of conceptual coherence and the poor system for sequencing and tracking the progression of students (Chisholm, 2000). These weaknesses were blamed on the ambiguous language used to describe the OBE framework in educational documents and the lack of coherence among curriculum content (Chisholm, 2000). Botha (2002), however, remained optimistic that a long-term strategic plan would provide more time to adequately train teachers to promote the success of OBE in schools.

Unfortunately, South Africa was never able to transform the education system as promised by OBE and predicted by some educational scholars. Botha (2002) argued that Spady's vision of OBE was not properly implemented because the differences in sociocultural setting and available resources between South Africa and the United States were not taken into consideration. Other individuals saw the poor implementation as only a small part of OBE's failure in South Africa. Allais (2012) admitted that practical problems with OBE became apparent from the beginning; however, she also criticized South Africa's attempt to use the outcomes to make judgments regarding the quality of education. In her studies monitoring the quality of education in public and post-secondary education, she concluded that outcomes did not appear to ensure a high quality of education across learning programs or curricula (Allais, 2012). It was noted that courses in secondary schools with varying breadth and content often led to the same outcomes in multiple subject areas, making it nearly impossible to make any judgment of the quality of education (Allais, 2012). Outcomes were often written with ambiguous language and

excessive explanations (Allais, 2012). The poor implementation in combination with the subjective nature of the outcomes most likely contributed to the Minister of Basic Education's decision to declare OBE in South Africa "dead" in 2009 (Allais, 2012).

There is no evidence to suggest that OBE is an effective educational framework in public education. In countries with federally and state/provincially regulated education systems, OBE frameworks have not been successful. However, there are no studies that use an experimental design to compare the impact of OBE to other forms of educational frameworks which makes it hard to truly evaluate its effectiveness. The OBE literature consists of critical reviews and critiques of its implementation in public education across the world. The major criticisms identified in the literature include the poor translation of OBE from theory to practice, inadequate training of teachers on OBE theory, increased workloads for teachers, the failure to ensure the quality of education, and vague, and over-specified outcomes.

### **Criticisms of Nova Scotia's Learning Outcomes Framework**

As previously noted, Nova Scotian students are not performing well under the Learning Outcomes Framework. Results of recent provincial assessment of student achievement are troubling. The 2014-2015 Nova Scotia Assessment of Reading in grade three reported that only 68% of students scored at or above the assessment expectation (Nova Scotia Department of Education and Early Childhood Development, 2015). These results are down 8% from the previous 2012-2013 school year and suggest that close to one-third of Nova Scotian students in grade three do not meet assessment expectation in reading (Nova Scotia Department of Education and Early Childhood Development, 2015). Only 74% of grade four students in the province currently meet the curriculum

expectation in mathematics (Nova Scotia Department of Education and Early Childhood Development, 2015). In comparison to other provinces, grade eight students in Nova Scotia performed, on average, below Ontario, Quebec, British Columbia, Alberta, and Newfoundland on assessments of reading, mathematics, and science (Report of the Minister's Panel on Education, 2014). These results indicate that students in Nova Scotia are generally not meeting assessment requirements and are below the Canadian average. The educational experience of African Nova Scotians has also been unsatisfying. A review of government programs and supports to Nova Scotian students of African ancestry provided 68 recommendations to the DOE (Enidlee Consultants Inc., 2009). A major concern outlined in the report was the disproportionate number of African Nova Scotian students on Individualized Program Plans (IPPs) According to the Department of Education and Early Childhood Development, an IPP is an annually revised document based on a student's areas of strengths that may contain different outcomes and outcome levels, necessary accommodations on an individual basis (Enidlee Consultants Inc., 2009).

In October 2014, the Report of the Minister's Panel on Education released a report that summarized the findings from a survey of more than 19 000 students, educators, school staff, parents/guardians, and community members to gather thoughts, concerns, and feedback with respect to the public education system. Results from the survey suggest that Nova Scotians have similar concerns to people in other countries where OBE was implemented. Based on survey responses, the general consensus of parents, teachers, and community members in Nova Scotia was that the public education system does not adequately support the learning of public school students. Specifically,

approximately 50% respondents indicated dissatisfaction with the public school system and only 55% of respondents agreed that the current provincial curriculum is focused on what students need to learn most. There were concerns expressed about the expectation that all students achieve the same outcomes and worry that the structure of the curriculum encompasses too many outcomes, forcing teachers to move on quickly before the students are academically prepared. Respondents indicated concern that students were not being taught the basic skills of reading, writing, and mathematics. Only 54% of respondents agreed that students were prepared to attend college or university after graduation and only 41% agreed that students were prepared to enter the workforce. The reporting of student assessment through report cards was also identified as a parental concern. A separate survey of 2637 parents by the Department of Education and Early Childhood Development revealed that 57-62% of parents felt that report cards do not help them understand where their children were struggling, what they learned or how well they progressed (Nova Scotia Department of Education and Early Childhood Development, 2014c).

**Developmental appropriateness of the specific outcomes.** Since the implementation of OBE, Nova Scotians have also been concerned that the curriculum does not take into account child cognitive development. For example, respondents to the recent Report of the Minister's Panel on Education (2014) survey noted that grade Primary learning outcomes were not developmentally appropriate for all children entering school. It is necessary to address concerns about the developmental appropriateness of learning outcomes because children spend a great deal of time in school during critical development periods and school is considered a key site for meeting developmental

milestones (Rushton & Larkin, 2001). Using developmentally appropriate practices (DAP) in schools impacts children's cognitive and social-emotional development (Rushton & Larkin, 2001). Research has demonstrated that implementing DAP when designing curriculum and classroom instruction improves literacy skills in young children. For example, children from low socioeconomic status (SES) households who attended a kindergarten program that promoted developmentally appropriate curriculum and classroom activities had higher reading scores in grade one than counterparts in more traditional classrooms (Burts, Hart, Charlesworth, DeWolf, Ray, Mauel & Fleege, 1993). Other researchers agree that developmentally appropriate experiences with print materials can aid in young children's reading development (Justice, Kaderavek, Fan, Sofka & Hunt, 2009). Furthermore, several resources have been developed by psychologists and educators to inform educators how to incorporate developmental stages when designing curricula and classroom lessons for children (e.g., Kostelnik, Soderman, Keil & Whiren, 2004; Gestwicki, 1999).

*Nova Scotia's Action Plan for Education 2015* addresses some of the concerns outlined above, yet it does not give the impression that the OBE framework embodied by the Learning Outcomes Framework was considered, suggesting that the literature on OBE was not consulted when developing the action plan. Additionally, the action plan does not appear to consider documented concerns of teachers working within the OBE framework, such as the increased workload as a result of building the curriculum and immense assessment responsibilities. Furthermore, the action plan does not appear to substantially address concerns regarding developmentally inappropriate outcomes. The document notes that the Department of Education and Early Childhood Development is aware of

the importance of the first few years on a child's brain development and presented recommendations to prepare preschool children for school by supporting development (Nova Scotia Department of Education and Early Childhood Education, 2015). In terms of the considering changes to the learning outcomes, the Department of Education and Early Childhood Development plans to refocus the curriculum by identifying the essential learning outcomes and concentrating on improving literacy and math skills (Nova Scotia Department of Education and Early Childhood Development, 2015). There are specific plans to make changes to learning outcomes at different stages of education (e.g., preschool, grade Primary to grade three, grade four to grade eight, and grade nine to grade twelve); however, none of these plans reference stages of cognitive development. There is no indication that Nova Scotia's OBE framework is appropriately aligned with children's cognitive development or that child cognitive development specialists (e.g., developmental/school/clinical psychologists, paediatricians, speech-language pathologists) were consulted by the Department of Education and Childhood Development during the creation of the action plan. This is an important shortcoming in the action plan, as students may not be achieving where we expect them to be if they are not developmentally capable of meeting the learning outcomes specified by the province. Therefore, a comprehensive evaluation of the current learning outcomes in Nova Scotia's Learning Outcomes Framework from a cognitive developmental perspective is necessary to determine areas of need and to make recommendations for the improvement of student academic achievement.

## **Chapter 2: Literature Review of Developmentally Appropriate Education**

### **Developmentally Appropriate Education**

The term “developmentally appropriate” is used to describe best practice in curriculum development and classroom instruction based on research in the areas of child cognitive, social, and physical development (Bredekamp, 1992). Developmentally appropriate educational practice and programming is rooted in studies of typical development in children as outlined by developmentalists such as Erik Erikson, Lev Vygotsky, and Jean Piaget (Morelock & Morrison, 1999). Using developmentally appropriate practices (DAP) became recognized in the United States when the National Association for the Education of Young Children (NAEYC) campaigned for more DAP in 1986 in response to growing concerns related to developmentally inappropriate curriculum expectations, especially in the primary years (Bredekamp, 1992). The NAEYC describes DAP as promoting optimal learning and development based on the research in child development and effective pedagogy (National Association for the Education of Young Children, 2009). DAP involves both creating a developmentally appropriate learning environment with lesson plans structured to the developmental stages of children and developing curricula to be aligned with the cognitive abilities of students at specific ages.

The NAEYC provides three main points of consideration for implementing DAP in schools for children up to eight years old. First, educators should have an understanding of child development and the associated research so that they can make informed predictions about the practices and expectations that are most likely promote children’s learning and development. This understanding provides educators and

curriculum developers with broad expectations of the material children will and will not be capable of achieving at particular stages of development. Second, given that individual differences in development are the norm rather than the exception, individual variations in development should be considered while creating developmentally appropriate practices. In doing so, the educator is better able to respond to the child's specific needs, which is crucial to DAP. The third suggestion is to consider what is known about students' social and cultural contexts, including culturally sensitive values and behavioural and language conventions, when considering developmental appropriateness. According to the NAEYC, the ideal educator combines all three suggestions and demonstrates knowledge of child development, accommodates for students' individual differences, and explores the social and cultural contexts in which students live (NAEYC, 2009).

### **Piagetian Influence on Developmentally Appropriate Education**

Jean Piaget's theory of cognitive development played a major role in shaping the movement toward DAP in the United States' education system (Warash, Curtis, Hursh & Tucci, 2009). Piaget began his career as a naturalist with an interest in birds and fossils and later pursued an interest in philosophy (Kohler, 2008). This training in biology and philosophy, combined with his methods of clinical observation, was used to answer questions about concepts of human intelligence, sociology, and mathematics (Elkind, 1976). In 1919, while working at the Alfred Binet Laboratory School in Paris, Piaget began to observe age-related variations in children's response patterns on the French British Intelligence Test (Mooney, 2013). Thereafter, Piaget dedicated his studies to



asking *how* children arrive at certain responses by developing tasks and experiments to explore children's thought and language patterns (Siegler & Ellis, 1996).

Piaget had an enormous impact on the field of developmental psychology, as his theory influenced the types of questions that are asked and how information is gathered (Seigel & Ellis, 1996). Piaget's pedagogy was influenced by Italian educator and physician Maria Montessori, who believed that children actively try to construct meaning of the world and need to create knowledge through experience (Mooney, 2013). From 1925 to 1929, Piaget produced several works that are still well known in the field of developmental psychology today including *The Language and Thought of the Child* (1930), *Judgment and Reasoning in the Child* (1928), and *The Moral Judgment of the Child* (1932). In a later phase of his career (1929-1939), Piaget put more emphasis on the early signs of intelligence in infancy by conducting observations of his own children in natural settings (Singer & Revenson, 1996). Into the 1940s, Piaget began to examine how children acquire an understanding of mathematical concepts (Singer & Revenson, 1996).

Piaget shaped the field of developmental psychology by developing tasks that tap into higher-level cognitive processes through problem solving, reasoning, and understanding concepts (Mooney, 2013). He emphasized the importance of examining children's verbal reasoning to identify errors in problem solving and reasoning (Siegler & Ellis, 1996). He used standardized questions as a starting point for his tasks and expanded to less structured conversation, observation, and questioning (Singer & Revenson, 1996). This methodology allowed him to pursue any interesting comments or rephrase questions because his interests lay not in whether children could correctly answer the questions, but in patterns of reasoning and logic (Singer & Revenson, 1996). Piaget developed tasks that

took into consideration his observation that young children often cannot yet reason verbally or think about abstract concepts. Thus, Piaget's method often included asking questions about materials or requesting that the child manipulate objects in a specific way in order to gain access to the child's thought processes (Singer & Revenson, 1996).

Piaget viewed intelligence as the ability to cope with the changing world through continuous reorganizing of cognitive processes as a result of biological change and experiences in the world (Siegler & Ellis, 1996). Information that comes to a person's senses is organized with a mental image of patterns called a schema (Singer & Revenson, 1996). A schema is a learned behaviour pattern that is extended and modified when new information arises (Elkind, 1976). An example of a schema formed in infancy is an infant who develops a sucking pattern to obtain nutrients. Schemata change through the process of *assimilation*, which refers to organizing new information from the environment into existing schemata (Helmore, 1969). For example, a child who knows that her pet is a dog with four legs, fur, and a tail will see a new animal, such as a cow, with similar features and also call it a dog. That is, the child brings in the new information from her environment and organizes it into her existing schema of "dog". The process of changing or modifying schemata in light of new information from the environment and surrounding stimuli is called *accommodation* (Helmore, 1969). For example, the child with the schema of a dog learns about a new animal that also has four legs, fur, and a tail called a cow. At first the new information produces confusion and a state of cognitive disequilibrium in the child. Then the child learns that cows are different than dogs because they are larger and produce milk (Cook & Cook, 2005). Together, the assimilation and accommodation processes that occur between the child and his or her

environment enable the growth of intelligence by establishing a point of equilibrium between self and the environment (Singer & Revenson, 1996).

Piaget was well-known by psychologists and educators for his theory of the stages of cognitive development at various ages from birth to adulthood. He made it clear that the ages he postulated in his stage theory of cognitive development are not absolute and may vary by up to one year (Piaget, 1973); however, he noted that every child goes through each stage in the same sequence (Singer & Revenson, 1996). Piaget also stressed that a child is not be capable of learning until he/she is psychologically and physically ready to do so (Singer & Revenson, 1996). The biological preparedness of each individual (i.e., genetic makeup, development of the nervous system and sensory organs) also determines the rate at which the individual will proceed through the stages (Singer & Revenson, 1996). Cognitive development is a cumulative process, as all experiences and skills acquired grow out of what was learned in a previous stage (Singer & Revenson, 1996). The completion of a stage is not defined by a behaviour or type of knowledge, but rather the underlying cognitive organization or schemata that enable children to develop new skills (Kohler, 2008). From an educational perspective, academic expectations need to take into consideration the cognitive abilities students may or may not have acquired at each grade. Major acquired skills, behavioural characteristics, and appropriate academic expectations are described below according to cognitive stage (see Table 1).

### **Piaget's Stages of Cognitive Development**

**Sensorimotor Stage (Birth to 2 years).** According to Piagetian theory, infants behave reflexively and rely on the senses and physical exploration to learn about the world (Mooney, 2013). In this stage, the beginnings of intelligence emerge through

physical exploration and the development of key abilities and skills such as sensory-motor schemata, intentional behaviour, joint attention, and object permanence. Infants develop these skills through direct experience with objects in the environment (Singer & Revenson, 1996). At the beginning of the sensorimotor stage, information from the environment comes in small, unrelated pieces (Elkind, 1976). Furthermore, the young infant does not differentiate between himself/herself and the world (Kesslring & Muller, 2011). For example, the infant may look at an object but not be able to connect the object to a visual image in his or her mind or to a schema of the object (Elkind, 1976). An infant in the early months of the sensorimotor stage will hit a bell and be startled by the noise. As intelligence develops further and new schemata are created, the infant will purposely ring the bell to produce the noise and therefore make the connection between his/her action and the outcome, thereby producing a new schema (Kesselring & Muller, 2011).

Joint attention behaviours develop in the sensorimotor stage. Joint attention is the shared experience of an infant, or child, adult, and a third party (e.g., an object; Moore, 2006). In older infants, joint attention may occur when an infant and adult share the experience of looking at or playing with a toy. To understand joint attention, the infant must understand that the other person is directed toward the world in a way that is independent of his/her own directedness (Kesselring & Muller, 2011). Piaget observed that infants at the start of the sensorimotor stage do not track objects that leave the visual field (Piaget, 1928a). By the end of the sensorimotor stage, the infant who once could only look at the finger an adult used to gesture toward an object can now follow the adult's gesture and also gaze at the object with the adult (Kesselring & Muller, 2011). The research indicates that joint attention emerges around ten-months-old (Moore, 2006).

The processes of assimilation and accommodation are active during the development of joint attention as the infant develops some of his/her first schemata.

The development of object permanence in the later infancy years is characteristic of the sensorimotor stage. Object permanence is the understanding that something exists even when out of sight (Cook & Cook, 2005). Initially, young infants will search for a missing object in the place he/she saw the object last and not in the location where the object disappeared (Kesselring & Muller, 2011). As the child approaches two years of age, he or she will understand that objects and people can exist even when they are not present (Mooney, 2013). Thus, the child will retrieve an entirely hidden object instead of searching where it was last seen (Kesselring & Muller, 2011). Another characteristic of object permanence that develops later in the sensorimotor stage is the understanding that an object is a stable entity despite changes to its appearance (Kesselring & Muller, 2011). For example, a ball is still a ball whether it is small, large, red or blue. Finally, joint attention abilities also explain why children begin to demonstrate signs of separation anxiety around two years of age. At this age, children understand that people exist even when not in view (Mooney, 2013). When the parent of a two-year-old child exits the room, he/she will cry as an attempt to bring his or her parent back into view (Mooney, 2013).

***Implications for Schooling.*** A number of activities can stimulate a child during the sensorimotor stage and promote cognitive growth. For example, babies need to explore the environment by pushing, pulling, touching, and exploring cause-and-effect relationships (Mooney, 2013). The infant develops sensory-motor schemata by manipulating objects in his or her environment (Kohler, 2008). Around six-months-old,

infants demonstrate intentional behaviours because they have developed sensory-motor intelligence (Kohler, 2008). For example, a child may know that if he or she drops an object, it will fall to the floor (Kohler, 2008). Infants at this age are stimulated by adults who talk to them about what is happening in the world around them (Mooney, 2013). It is imperative to provide a learning environment that is safe and allows children to interact with the environment while remaining in proximity to his or her caregiver (Mooney, 2013). By the end of the sensorimotor stage, infants have actions that are coordinated with one another, demonstrate joint attention, and understand object permanence. These newly acquired skills continue to develop in the preoperational stage and are the foundation for more advanced skills (Kesselring & Muller, 2011).

**Preoperational Stage (2-7 years).** The beginning of this stage is marked by the development of a permanent sense of self and objects, along with a primary understanding of symbolic thought. Children in the preoperational stage develop language skills and expand upon schemata to include symbolic representations (Elkind, 1976). Intelligence is no longer a function of direct experience with the environment (Kohler, 2008). However, these children still form ideas from direct experiences in life (Mooney, 2013). They are not capable of connecting with each other's points of view and will instead connect individual attributes or words that they hear to first-hand experiences (Mooney, 2013). Children's preoperational thinking and reasoning behaviours and thoughts are characterized by being egocentric, overgeneralized, and lacking reversibility. The preoperational operational stage is known for the *five-to-seven-shift*. This is the transition between the five-year-old who struggle with conservation tasks (i.e., can

consider only one dimension or attribute of a situation) and the seven-year-old who has the cognitive operations necessary to successfully complete conservation tasks.

Symbolic representation, or symbolic thought, develops between the ages of two and four/five years when the child can represent things that are not directly experienced or tangible using signs and symbols (Kohler, 2008). Symbolic thought is the ability to form mental images or ideas that represent objects or events in the environment (Cook & Cook, 2005). Knowledge of symbolic representation is observed in pretend play, drawing, psychological functions based on mental images (e.g., recall memory), and language (Kesselring & Muller, 2011). The child's schemata grow and are replaced by mental representations, which lead to a faster acting and more cognitively flexible child (Kohler, 2008). The emergence of language around age two years demonstrates an understanding that words are symbolic representations of things in the world. Language allows the child to recall previous outcomes of his/her actions, thereby allowing reflection upon actions (Kohler, 2008). Symbolic play emerges at the same time as language development; however, according to Piaget, the two are independent of each other (Piaget, 1954). Symbolic play (e.g., a child using a piece of cardboard to represent an airplane) is important in the development of the child's understanding of how meaning is attributed to things (Kohler, 2008). The development of language in the preoperational stage also illustrates the egocentric limitation of young children (Kohler, 2008).

The preoperational stage involves a type of thinking that differs substantially from adult thinking because children's cognitions are characterized as egocentric (Singer & Revenson, 1996). That is, children in the preoperational stage are unable to see the world from the point of view of others (Mooney, 2013). Piaget used the term egocentric to

describe the thinking patterns of children across several stages of development, not just the preoperational stage (Kesselring & Muller, 2011). However, specific forms of egocentric thought are present in the preoperational child. A preoperational child will think for him/herself and not recognize that multiple points of view exist (Kesselring & Muller, 2011). Piaget observed that children in this stage are not aware of the importance of arranging sentences into logical order because they think for themselves and do not know how to make one point of view understood by another person (Piaget, 1928b). Furthermore, most children do not provide logical justifications, or answers to the question *why*, when presenting a point of view because they do not see the need to provide evidence or arguments for the other person (Piaget, 1928b). Piaget also noted that, up until five years of age, children often speak aloud to themselves without addressing anyone in particular (Piaget, 1930).

The cognitions of these preoperational children are characterized by the inability to see multiple attributes of a single object or concept (Kesselring & Muller, 2011). For example, a child may observe that Mary is small and John is tall; however he/she may not be able to understand that Mary is smaller than John. Socially, two-year-olds can see that other people have different perspectives, but there is a lack of coordination of these difference perspectives (Kesselring & Muller, 2011). Piaget referred to this inability to focus on more than one attribute *centration* (Cook & Cook, 2005). Four- and five-year-old children discover that objects can belong to simple and concrete classes; however, they struggle to grasp items can belong to more than one class or subclass (Kohler, 2008). From the preoperational phase to the concrete operational stage, a major shift in thinking



occurs as children develop intuitive thought, the foundation for logical thinking (Kohler, 2008).

Intuitive thought is the basis for logical thinking and occurs once children have obtained a substantial amount of knowledge through the environment, but are not aware of how they acquired the knowledge (Kohler, 2008). Intuitive thought is only based on personal experience (Cook & Cook, 2005). Children with intuitive thought appear very curious, ask several questions, and may demonstrate the beginnings of reasoning; however, they will not be able grasp concepts of logical, spatial, or temporal relations until the end of the preoperational stage (Kohler, 2008). Therefore, it is not useful to tackle abstract concepts while children are still in the preoperational stage. Another limitation of the thinking and reasoning skills of children in the preoperational stage is a lack of mental reversibility. Mental reversibility refers to the ability to reverse direction of thought, a skill used for situations such as retracing steps to find a missing object (Mooney, 2013). Reversibility is important for understanding mathematics concepts involving subtraction and addition of numbers. The lack of mental reversibility in this stage helps to explain why preoperational children do not grasp concepts of conservation. For example, a preoperational child would not be able to imagine what would happen if they reversed the action of pouring liquid from one glass to another (Cook & Cook, 2005).

A great deal of Piaget's research with the preoperational stage involves the development of the concept of conservation. Conservation refers to the understanding that some properties of objects remain the same despite visible changes of other properties (Pratoomraj & Johnson, 1966). Preoperational children have the tendency to

believe what they see and often do not have a strong grasp of the qualities of objects such as mass and height (Mooney, 2013). For example, a child with an understanding of conservation would know that the amount of water in a glass remains the same even when the shape of the glass changes. When children develop an understanding for the conservation of matter, they will understand that the amount of matter which an object contains will remain the same, regardless of changes to form, as long as none of the matter is added or taken away (Pratoomraj & Johnson, 1966). Several experiments used conservation tasks to demonstrate the five-to-seven shift in thinking between the preoperational and concrete operational stages. One of Piaget's famous experiments demonstrating preoperational thinking involved a conservation of substances task with two lines of the same amount of coins. One of the lines of coins was spread apart while the other line of coins was placed close together. Preoperational children almost always said that the line with coins spread farther apart had more coins than the other line, whereas concrete operational children recognized that both lines had the same amount of coins (Mooney, 2013). Inhelder and Piaget (1958) stated that children achieve an understanding of the conservation of substances by about age seven, and the conservation of volume by about age 12. Subsequent studies have demonstrated similar results with children who appear to more frequently understand concepts of conservation as age increases; however, it is important to consider individual differences in the amount of conservation knowledge at all ages (Pratoomraj & Johnson, 1966).

***Implications for schooling.*** Children typically start school around four or five years of age, which corresponds to the middle of the preoperational stage. Therefore, careful consideration must be taken when designing academic expectations for children

who are cognitively egocentric by nature until about seven and a half years-old. The thought processes of five-year-olds are usually still focused on direct experiences with the home, family, and friends (Cook & Cook, 2005). As such, appropriate academic expectations should not require these children to perform tasks for which they lack cognitive capacity such as taking the point of view of another person (Elkind, 1976). Piaget suggested that educators should expect children at this stage to use very concrete reasoning and to have less deductive and rigorous thought patterns (Piaget, 1928b). A limitation of this stage is that preoperational children are generally not able to participate in reversible thought (Cook & Cook, 2005). Mental reversibility is imperative for the understanding concepts such as conservation, mathematical operations, and more abstract forms of reasoning (e.g., using a tool such as number line; Elkind, 1976). Academic outcomes should focus on concrete, tangible items and should not require students to engage in any forms of logical operations such as retracing steps, speaking about the future, or mental operations with numbers (Cook & Cook, 2005).

**Concrete Operational Stage (7-12 years).** Children enter the concrete operational stage around the age of seven or eight years of age. At this time, they begin to demonstrate several changes in thought patterns. Piaget (1954) defined the concrete operational stage as the beginning of logical or operational thought. Operations are mental activities that have a symbolic representation, are internalized and integrated with actions, and can be reversed (Kohler, 2008; Cook & Cook, 2005). Children can now consider above and beyond the present to the past and future. With the transition into concrete operations, children's reasoning is no longer solely based on the perception of objects. Children understand that numbers, names, and some objects are symbolic

representations (Singer & Revenson, 1996). The concrete operational stage is characterized by the ability to perform mental operations and attend to two attributes of an object, event, or person at a time (Mooney, 2013). Children in the concrete operational stage are less egocentric than five-year-olds (Siegler & Ellis, 1996). Several other abilities develop during this stage, including ability to conserve substances, mental reversibility, seriation, and spatial and temporal operations. Socially, concrete operational children understand the concept of mutual respect and often form play based on the *golden rule* (i.e., treat others the way you would like to be treated; Siegler & Ellis, 1996). However, children will only be able to perform mental acts with physical, concrete items until they reach formal operations (Kohler, 2008; Singer & Revenson, 1996).

Around seven or eight years of age, children gain the ability to understand concepts of conservation and reversibility. Concrete operational children demonstrate flexible thought and can notice differences between objects in classes (e.g., types of dogs; Mooney 2011). Whereas the reasoning of a five-year-old is still focused on things he or she perceives directly in the environment, the eight-year-old can hold in mind multiple perspectives and form multidimensional representations of problems (Siegler & Ellis, 1996). For example, a child at this age will now be able to retrace his or her steps if he or she forgets something (i.e., reversibility) and perform mental math with natural numbers (e.g.,  $2 + 3 = 5$  and  $3 + 2 = 5$ ; Singer & Revenson, 1996). As stated previously, children in the concrete operational stage are also capable of conserving matter and will complete conservation tasks, such as the coin task described above, correctly.

The five-year-old child has a limited knowledge of numbers and may only be able to number and name up to three objects correctly. The eight-year-old child begins to

demonstrate an understanding of intervals and number concepts through seriation (Elkind, 1976). Seriation is the ability to arrange a series of objects by classification or group (e.g., type of object, length, size, and colour). Five-year-olds struggle to arrange numbers in order when multiple factors are considered (e.g., colour *and* size; Elkind, 1976); however, seven and eight-year-olds grasp that a series of objects can be based on multiple factors such as size or category of object. At the same time, concrete operational children still have difficulty handling large numbers and do not understand irrational and infinite numbers (Kohler, 2008).

Following the cognitive developments made with respect to seriation and natural numbers, children begin to grasp ideas related to spatial and temporal relations. Up until the concrete operational stage, the order of space and the sequence of time are not differentiated from each other (Kohler, 2008). Piaget described a child in the preoperational stage who believed two dolls sitting on a table were closer together when there was an umbrella bridging the gap between them; however, the concrete operational child understood that the space between the two dolls did not change with the addition of an umbrella (Piaget, Inhelder, & Szeminska, 1960). Piaget also compared measuring skills of five-year-olds and eight-year-olds using a short experiment involving a group of children who were provided some short measuring sticks and asked to determine differences in heights of individuals. He observed that five-year-old participants used their hands to compare the two individuals' heights while the eight-year-olds used the measuring sticks to determine both heights and make a judgment (Singer & Revenson, 1996). The concept of time does not usually develop until the end of this stage because time is a two dimensional concept that requires the ability to hold in mind both distance

and duration (Kohler, 2008). The two-dimensional nature of time makes it difficult to illustrate in a concrete manner (Kesselring & Muller, 2011). The concept of time only develops after a child can coordinate the two dimensions of time and understand it as a constant flow (Singer & Revenson, 1996).

With respect to social development, these new cognitive abilities are aligned with the ability to understand mutual respect and different perspectives of social dilemmas (Kesselring & Muller, 2011). Children learn that rules require mutual expectations of all members of a group (Kesselring & Muller, 2011). Piaget's theory of morality places children from seven to 11-years-old in the cooperative phase (Singer & Revenson, 1996). However, Piaget noted some limitations in the cooperation of these children, observing that while a child may engage in the rules of a game while playing with peers, that child may have his or her own individual rules and may not coordinate rules with all players during a game (Singer & Revenson 1996). The ability of concrete operational children to understand and respect different social rules can be attributed in part to new quantitative knowledge and ability to see multiple attributes of the same event or situation (Elkind, 1976). For example, the child can now understand that it is polite to say "thank you" whenever a gift is received in any situation, not just at birthdays (Elkind, 1976).

There are still limitations in the thought processes of concrete operational children despite enormous developments. A concrete operational child cannot reason about abstract concepts (Mooney, 2013). Even at the end of the stage, most children's reasoning is related to direct, concrete experiences (Okun & Sasfy, 1977). It is false to assume that concrete operational children can now comfortably work well with all abstract symbols now that they can solve problems mentally (Elkind, 1976). Although the preoperational

child can now solve some problems mentally, these problems must be tied to materials in addition to symbols (Elkind, 1976). Thus, when problems are presented verbally without a visual or concrete representation, the concrete operational child will have difficulty solving the problem (Elkind, 1976).

***Implications for schooling.*** Academic outcomes for students in the concrete operational stage should not require students to use logical reasoning with materials and experiences that are not concrete (Cook & Cook, 2005). Instead, the focus should be to challenge the child's ability to perform logic, reversibility, conservation, and other operations with concrete items. To foster cognitive development at this age, researchers suggest providing hands-on activities with multiple ways of representing concepts, especially mathematical equations (Burns & Silbey, 2000). It is not reasonable to expect concrete operational children to perform questions of logic without the use of manipulatives.

**Formal Operational Stage (12 years - adulthood).** The ability to reason about the future, abstract concepts, and hypothetical situations is a skill acquired in the formal operational stage (Singer & Revenson, 1996). It is this stage that brings adolescents in close proximity to the thinking and reasoning abilities of adults (Elkind, 1976). Children enter the formal operational stage without the ability to differentiate between levels of hypothesis and fact, but in time, these children begin to engage in deductive reasoning and distinguish between reality and possibility (Kesselring & Muller, 2011). Piaget and his colleague, Barbel Inhelder, a Swiss developmental psychologist, combined the evidence they collected about formal operational reasoning and concluded that the stage is defined by a form of propositional logic that begins around 11-years-old (Kohler,

2008). Propositional logic differs from concrete reasoning because propositional reasoning goes beyond objects themselves to formulated propositions (Kohler, 2008). Formal operations allow adolescents to form hypotheses, hold them in mind, and systematically test them (Elkind, 1976). When adolescents begin to make hypotheses, they often turn into assumptions about the reasoning of other people and become self-conscious (Elkind, 1976). These defining characteristics are accompanied by other skill development such as the ability to reflect on one's own thought processes, personality traits, and to reason through questions of morality (Okun & Sasfy, 1977).

The use of words such as "belief", "intelligence", and "values" emerges in the language of adolescents, reflecting new developments in cognitive ability (Elkind, 1976). Rather than performing mental operations with concrete materials, adolescents are able to perform operations with abstract ideas (Kohler, 2008). They keep a number of items, including abstract items, in mind simultaneously, become detached from direct environmental contexts, and reason about hypothetical situations (Kohler, 2008). These skills are also reflected in adolescents' ability to conceptualize time, space, metaphors, and similes (Elkind, 1976). Moral questions and abstract concepts can be discussed with purpose (Mooney, 2013). Adolescents can engage in deductive reasoning, or generating all possible outcomes and combinations within a logic system (Okun & Sasfy, 1977) and chance is no longer a concept that cannot be explained logically (Kohler, 2008). Inhelder and Piaget (1958) identified the final transformation of thought at the end of the formal operations stage to include reasoning about possibilities that are not just an adjunct to a direct experience or of actions physically performed.



There are still some limitations to the thinking and reasoning of adolescents that are developed in time, such as Inhelder and Piaget's observations of adolescent egocentrism. Adolescents have a tendency to construct ideals that are independent of concrete reality (Okun & Sasfy, 1977). Now that adolescents are able to perform operations with their own thinking and the thinking of others, they become overly concerned with the thinking of others and how it is related to him or herself (Elkind, 1976). A formal operational adolescent will often place great value on his/her own significance (Kesselring & Muller, 2011). Inhelder and Piaget (1958) observed that adolescents may enthusiastically promote a social goal that they deem as important, but not demonstrate behaviours consistent with these goals (Kesselring & Muller, 2011). For example, an adolescent may promote keeping the environment clean and subsequently litter (Kesselring & Muller, 2011).

***Implications for schooling.*** It is imperative to understand adolescent egocentrism when creating academic expectations for students in the formal operational stage. Adolescent egocentrism occurs in unique and specific situations such as when a new existential situation occurs, when they are learning about new cultures, or participating in intercultural communication (Kesselring & Muller, 2011). The reasoning abilities of middle school and high school students are more engaged when academic experiences are integrated with questioning and postulating about significant issues that impact their own lives (Brown, 2006). Abstract reasoning, deductive reasoning, and empirical testing are all possible for formal operational children; however, these skills are developed later on in the formal operational stage. At the beginning of the formal operations stage, adolescents have not mastered the skill of differentiating fact from hypotheses (Muller,

Sokol & Overton, 1999). Academic expectations may need to be modified depending on the age of the student in formal operations.

### **The Impact of Developmentally Appropriate Education on Academic Outcomes**

Providing developmentally appropriate education means to have an understanding of the specific windows of opportunity for learning when the brain's plasticity or adaptability will allow for greater amounts of information to be processed and absorbed (Rushton & Larkin, 2011). For decades, Piagetian theory has been used to create educational programs and curricula that are developmentally appropriate (Metz, 1978). Any form of developmentally appropriate education can be traced back to the Piagetian premise that children are social learners who actively construct meaning and knowledge as a result of interacting with the environment and Piaget's clearly stated cognitive stages that outline the capabilities of children with respect to various thinking and reasoning tasks (Rushton & Larkin, 2001). The positive impact of developmentally appropriate education is also supported by research demonstrating that developmentally appropriate lessons and curriculum expectations advance the cognitive and social development of children in classrooms (e.g., Rushton, Larkin, 2001; Burts et al., 1993; Justice et al., 2009).

Children in grade one DAP classrooms based on NAEYC standards have been found to perform better on standardized testing than students in non-DAP classrooms (Frede & Barnett, 1992). Additionally, when grade one students from low socioeconomic home environments were placed in DAP classrooms, they had higher reading scores than same-aged peers in regular, non-DAP classrooms (Burts et al., 1993). Other research examining children from grade one to grade two indicates that well-selected and

developmentally appropriate book choices allow new readers to learn the necessary conventions of literacy while simultaneously being exposed to the content in the book (Zeece, 2010). Researchers suggest that teachers and curriculum specialists select a variety of texts that are appropriate for each student's age and to optimize cognitive development (Zeece, 2010).

Some studies demonstrate that promoting the cognitive growth of middle school students also requires the use of developmentally appropriate curricula. The majority of middle school (i.e., grades six to nine) curricula in the United States expect students to demonstrate cognitive processes that are beyond their capability (Brown & Caniff, 2007). The type of curricula provided to middle school students can impact students' opportunities to grow and improve cognitive processing (Brown & Caniff, 2007). When students are expected to complete academic tasks outside of the cognitive ability, academic expectations will be difficult to achieve. Unfortunately, the literature examining the long-term effects of developmentally appropriate academic expectations and practices is limited. In particular, very little research exists that examines outcomes for students in grades three to six, and grades nine to twelve. Of the research that does exist, there are few replications, small sample sizes, and most of it is directly funded by the NAEYC, making it difficult to draw unbiased conclusions.

### **The Impact of Developmentally Appropriate Education on Psychosocial Outcomes**

Developmentally appropriate education also leads to positive psychosocial outcomes in young students. A study examining the effects of DAP (according the NAEYC standards) on stress and anxiety levels of kindergarten children found that students in DAP classrooms experienced less stress and anxiety about school in

comparison to same-aged peers in non-DAP classrooms (Burts, Hart, Charlesworth, Kirk, 1990). Kindergarten children also had more positive ratings of school when they were in DAP classrooms compared to students in developmentally inappropriate classrooms (Burt, Hart, Charlesworth, Fleege, Mosley & Thomasson, 1992). A study of developmentally appropriate education also found that the practice positively influences perceived self-competence (Jambunathan, 2010). A study examining these effects involved 72 three- and four-year-old children participating in Head Start programs in the United States indicated a positive correlation between students in DAP classrooms and peer acceptance and cognitive competence (Jambunathan, 2010). As demonstrated by the literature, developmentally appropriate educational practices have an impact on young children's academic outcomes and social-emotional well-being.

### **Nova Scotia's Learning Outcomes Framework**

Nova Scotia's curriculum was recently criticized for not being developmentally appropriate, especially in grade Primary. The current curriculum is based on an OBE framework called *Nova Scotia's Learning Outcomes Framework*. Unfortunately, OBE may not be the most effective educational framework to support developmentally appropriate education. William Spady, developer of OBE, advocates for Transformational OBE, which includes overarching outcomes that will be met by each student as a result of meeting the subject and grade-level outcomes (Spady, 1996). The overarching outcomes are based on the interests of regional or national parties to shape the skillset, attitudes, beliefs or other characteristics of high school graduates. Spady (1996) describes the educational framework as being 'design-back'. In other words, OBE begins with specific learning outcomes students should demonstrate by the end of certain

periods of public education and makes teachers responsible for designing a curriculum to guide students toward the achievement of these outcomes (Spady, 1996). OBE also demands that teachers be accountable for assessing students' demonstration of each learning outcome (Berlach, 2007). The OBE framework gained popularity in the early 1990s in parts of Australia, South Africa, the United States, and other countries where governments pushed for visible evidence of the impact of schools' teachers on student learning. Such demand for accountability has the potential to narrow the scope of the curriculum by bending instruction toward the demonstration of the learning outcomes and taking away from developmentally appropriate practices (Clark & Clark, 2000). Clark and Clark (2000) suggested that any push by the government to hold educators responsible for student performance impacts the type of instruction provided to students. When the focus of instruction is placed on the demonstration of a specific piece of knowledge or a new skill, developmentally appropriate practices will be lost (Clark & Clark, 2000). According to the NAEYC, an OBE framework can only be successful if the outcomes clearly describe what students should know or demonstrate and are aligned with the developmental stages that children experience while remaining consistent with the research on how children develop and learn (NAEYC, 2009). Without an alignment to child development, learning outcomes become unrealistic by either underestimating or overestimating a student's ability (NAEYC, 2009).

The education system in Nova Scotia was under scrutiny for years prior to and after the implementation of the Learning Outcomes Framework. The Learning Outcomes Framework, implemented in the early 1990s, is based on the principles of OBE, an educational framework that has not demonstrated lasting success in other countries.

Student literacy and mathematics scores in Nova Scotia have been declining steadily for three years (Nova Scotia Department of Education and Early Childhood Development, 2014c). The Department of Education and Early Childhood Development in Nova Scotia recently made a movement toward taking responsibility for the low success rates of students. The 2015 *Action Plan* released by the NS Department of Education in April 2015 described several areas that will be targeted in the education system to improve the performance of Nova Scotian students, including a more streamlined and innovative curriculum for grades Primary to grade three and the creation of a growth and development guide for four-year-olds. However, the action plan does not appear to have moved away from the OBE framework and little was mentioned with respect to the developmental appropriateness of the academic expectations within this framework.

### **Current Study**

As noted above, combining best practices in developmental psychology and education may benefit students by promoting the best learning environments for growth. This requires the alignment of best practices in psychology and education to design environments that are appropriate to each group of children's cognitive ability. The current study reviewed a selection of the learning outcomes within Nova Scotia's Learning Outcomes Framework from a Piagetian perspective to evaluate the developmental appropriateness of the learning outcomes and provide recommendations to the Nova Scotia Department of Education and Early Child Development, educators, psychologists, and other professionals, of appropriate expectations for students at each developmental stage.

Table 1

*Piaget's Stages of Cognitive Development*

Stage	Age	Behavioural Characteristics	Major Skills Acquired
Sensorimotor	Birth – 2-years-old	Innate reflex behaviours; exploration through the senses; direct experience with objects	Beginnings of intelligence; sensory-motor schemata; joint attention; object permanence intentional behaviour
Preoperational	2 – 7-years-old	Egocentric thought; overgeneralization; attends to one variable at a time; symbolic play	Language; symbolic representation; sensory-motor schemata internalized; intuitive thought
Concrete Operational	7 – 12-years-old	Thought limited to concrete objects, or people, events; representational thinking; rule following	Mental acts with concrete ideas; conservation; reversibility; seriation; temporal and spatial operations
Formal Operational	12-years-old and older	Conceptual thought; adolescent egocentrism; self-consciousness	Hypothetical, futuristic, and abstract reasoning; propositional logical; operations with operations; moral questions

### **Chapter 3: A Piagetian Perspective on Nova Scotia's Specific Outcomes**

Among several concerns raised by parents, educators, and members of the public, one criticism of Nova Scotia's *Learning Outcomes Framework: Primary – 6* (Department of Education and Early Childhood Development, 2014) is that the outcomes in grade Primary appear to expect children to perform tasks and demonstrate skills that are outside of their cognitive abilities (Report of the Minister's Panel on Education, 2014). Results on provincial standardized tests of literacy and mathematics for public school students have declined since 2012 and Nova Scotian students consistently perform below students in several other provinces (Report of the Minister's Panel on Education, 2014). Research suggests that developmentally appropriate education promotes improved academic and social-emotional outcomes (e.g., Burts et al., 1993; Frede & Barnett, 1992; Jambunathan, 2010). If the specific outcomes in Nova Scotia's *Learning Outcomes Framework: Primary – 6* are developmentally inappropriate, Nova Scotian students may not have the opportunity to perform as well as students in other provinces on standardized tests of literacy and numeracy.

Public school students in Nova Scotia may not be performing as well as expected academically because the current *Learning Outcomes Framework* uses an OBE approach. As noted previously, OBE is an educational framework based on a design-back principle. Several countries have implemented OBE with the aim of improving to improve the quality of education, but these changes have been met with little success. The literature on OBE consists of reviews and critiques by researchers in education and educators who have not been successful in the implementation of OBE. Several of the criticisms of OBE identified in the literature include increased teacher workload, too many outcomes, and developmentally inappropriate outcomes. These criticisms align with concerns raised by



Nova Scotians in the recent survey conducted by the Minister's Panel on Education. As a result of these criticisms, *Nova Scotia's Action Plan for Education 2015* provides recommendations to improve student academic outcomes and address the concerns of Nova Scotians such as identifying the essential learning outcomes in each grade to limit the number of outcomes (Nova Scotia Department of Education and Childhood Development, 2014b). Some of the recommendations aim to support preschool children with meeting developmental milestones; however, the plan does not appear to address developmental appropriateness of learning outcomes after the preschool years, nor does it modify the OBE framework (Nova Scotia Department of Education and Childhood Development, 2014b). Furthermore, the action plan does not address the effectiveness of the OBE framework that underlies the Learning Outcomes Framework. To further examine the developmental appropriateness of Nova Scotia's specific outcomes and the OBE framework, select outcomes from grades Primary, three, and six will be evaluated and compared to Piagetian theory.

## **Method**

### **Specific Outcomes**

The present review examined some of the specific English language arts and mathematics outcomes for grades Primary, three, and six (see Tables 2-4). The specific outcomes were taken from *Learning Outcomes Framework Primary – 6*, a document available online through the Nova Scotia Department of Education and Early Childhood Development (2014a). Specific outcomes were included in the study if they appeared to be important for achieving the key-stage or general outcome for each subject. Grade Primary specific outcomes were examined because the outcomes were identified by

respondents of the survey by the Report of the Minister's Panel on Education (2014) to be potentially developmentally inappropriate. The outcomes from grades three and six were a part of the examination to compare academic expectations for children at the beginning and the end of Piaget's concrete operational stage. In addition, Nova Scotia's provincial standardized testing occurs with students in grade three. Specific outcomes from secondary grades were omitted from the current study due to the limited amount of research on developmentally appropriate curriculum practices in secondary education and to ensure that the scope of the project was manageable. The specific outcomes were taken from the subject areas of English language arts (ELA) and mathematics because these areas are where students appear not to be meeting academic expectations based on results of provincial standardized testing.

### **Procedure**

In light of the previous discussion of Piagetian theory, the developmental appropriateness of the specific outcomes was evaluated using a Piagetian framework. Furthermore, the specific outcomes were assessed with respect to their practicality for implementation within an OBE framework. Recommendations were formulated for educators and school psychologists using knowledge of child cognitive development and OBE to provide suggestions for improving student academic outcomes in Nova Scotia.

### **Results**

For the purpose of this examination, the specific outcomes will be presented by grade. Within each grade, the developmental appropriateness of the specific outcomes will be discussed for ELA and mathematics (see Table 5). Specific outcomes will be

referred to by their given number as designated in *Nova Scotia Learning Framework Primary – 6*.

### **Developmental Appropriateness**

**Grade primary specific outcomes.** Students enter grade Primary when they are four or five-years-old, which corresponds to Piaget’s preoperational stage. The thinking and reasoning skills of children in the preoperational stage are characterized by egocentrism and are generally limited to attending to one attribute of a situation or object at a time. Children in grade Primary have thinking and reasoning skills that are related to direct, personal experiences. Most tasks of conservation and mathematical concepts will be difficult for children to grasp at this age because they are incapable of reversible thought. The Grade Primary specific outcomes were identified in the Report of the Minister’s Panel on Education (2014) as possibly developmentally inappropriate.

***English language arts.*** There are 33 specific outcomes for grade Primary ELA.

*Specific outcome 9.2: Students in grade Primary are required to demonstrate a beginning awareness of audience and purpose* (Nova Scotia Department of Education and Early Childhood Development, 2014a). It is clear from Piagetian theory that children in the preoperational stage are incapable of tasks that require them to attend to more than one attribute of a situation at once. Recognizing the point of view of the audience requires the understanding that the creator of a work, such as an author, artist or presenter, has a different perspective on the same piece of work than the readers, listeners or viewers. This requires the balancing the perspective of the author and the reader at the same time. Understanding purpose also requires having an understanding of another person’s point of view. During the preoperational stage, children are limited to thinking

about one attribute of a situation at a time. Therefore, it is unlikely that students in grade Primary are capable of demonstrating a beginning awareness of audience or purpose.

In addition to being developmentally inappropriate, this specific outcome appears difficult to assess. Teachers are required to assess the performance of each student on every specific outcome. In this case, grade Primary teachers are required to assess the ability of each student to demonstrate a beginning awareness of audience and purpose. Not only is this specific outcome difficult to assess, teachers would most likely need to ask question that are beyond the developmental capabilities of their students (i.e., not concrete).

*Specific outcome 9.3: Students are required to begin to consider the comments and questions of peers regarding their own work.* Based on Piagetian theory, students in grade Primary will struggle to consider the thoughts and perspectives of others. Piaget (1939) wrote that the thinking and reasoning skills of preoperational children is purely individualistic thinking. Egocentrism (i.e., the inability to see the point of view of others) is one of the primary characteristics of preoperational thought (Kesselring & Muller, 2011). As a result, preoperational thinking is limited to direct experiences with the environment. Students at this age are not able to consider the perspective of others and thus will have difficulty meeting any expectation to consider the questions/comments of readers/listeners/viewers.

*Specific outcome 10.1: Students in grade Primary are also required to begin to develop strategies for prewriting, drafting, revising, editing, and presenting.* The *Learning Outcomes Framework Primary-6* (2014) indicates that this outcome refers to using drawing and talking to rehearse for writing, drafting by getting ideas on paper

regardless of spelling errors, discussing with peers, beginning to use simple revision strategies (e.g., adding on), using simple editing strategies, and sharing writing and other representations in multiple different ways. This outcome expects students to learn editing and revision strategies and apply them to their own writing.

Grade Primary students will require explicit instruction to grasp the editing and revision processes. For the purposes of evaluating the developmental appropriateness of specific outcome 10.1, this discussion will assume that editing and revising skills are explicitly taught and demonstrated to students. However, even with explicit and direct instruction, it is likely that students will struggle to begin to use such strategies independently. Revising requires the ability to hold multiple attributes of writing in mind at once. For example, one must think about the word that one is trying to spell, the sounds in the word, the meaning of the word, grammatical rules (e.g., periods and capitals), and the meaning of the piece of writing (i.e., the purpose). This is a skill that develops in the concrete operational stage of reasoning. Students are typically close to six-years-old by the end of grade Primary and only some will have entered the concrete operational stage. However, at the end of the preoperational stage, symbolic thought grows and children are able to use past experiences to tackle present and future obstacles (Elkind, 1976). Some students who have approached this level of reasoning may use past errors in spelling or writing as an editing strategy.

Another issue with expecting students to engage in the drafting and revising process is that the students likely cannot grasp the purpose or reason for prewriting, drafting, revising or editing due to their egocentric reasoning. Elkind (1976) explains that the preoperational child has difficulty learning rules and applying those rule patterns to

different situations. Thus, even if a student in grade Primary is able to master a revising or editing rule (e.g., adding more on to a sentence or paragraph), the student may not be able to apply this strategy in multiple settings.

**Mathematics.** There are 10 specific outcomes for grade Primary mathematics. The mathematics outcomes are composed of specific outcomes and *performance indicators* which provide additional specification regarding what students need to demonstrate in order to achieve each specific outcome. There are 29 performance indicators for grade Primary mathematics.

*Specific outcome N06: Students will be expected to describe and apply mental mathematics strategies for adding two 2-digit numerals.* This specific outcome for the number sense section of the curriculum has three performance indicators. In summary, the outcome requires grade Primary students to demonstrate that counting a set of 10 objects remains the same when counted in a different order or when the objects are rearranged. The performance indicators specify that when counting to 10 from different start places, the objects will remain in a fixed position. Furthermore, the objects do not change in volume, size or any other physical characteristic.

A limitation of students in the preoperational stage is that they cannot conserve the size or amount of matter (Cook & Cook, 2005). Students do not require an understanding of conservation to achieve this specific outcome because they are simply counting objects. There is also no demand on the student to hold in mind multiple attributes of the objects because the objects themselves remain the same, despite being counted in different orders. Another limitation of preoperational students is that they are not able to perform mental tasks of reversibility (Mooney, 2013). To achieve this specific

outcome, students would need to have some reversibility skills because they need to understand that counting to ten is the same no matter which way the objects are reversed; however, reversibility is not the only factor that contributes to performing this task and with practice, preoperational students could learn the pattern of counting to ten. The academic expectation that students demonstrate an understanding of counting to 10 appears to align with Piagetian theory.

*Specific outcome M01: Students will be expected to use direct comparison to compare two objects based on a single attribute, such as length, mass, volume, and capacity.* This is the only specific outcome for the measurement section of the curriculum. There are four performance indicators for this outcome, which describes different types of comparisons that students in grade Primary are expected to demonstrate. Students are required to use descriptive terms (e.g., shorter, longer, lighter, heavier, holds less, holds more) to compare length, mass, capacity, and volume.

The research is clear that preoperational children are not capable of conservation and often cannot grasp concepts of the qualities of objects such as mass and height (Mooney, 2013). A simple comparison such as that described by performance indicator M01.01 (i.e., students must compare the length of two objects and explain the comparison with words such as shorter, longer, taller or almost the same) may be possible for some students because it does not involve the conservation of matter. However, preoperational children struggle with ordering objects in a series (i.e., seriation) based on an attribute of the objects such as length (Singer & Revenson, 1996). Therefore not all students should be expected to easily achieve this outcome.

The performance indicators that require students to compare mass, capacity, and volume are more unrealistic for children in the preoperational stage. Comparing the mass, capacity or volume of two substances or objects requires the ability to hold in mind qualities of two objects to compare them. Without a strong grasp of the qualities of objects, students will need one-on-one support to achieve this outcome because they may not have the reasoning abilities to complete the task independently. If a student in grade Primary cannot demonstrate this specific outcome, it may be due to preoperational thinking and reasoning skills that will develop as they build more knowledge through experience with the environment.

*Specific outcome G02: Students will be expected to build and describe 3-D objects.* In geometry, students are required to use building blocks to build 3-D objects from a model and describe the 3-D object using words such as *big, little, round, like a box or like a can*. This specific outcome will be discussed in terms of the two expectations it requires from students: (1) to build the 3-D object and (2) to describe the 3-D object.

Piaget used the term *centering* to describe the trend of focusing on one attribute of a situation and ignoring the rest (Singer & Revenson, 1996). Preoperational children often confuse geometric shapes (e.g., triangles, squares, and rectangles) because they can only attend to one attribute of the shape at a time (e.g., does the shape have corners/angles). Older children with more developed cognitive abilities can examine shapes for their angles, number of sides, length of sides, and symmetry of sides. When recreating a three dimensional shape with blocks, students will have difficulty attending to the multiple attributes of the shape because they do not have the reasoning skills to



support them. Another type of egocentric thought, *spatial egocentrism*, is also a hallmark of preoperational thinking. Preoperational children have difficulty comparing and contrasting different perspectives of the same object (Singer & Revenson, 1996). Spatial egocentrism does not appear to disappear until well into the concrete operational stage around nine-years-old. As a result, viewing the different perspectives of a 3-D shape and recreating the shape may be very difficult for grade Primary students.

The performance indicator stating that children should be able to describe 3-D shapes with the terms big, little, round, like a box or like a can, appears appropriate for children in grade Primary. These descriptor words do not require comparison of multiple attributes within or between objects. Spatial egocentrism will not inhibit students from using descriptive words to describe one physical characteristic of a 3-D shape.

**Grade three specific outcomes.** Students enter grade three when they are seven- to eight-years-old, corresponding to Piaget's concrete operational stage. The concrete operational stage is the beginning of logical or operational thought (Piaget, 1954). Thinking and reasoning skills are no longer based entirely on perceptions of objects. Children can also perform tasks of conservation and attend to more than one attribute of a situation at a time (Mooney, 2013). Concrete operations are still limited to mental acts with physical and concrete items until children reach the formal operations stage (Kohler, 2008). Grade three is the first year students participate in provincial standardized testing.

***English language arts.*** There are 33 specific outcomes for grade three ELA.

*Specific outcome 1.4: Students in grade three are required to listen critically to the ideas and opinions of others.* This academic expectation may be challenging for grade three students. Thinking and reasoning skills in the concrete operational stage are limited

to operations with physical, concrete items (Kohler, 2008; Singer & Revenson, 1996). Students will struggle to reason about ideas in the future, hypothetical situations, and possibilities until the formal operational stage (Singer & Revenson, 1996). As previously stated, specific outcomes for students in the concrete operational stage should not expect students to demonstrate logical reasoning with materials and experiences that are not concrete. Listening critically to the ideas and opinions of others entails an experience that is somewhat abstract. This skill requires managing both one's own opinion and the opinion of another person and then contrasting them. Opinions could vary greatly and are not necessarily confined to abstract concepts. Opinions could be simple and related to direct experiences or concrete items, in which case, grade three students might be able to respond to the opinions and comments to others. However, it requires more reasoning skills to critically consider the opinions of others than to state an opinion. Given its focus on abstract processes, this specific outcome does not align well with Piagetian theory.

*Specific outcome 4.5: Describe their own reading and viewing processes and strategies.* This specific outcome expects students to think and reason about the processes and strategies they use to read and view literature, information, media, and visual texts. Piagetian theory suggests that reasoning about one's own thinking processes is outside the realm of the concrete operational phase. The knowledge of one's own thinking processes and the ability to reflect upon those processes is referred to in the literature as metacognition (Weil et al., 2013). In accordance with Piagetian theory, Weil and colleagues (2013) suggest that the ability to use metacognitive strategies does not fully develop until adolescent years. Other research indicates that only some of the foundational skills for metacognitive strategies are developed in early and late childhood

(e.g., improvements in estimation memory; Ghetti, Castelli, & Lyons, 2010; Karably & Zabrucky, 2009). Students in grade three range from seven- to nine-years-old throughout the school year. Even by the end of the school year when most students are either eight- or nine-years-old, tasks of metacognition will be a difficult to grasp because the ability to reason with abstract ideas does not develop until the formal operational stage.

*Specific outcome 10.3: Demonstrate engagement with the creation of pieces of writing and other representation.* This specific outcome cannot be understood without considering the three sub points that describe what students need to demonstrate to achieve the specific outcome. Students must engage in the writing process for prolonged periods of time, be willing to revise and edit work for an audience, and demonstrate pride and ownership in writing/representing. These expectations are not defined or operationalized. The definition of “sustained period of time” is unclear, making it difficult to judge whether this expectation is appropriate for a student in grade three.

In terms of the developmental appropriateness, revising and editing of work is a reasonable expectation, assuming that revising and editing skills have been pre-taught and that students have concrete materials for support. The research is clear that children in the concrete operational stage can now think beyond the present into the future and past and are capable of understanding the point of view of others, which is imperative for understanding the purpose of revising and editing for an audience (Siegler & Ellis, 1996; Singer & Revenson, 1996). This specific outcome is unclear with respect to how students should demonstrate pride and ownership, as there is no clear definition of what these terms mean. This also presents a challenge for teachers who are required to assess this specific outcome. Without proper definitions and clear language, it is difficult for

teachers to assess *engagement* with writing and other representations. Given that this outcome is rather ambiguous and not well defined or operationalized, it is difficult to compare to a Piagetian framework.

***Mathematics.*** There are 25 specific outcomes and 149 performance indicators for grade three mathematics.

*Specific outcome N06: Students will be expected to describe and apply mental mathematics strategies for adding two 2-digit numerals.* The performance indicators for this specific outcome identify several mathematics strategies that students must be able to perform mentally (e.g., “quick addition, adding on, make ten, addition on the hundred chart”; Nova Scotia Department of Education and Early Childhood Development, 2014a, p.100). To perform the mathematics strategies mentally, it is imperative that students received proper instruction of foundational skills such as the memorization of math facts along with lots of practice with concrete materials so that they become proficient and automatic when completing basic operations. Students must be able to perform the same strategies with pencil and paper before they can perform them mentally.

Children in the concrete operational stage have flexible thinking, which means that they can perform acts of reversibility, conservation, and hold multiple perspectives in mind (Kohler, 2008). According to Piagetian theory, concrete operational students will have the ability to meet specific outcomes that require them to perform mental math with natural numbers (Singer & Revenson, 1996); however, mental math problems must be tied to materials or symbols (Elkind, 1976). In addition, concrete operational children are not capable of mentally solving problems presented verbally without a concrete or visual support (Elkind, 1976). The *Learning Outcomes Framework: Primary – 6* (2014) does

not include any specific outcomes that expect students to learn the paper and pencil strategies for performing and explaining 2-digit addition before expecting students to perform mental math. Reviewing the grade two outcomes briefly, there did not appear to be any outcomes expecting students to demonstrate the same strategies via paper and pencil or to demonstrate proficiency with basic math facts. Without explicit instruction of the building blocks of mental math, students will be unable to meet this specific outcome.

*Specific outcome N08: Students will be expected to apply estimation strategies to predict sums and differences of 1-, 2-, and 3-digit numerals in a problem-solving context.* Students in grade three are also expected to use estimation strategies to predict sums in the number sense area of curriculum. Similar to specific outcome N06, this outcome expects students to perform a skill of which they are capable (i.e., estimation), given they have received prior explicit instruction on the strategy. Estimation does not use concrete ideas or materials and requires mental math. According to Piaget, students in the concrete operational stage should be capable of mental math; however, without proper instruction with concrete materials, students will struggle to make the transition from mental math to estimation (Elkind, 1976). The thinking and reasoning of students in the concrete operational phase is limited because they cannot perform operations related to abstract and hypothetical ideas (Okun & Sasfy, 1977). The requirement to demonstrate estimation with word problems does not consider this limitation. It may be difficult for some students to perform estimation tasks without the use of concrete materials or paper and pencil.

*Specific outcome N09: Students will be expected to demonstrate an understanding of addition and subtraction of numbers (limited to 1-, 2-, and 3-digit numerals) with*

*answers to 1000*. The present discussion will focus on the first sub-point of this specific outcome listed immediately after and before the performance indicators. The sub point states that students will *use personal strategies for adding and subtracting with and without the support of manipulatives*.

As stated above, Piagetian theory emphasizes the need for concrete materials to support the thinking and reasoning skills of concrete operational children as they are not capable of abstract reasoning. The research is in agreement with Piagetian theory and suggests that using manipulatives leads to better performance in mathematics compared to abstract teaching methods (Carbonneau, Marley, & Selig, 2013) This specific outcome is developmentally appropriate if students are permitted to use paper and pencil supports when performing addition with answers to 100.

The use of personal strategies to perform problems of number sense has little value without a proper foundation in mathematics and practice with basic math facts. Personal strategies may develop only after students have received the proper foundations in math instruction. The curriculum documents are not clear on how the foundations of mathematics are taught to students. Structuring the discovery process to guide students toward developing personal strategies may be helpful if students have a solid foundation in basic math facts; however, allowing students to independently discover personal strategies for addition and subtraction through discovery-based learning is not supported by the literature (e.g., Alferi, Brooks, Aldrich, & Tenenbaum, 2010). From a Piagetian standpoint, it may be possible for students to develop their own personal strategies for addition and subtraction because they have more flexible thought and can attend to more than one idea at once; however, they would benefit more from using explicit and concrete

materials to develop these strategies (Mooney, 2013). Furthermore, most students in grade three are not yet capable of reasoning about their own thinking (Okun & Sasfy, 1977).

**Grade six specific outcomes.** Students enter grade six at 10- or 11-years-old, near the end of Piaget's concrete operational stage and the beginning of the formal operational stage. It is important to consider that, although some grade six students may reach the formal operational stage (i.e., 12-years-old), students will not have fully developed formal operational thought by the time they finish grade six. Students in grade six have well-developed concrete reasoning skills and will meet all expectations suited for the concrete operational stage and some expectations suited for the formal operational stage. Thus, specific outcomes need to be appropriate for both stages of reasoning.

***English language arts.*** There are 34 specific outcomes for grade six ELA

*Specific outcome 3.2: Detect examples of prejudice, stereotyping, or bias in oral language; recognize their negative effect on individuals and cultures; and attempt to use bias-free language.* This is an academic expectation that many people, even adults, may find difficult. Most children in the concrete operational stage are only capable of reasoning about direct and concrete experiences (Okun & Sasfy, 1977). Piagetian theory would seem to suggest that identifying examples of prejudice, stereotyping or bias in oral language requires immense support from educators for students in the concrete operational stage. The meaning of concepts such as prejudice and bias are difficult for students to grasp if they do not have the ability to reason about abstract concepts. Students who have reached the formal operational stage have further developed abstract reasoning skills, which may act as an advantage (Inhelder & Piaget, 1958). Students with

formal operational thought may be somewhat capable of understanding and identifying bias and prejudice, but will still require support as they are only at the beginnings of the formal operational stage.

To identify prejudice and bias in one's own language requires a level of self-awareness that is likely very difficult for students in the concrete operational stage. Additionally, 11-year-olds who are approaching the formal operational stage may begin to demonstrate forms of egocentric thought which could make it even more difficult to use bias-free language. Later in the formal operational stage, children develop the ability to reflect on thought processes and discuss topics of morality (Okun & Sasfy, 1977).

*Specific outcome 4.5: Reflect on and discuss their own processes and strategies in reading and viewing.* This is another specific outcome for which students must have the required metacognitive skills if they are to meet the expectation. As stated above, the ability to reflect upon one's own thought processes does not develop until later in the formal operational stage (Okun & Sasfy, 1977). However, it is not clear from the specific outcome whether students are required to reflect on personal processes and strategies (i.e., their own thinking and reasoning) or on strategies or processes for reading and viewing that they have been taught.

If students are required to consider their own personal strategies/processes, discuss the strategies/processes out loud, and reflect on them, this requires metacognitive skills that likely have not developed for some students in grade six. As stated earlier, not all children in grade six will have reached the formal operational stage. The students who have reached the formal operational stage might be capable of reflecting on their own thinking processes because they are better able to keep a number of abstract thoughts in



mind at once and reason about ideas that are not directly attached to their environmental contexts (Kohler, 2008). It is also important to note that the research shows that cognitive developments made with respect to performing abstract reasoning with possibilities and propositions occurs near the end of the formal operational stage (Inhelder & Piaget, 1958). The divide between concrete and formal operational students in grade six will impact how the students meet the specific outcomes. It is important for teachers to be aware of this distinction when assessing the outcomes and to accommodate and modify the curriculum to suit the needs of concrete operational thinkers in the classroom. As a whole, this specific outcome is not developmentally appropriate for all students in grade six.

*Specific outcome 8.2: Students in grade six are expected to select and use the appropriate note-making strategy.* The only other time that “note-making” is referenced in the *Learning Outcomes Framework: Primary – 6* (2014) is in grade five where students are expected to expand their repertoire of note-making strategies. There is no indication in the specific outcomes that students were required to learn the basics of note-making strategies. Direct instruction of the note-making strategies must have taken place in order for students to be able to independently select the correct strategy.

As stated above, students in grade six will be most likely be split between concrete and formal operational thinkers, yet both of these groups of students will struggle with abstract reasoning which develops well into the formal operational stage (Inhelder & Piaget, 1958). This specific outcome does not require students to perform operations with abstract ideas and thoughts. If the assumption is made that students received explicit instruction and practice with the basics of writing and note-making

strategies, the concrete nature of this specific outcome is developmentally appropriate for grade six students.

***Mathematics.*** There are 33 specific outcomes for grade six mathematics.

*Specific outcome B5: Add and subtract simple fractions using models.* Although “models” is not operationally defined, using any type of model, whether pictorial or numerical, is a developmentally appropriate way to approach fractions with students in the concrete and early formal operational stages. These students are only beginning to be able to reason with multiple abstract concepts in mind at once and students in the concrete operational stage may still not be capable of performing mental math without a concrete representation (Elkind, 1976). Providing models will limit the amount of stress on students’ abstract reasoning skills because they will have concrete materials to support them. This outcome is developmentally appropriate for students in grade six who do not have fully developed abstract reasoning skills in both the concrete and formal operational stages.

*Specific outcome B10: Students in grade six are expected to divide numbers by 0.1, 0.001, and 0.001 mentally.* Elkind (1976) specifically writes that, according to Piagetian theory, concrete operational students will not be able to perform mental math if problem are provided without a concrete representation. Formal operational students have developed abstract reasoning skills and may find problems of mental math easier because they are capable of propositional logic and can form hypotheses to check their answers (Elkind, 1976). If students are explicitly taught the division rules for these numbers and provided time to practice the problems with concrete materials, most students will be able to perform these mental math problems by the end of grade six. However, it is

unreasonable to not allow students who are struggling with mental math to use concrete or visual materials to assist in these types of problems even if some students with formal operational thinking skills are capable of these mental math problems. Not all children in grade six will have fully achieved the ability to rely primarily on mental operations without a visual reference. This specific outcome is developmentally appropriate as long as teachers are able to support and accommodate for concrete thinkers.

*Specific outcome E10: Predict and represent the result of combining transformations.* Predicting the result of combining transformations of 2-D and 3-D figures requires abstract reasoning. Students must be able to visualize the shapes and how they will change under a transformation. Again, due to the underdeveloped abstract reasoning abilities of concrete operational students (Okun & Sasfy, 1976), predicting the result of transformations may be a developmentally inappropriate task for some students in grade six who have not reached the formal operational stage. Students with formal operational reasoning skills will likely be able to meet this specific outcome because they are more capable of performing operations with abstract ideas than students in the concrete operational stage of development (Kohler, 2008). Students in the formal operational stage are more detached from the direct environment and can reason hypothetically (Kohler, 2008). Therefore, this academic expectation is developmentally appropriate for students in the formal operational stage, but students still in the concrete operational stage would require concrete materials or manipulatives to support the prediction of the combining transformation.

*Grade Primary Specific Outcomes*

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Subject	Specific Outcome
English Language Arts	9.2 Demonstrate a beginning awareness of audience and purpose
	9.3 Begin to consider readers'/listeners'/viewers' questions/comments about their work
	10.1 Begin to develop strategies for prewriting, drafting, revising, editing, and Presenting
Mathematics	N06 Students will be expected to demonstrate an understanding of counting to 10
	M01 Students will be expected to use direct comparison to compare two objects based on a single attribute, such as length, mass, volume, and capacity
	G02 Students will be expected to build and describe 3-D objects

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Nova Scotia Department of Education and Early Childhood Development, 2014a

Table 3

*Grade Three Specific Outcomes*

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Subject	Specific Outcome
English Language Arts	1.4 Listen critically to others' ideas and opinions
	4.5 Describe their own reading and viewing processes and strategies
	10.3 Demonstrate engagement with the creation of pieces of writing and other representation - engage in writing/representing activities for sustained periods of time - work willingly on revising and editing for an audience - demonstrate pride and sense of ownership in writing/representing efforts
Mathematics	N06 Students will be expected to describe and apply mental mathematics strategies for adding two 2-digit numerals
	N08 Students will be expected to apply estimation strategies to predict sums and differences of 1-, 2-, and 3-digit numerals in a problem-solving context.
	N09 Students will be expected to demonstrate an understanding of addition and subtraction of numbers (limited to 1-, 2-, and 3-digit numerals) with answers to 1000 by - using personal strategies for adding and subtracting with and without the support of manipulatives

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Nova Scotia Department of Education and Early Childhood Development, 2014a

Table 4

*Grade Six Specific Outcomes*

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Subject	Specific Outcome
English Language Arts	3.2 Detect examples of prejudice, stereotyping, or bias in oral language; recognize their negative effect on individuals and cultures; and attempt to use bias-free language
	4.5 Reflect on and discuss their own processes and strategies in reading and viewing
	8.2 Select appropriate note-making strategies from a growing repertoire
Mathematics	B5 Add and subtract simple fractions using models
	B10 Divide numbers by 0.1, 0.01, and 0.001 mentally
	E10 Predict and represent the result of combining transformations

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Nova Scotia Department of Education and Early Childhood Development, 2014a

Table 5

*Specific Outcomes Compared to a Piagetian Framework*

Grade	Subject	Specific Outcome		
		Developmentally Appropriate	Developmentally Inappropriate	Ambiguous
Primary	English Language Arts		9.2	
			9.3	
			10.1	
	Mathematics	N06	M01	
		G02	G02	
Three	English Language Arts		1.4	
			4.5	
				10.3
	Mathematics			N06
		N08	N09	
Six	English Language Arts		3.2	
			4.5	
		8.2		
	Mathematics	B5	B10	
			E10	

## **Chapter 4: Discussion and Recommendations**

Nova Scotia's Department of Education and Early Childhood Development is currently making changes to the public education system following declining student achievement scores in literacy and mathematics, along with years of criticism from both the public and academics in the field of education of the Learning Outcomes Framework. The new action plan, which is scheduled to be implemented in September 2015, contains several strategies for improving education and addressing the concerns raised by members of the public in Nova Scotia as identified in the Minister's Panel on Education survey. The current study aimed to address several of the problems currently facing teachers and students by exploring the OBE structure that underlies the Learning Outcomes Framework and examining the specific outcomes within the OBE framework to determine if they are properly aligned with child cognitive development.

### **Recommendations for Educators**

**Developmental appropriateness of the specific outcomes.** As stated above, the literature is clear that developmentally appropriate education is necessary to promote student learning. The current review of select specific outcomes in ELA and mathematics revealed variability in developmental appropriateness when these outcomes were considered in the context of Piaget's theory of cognitive development. Some specific outcomes from each grade expected students to demonstrate skills that were too advanced for their cognitive abilities. A few of the outcomes were developmentally appropriate for the average stage of cognitive development of the students; however, they often did not take into account that some students at a particular grade level may not have reached the average stage of cognitive development for their age. For example, students in grade six



may be in either the concrete operational stage or the formal operational stage. The ELA specific outcome 4.5 requires students to reason about and discuss their own reading and viewing strategies. This particular example of a specific outcome demonstrates how the academic expectation may be appropriate for students who have reached the formal operational stage, but not for those who are still in the concrete operational stage.

Unfortunately, several of the outcomes used ambiguous language that was not well defined, making it difficult to determine whether the expectations were appropriate. At times, assumptions about previous explicit instruction of certain skills and strategies that students were expected to demonstrate were necessary to evaluate the developmental appropriateness of the outcomes. There was no clear indication in the Learning Outcomes Framework regarding when students are taught the building blocks of certain skills (e.g., addition or multiplication) before the specific outcomes demand that students perform the skill.

In the 2014 survey by the Minister's Panel on Education, Nova Scotians expressed concern that several of the grade Primary specific outcomes were developmentally inappropriate. Nova Scotians were correct. The majority of the grade Primary outcomes reviewed were developmentally appropriate for students in the preoperational stage. When the outcomes were considered inappropriate, there were expectations that involved concrete operational skills that are not available to students in Primary. It is recommended that the limited thinking and reasoning skills of preoperational students be considered when the grade Primary specific outcomes are reviewed. These students are not capable of considering multiple attributes at once, reversible thought or conservation. Specific outcome N06 was developmentally appropriate for students in grade Primary

because it did not demand the student hold in mind multiple ideas or attributes. It would be useful to consider refining the specific outcomes in grade Primary to encompass academic expectations that are attainable for preoperational thinkers while also building thinking and reasoning skills.

Specific outcomes in grade three were more challenging to compare to a Piagetian framework because of their ambiguity. Specifically, there appeared to be some subjectivity in the interpretation of the outcomes. For several of these outcomes (e.g., grade three ELA specific outcome 10.3, grade three mathematics specific outcome N06, N08, and N09, grade six ELA specific outcome 8.2, and grade six mathematics specific outcome B10), it was not clear whether the student had been taught the appropriate strategies to demonstrate the academic expectation. To fully improve the developmental appropriateness of the specific outcomes, it would be useful to clarify and operationally define ambiguous outcomes. It is also not clear from the specific outcomes how the students are supported. In other words, accommodations need to be provided for some students who have not reached the appropriate stage of development to achieve the specific outcomes.

In reviewing the grade six outcomes, it was necessary to consider that some students may still be in the concrete operational stage whereas others may have reached the formal operational stage. More of the ELA specific outcomes appeared to be developmentally inappropriate compared to the mathematics outcomes. When considering the concrete operational minds of some children in grade six, expectations that involve hypothesizing, reflecting on thought processes or other forms of metacognition are not developmentally appropriate. As previously stated, these skills are

acquired in the formal operational stage. In contrast, when the specific outcomes involved abstract reasoning with the use of models or concrete items, the expectations were likely attainable by both concrete and formal operational students. To fully improve the developmental appropriateness of the specific outcomes, several of the specific outcomes would benefit from clarification and operational definitions. Educators would benefit from awareness of the stages of reasoning and cognitive development in their students to provide appropriate instruction. Finally, students have not reached a specific stage of cognitive reasoning will likely benefit from support and/or accommodation to assist them in meeting outcomes.

**Clarity of the Outcomes.** The specific outcomes within Learning Outcomes Framework documents use ambiguous language that is not clearly defined. Defining OBE as an educational framework is a difficult task without the added difficulty of interpreting the educational documents. The term *critically* is used 30 times in the *Primary – 6* specific outcomes document with no operational definition. Other ambiguous language in the Learning Outcomes Framework (e.g., *writing/representing efforts, demonstrate engagement, and demonstrate a beginning awareness*) is subjective in nature and may be interpreted differently by each reader (Nova Scotia Department of Education and Early Childhood Development, 2014a). Ambiguity in specific learning outcomes was identified in the literature as a problem in the implementation of OBE in other public education systems. Berlach (2004) noted that the use of jargon in OBE curriculum documents can appear on first glance as substance and quality; however, jargoned language obscures rather than clarifies the readers' understanding. Similar to Nova Scotia, during the short implementation of OBE in South Africa, curriculum documents were plagued with

ambiguous language and often included excessive explanations (Allais, 2012).

Academics in South Africa postulated that OBE was abandoned in the country due to the ambiguity of the curriculum documents and easily misinterpreted specific outcomes (Allais, 2012).

There are two main problems for teachers when the specific outcomes or other OBE documents use ambiguous language. The first problem is that teachers are likely to interpret the specific outcomes or academic expectations differently. As a result, teachers design the curriculum to suit a specific interpretation of the OBE documents. This may lead students across the province to experience different curricula or learning different skills to meet specific outcomes. The second problem with unclear specific outcomes is that it becomes challenging for teachers to know how to assess students. An important factor of OBE is that teachers must assess all specific outcomes to provide evidence that each student can demonstrate the outcomes. If the specific outcome uses terms that are not clearly defined (e.g., *demonstrates engagement*; Nova Scotia Department of Education and Early Childhood Development, 2014a), the teacher may struggle to determine how to objectively assess students or provide students the opportunity to demonstrate the specific outcome. Moreover, students may be assessed in different ways depending on the teacher's interpretation of the specific outcome.

The clarity of the specific outcomes is not a concern that was addressed by the Department of Education and Early Childhood Development in the 2015 action plan, yet led to negative outcomes for teachers in other countries where OBE was implemented. Ambiguous outcomes may result in different interpretations by teachers, thereby changing the way that curriculum is designed. Within the Public School Programs (2014)

document, Foundation documents, and parts of the Learning Outcomes Framework documents there are some definitions to aid educators in applying the Atlantic Canada Framework for Essential Graduation Learnings. For example, the different documents are explained and there are definitions of each type of learning outcome. Still, there are no definitions to clarify terms used in the specific outcomes. To improve the clarity of Nova Scotia's OBE framework, it is recommended that any unclear terminology within Nova Scotia's Learning Outcomes Framework documents, including ambiguous specific outcomes, be operationally defined. Accordingly, student learning will be more consistent across the province and teacher interpretation of the specific outcomes will be less subjective.

**Teacher workload.** In addition to ambiguous outcomes, the Learning Outcomes Framework consists of a large number of specific outcomes along with sub-points to explain what students are expected to demonstrate for each outcome. For example, in grade Primary, there are five specific outcomes that correspond with General Curriculum Outcome 10 (i.e., 10.1, 10.2, 10.3, 10.4, and 10.5). Each of the five specific outcomes also includes two to nine sub-points to explain the specific outcome further. If the sub-points are also considered specific academic expectations for students, there are a total of 30 academic expectations in grade Primary for General Curriculum Outcome 10 only. In mathematics, performance indicators are specific expectations used to explain what the students must perform to achieve the specific outcome (Nova Scotia Department of Education and Early Childhood Development, 2014a). In grade three mathematics, there are 149 performance indicators that students must demonstrate by the end of the school year. Teachers use the performance indicators to determine whether students have met

the specific outcomes (Nova Scotia Department of Education and Early Childhood Development, 2014a). Given that there are 195 school days a year in Nova Scotia, students in grade three may struggle to master these mathematical concepts when they have, on average, 1.3 days to learn the skill. Respondents to the Minister's Panel on Education survey reported concerns about teachers being forced to move to the next learning outcome before students were ready (Report of the Minister's Panel on Education, 2014). Moving on too quickly before students have mastered important skills may have negative impacts on student learning (Geary, 2011). Students require explicit instruction and ample practice with mathematical concepts to improve their competency (Geary, 2011).

The high number of academic expectations for students increases the amount of work for teachers who are required to assess the performance of each student on each outcome. Teachers and members of the public in Nova Scotia who responded to the Minister's Panel on Education (2014) survey indicated concern that the high number of specific outcomes forced teachers to move on quickly before students were academically prepared. An increased teacher workload was a major concern by educators in during the implementation of OBE in Western Australia (e.g., Loudon et al., 2007) and was a contributing factor to the increase in teacher attrition (Berlach, 2004). *Nova Scotia's Action Plan for Education 2015* does not address teacher workload; however, it does claim to identify the most critical specific outcomes in each grade.

The number of specific outcomes, sub-points, and performance indicators for which teachers are required to design curriculum is overwhelming and unrealistic. If the specific outcomes are reconsidered in terms of providing operational definitions for the

ambiguous or unclear expectations, there will consequently be decreased need for sub-points to clarify the outcomes. It is recommended that, in addition to the Department of Education and Early Childhood Development's plan to identify the critical specific outcomes, the total number of specific outcomes, sub-points, and performance indicators be streamlined to facilitate teacher management and student learning.

**Teacher training.** Another issue in the literature is that teachers often do not receive training on the implementation of OBE. The literature indicates that poor teacher training may lead to the poor implementation of OBE (Botha, 2002). None of the APEF of Nova Scotia curriculum documents provide an explanation of the theory behind OBE to assist teachers in implementing the curriculum. Spady's four principles of OBE that are imperative for the implementation of OBE are also not located in any curriculum documents (i.e., *clarity of focus, designing back, high expectation for all students, teachers must provide expanded opportunities to allow for achievement of outcomes in a variety of ways*, Spady, 1994). As previously stated, the Foundation documents note that some of the key-stage curriculum outcomes may look similar, but it is the teacher's responsibility to recognize the need to increase in expectations for students at each key stage (Atlantic Provinces Education Foundation, 1996a). This poses a challenge for teachers who are required to read, interpret, design curricula, and assess students according to the OBE framework. Furthermore, teachers are expected perform these tasks in a developmentally appropriate manner. For teachers to fulfill this role, they require proper training on the philosophy of OBE and child cognitive development.

**Administration vs. classroom teachers.** In public education systems that employ an OBE framework, there may be a divide between the Department of Education and the

classroom teachers. For example, in Western Australia, teachers and administration responded differently on a survey when rating the usefulness of the OBE framework (i.e., Curriculum 2005; Louden et al., 2007). People working in the Western Australia Department of Education administration believed that the OBE framework was effective and had led to improved outcomes for students; however, classroom teachers did not agree. Teachers and administration reported similarly on a survey about public education in Nova Scotia. More school administrators (71%) than classroom teachers (51%) were satisfied with the current public school system (Minister's Panel on Education, 2014). Furthermore, 74% of school administrators believed that students were well prepared by the end of the school year to move on to the next grade, while only 53% of teachers agreed (Minister's Panel on Education, 2014). This data suggests that the practical implementation of OBE in Nova Scotia classrooms is the source of dissatisfaction in Nova Scotia's Learning Outcomes Framework.

Classroom teachers and members of school or board administration have differing views of the usefulness of the Learning Outcomes Framework. According to OBE theory, school administrators likely have input on the creation of the transformational, key-stage, general, and specific outcomes, however they do not play a large role in the implementation of OBE. Classroom teachers carry the responsibility for interpreting the OBE documents and designing the curriculum so that each student has the opportunity to meet the outcomes in whatever path or in whatever time necessary. In addition, teachers are required to assess the students to prove that each student has met each outcome, adding up to over 30 specific outcomes with over 100 sub-points or performance indicators at times.



**Political objectives.** The Learning Outcomes Framework was developed in 1996 to complement the Atlantic Canada Framework for Essential Graduation Learnings. The new curriculum for Atlantic Canada was developed with inherent political agendas to improve the quality of education, the effectiveness of the curriculum, and meet the needs of society (APEF, 1996a). Designing a curriculum with an OBE framework allowed the APEF to determine what overarching skills, attitudes, and knowledge students should have upon graduating high school. The South African experience of OBE was also politically charged. In 1997, South Africa introduced OBE as a political move to drive the economy and recover the quality of education after the abolition of apartheid (Botha, 2002). Jansen (2007) was correct when he predicted that OBE would not be successful in South Africa due to hidden political objectives and pointed out that there is no research suggesting that OBE improves the quality of education or economies. Other countries where OBE was not successfully implemented (e.g., Australia) also indicate a primarily political motive for introducing OBE (e.g., Berlach, 2008). There is nothing in the APEF documents to suggest that the research was consulted determine the effectiveness of OBE as an educational framework before creating the Learning Outcomes Framework.

Although the objects were different and placed in a different economies and cultures, Nova Scotia also introduced an OBE framework for politically driven reasons. OBE did not succeed in South Africa because it was introduced for political reasons, which may provide reason to believe that OBE will not be successful in Nova Scotia because it too was commenced with inherently political objectives.

## **Recommendations for School Psychologists**

School psychologists work with children, teachers, and families to provide students with the best school conditions to foster academic growth and social-emotional well-being. School psychologists have training in child development and psychology, assessment, intervention, instruction, and data analysis and collection. The school psychologist is in a position to consult with teachers and members of the Department of Education and Early Childhood Development on issues of OBE and cognitive development. For teachers, school psychologists can be consulted for questions of the cognitive abilities of students at certain ages. Bridging the gap between teachers and school psychologists many also allow the two professionals to work together to provide accommodations for students who are having difficulty meeting the specific outcomes. The role of school psychologists can also extend to higher level curriculum design. When the curriculum is revised in Nova Scotia, administrators at the departmental and school levels would benefit from consulting with school psychologists regarding cognitive development and the empirical evidence for various educational philosophies. Psychologists working in schools have training in child development, which is imperative when designing a curriculum that can appropriately facilitate student learning. Psychologists also have the training to interpret the literature to determine whether an educational framework is evidence-based. It is recommended that school psychologists and educators combine their expertise when revising the Nova Scotia Learning Outcomes Framework.

The practice of school psychologists could benefit from understanding the operation of the educational framework that is used in this province so that they can

provide useful accommodations for students in the classroom. To work collaboratively with educators, parents, and students, school psychologists should understand what students are being expected to know or demonstrate and the role of the teacher in leading the student to academic expectation. It is necessary for school psychologists in Nova Scotia to be informed of the theory of OBE (e.g., the design-back feature, the requirement to assess each outcome) so that when working with teachers, school psychologists can provide recommendations that are realistic and align with OBE. Moreover, familiarity with the specific outcomes within the OBE framework will allow school psychologists to work with the teachers and parents and provide alternate routes to the specific outcomes for struggling students. Understanding OBE and the Nova Scotia Learning Outcomes Framework is imperative to the school psychologist's ability to communicate effectively with students, educators, and parents.

### **Limitations and Future Research**

The current study only considered a small number of specific outcomes from the Learning Outcomes Framework. The specific outcomes were chosen to promote discussion about the developmental appropriateness of academic expectations. To fully evaluate and improve Nova Scotia's Learning Outcomes Framework, more specific outcomes could be examined in the future. A second limitation of the current study is that no specific outcomes from grades 9 – 12 were examined for developmental appropriateness. Reviewing outcomes from grades 9 – 12 would be beneficial to address the concern of Nova Scotians that students are graduating high school without the skills needed for post-secondary endeavours. Another limitation of the specific outcomes is that only ELA and mathematics outcomes were chosen, thereby limiting the breadth of

recommendations. These subjects were chosen because they are assessed on provincial standardized testing and they are the two main subjects discussed in terms of the effectiveness Nova Scotia's curriculum. The remaining subject areas could also be examined for developmental appropriateness in the future. A fourth limitation of the current study is that only specific outcomes were examined. Recommendations were made to reconsider the OBE framework of Nova Scotia's Learning Outcomes Framework; however, not all areas of the framework were assessed. To improve upon the recommendations with respect to OBE, the framework, including all of the Atlantic Canada and Nova Scotia documents should be fully examined.

In the future, an in depth exploration of the teacher role in curriculum design may be helpful. Future researchers may consider surveying teachers about their interpretation of specific outcomes to evaluate the consistency of curriculum design across the province. Another area of future research may involve interviews with the Department of Education and Early Childhood Education to determine what considerations are given to child development and whether specialists in cognitive psychology (e.g., school psychologists, clinical psychologists, developmental psychologists or paediatricians) are consulted when creating the outcomes. Future research may also explore alternative educational frameworks to OBE that may be effective in Nova Scotia. The Nova Scotia public education system could be compared to other provinces with better academic outcomes on standardized tests (e.g., Ontario, British Columbia or Alberta). Such a comparison would provide information on the differences between educational frameworks and academic outcomes that may be impacting student achievement.

## **Conclusion**

As Nova Scotia's public education system and curriculum is reconsidered over the upcoming year, it will be important for educators, academics, and members of the Department of Education and Early Childhood Development to consider OBE framework that underlies the Nova Scotia Learning Outcomes Framework and the developmental appropriateness of the specific outcomes. The lack of research supporting OBE should act as an indication for the need to seek an alternate, evidence-based educational framework to support student learning. If the framework remains, changes are necessary to improve the state of the specific outcomes. In addition, improving student outcomes will require educators, members of the Department of Education and Early Childhood Development, and other professionals to work together to align academic outcomes with knowledge of child cognitive development. Immediate attention to Nova Scotia's Learning Outcomes Framework is critical and necessary to improve the academic outcomes of Nova Scotian students.

## References

- Akhmadeeva, L., Hindy, M., & Sparrey, C. J. (June, 2013). *Overcoming obstacles to implementing an outcome-based education model: Traditional versus transformational OBE*. Canadian Engineering Education Association (CEEAA13) Conference, Montreal, QC. Retrieved from <http://library.queensu.ca/ojs/index.php/PCEEA/article/view/4913>
- Akir, O., Eng, T. H. & Malie, S. (2012). Teaching and learning enhancement through outcome-based education structure and technology e-learning support. *Procedia – Social and Behavioural Sciences*, 62, 87-92. doi: 10.1016/j.sbspro.2012.09.015
- Allais, S. (2012). Claims vs. practicalities: Lessons about using learning outcomes. *Journal of Education and Work*, 25, 331-354. doi: 10.1080/13639080.2012.687570
- Alderson, A. & Martin, M. (2007). Outcomes based education: Where has it come from and where is it going? *Issues in Educational Research*, 17, 161-182.
- Alferi, L., Brooks, P. J., Aldrich, N. J. & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning? *Journal of Educational Psychology*, 108, 1-18. doi: 10.1037/a0021017
- Ashiedu, J. A. & Scott-Ladd, B. S. (2012). Understanding teacher attraction and retention drivers: Addressing teacher shortages. *Australian Journal of Teacher Education*, 37, 17-35.
- Atlantic Provinces Education Foundation (1996a). *The Atlantic Canada framework for essential graduation learnings in schools*. Halifax, N.S.: Atlantic Provinces Education Foundation. Australian Education Union (2008). Beginning teacher

- survey 2007: Results. 1-17. Retrieved from  
<http://www.aeufederal.org.au/Publications/2008/Btsurvey07res.pdf>.
- Atlantic Provinces Education Foundation. (1996b). *Foundation for the Atlantic Canada English language arts curriculum*. Halifax, N.S.: Atlantic Provinces Education Foundation.
- Atlantic Provinces Education Foundation. (1996c). *Foundation for the Atlantic Canada mathematics curriculum*. Halifax, N.S.: Atlantic Provinces Education Foundation.
- Berlach, R. G. (2004). *Outcomes-Based Education and the death of knowledge*. Paper presented at the Australian Association for Research in Education Conference, The University of Melbourne, VIC, 28 Nov–2 Dec, 2004.
- Berlach, R. G & McNaught, K. (2007). Outcomes based education? Rethinking the provision of compulsory education in Western Australia. *Issues in Educational Research, 17*, 1-14.
- Berlach, R. G. (2008). Western Australia's 'English' course of study: To OBE or not to OBE, perhaps that is the question. *Australian Journal of Education, 52*, 49-62.  
doi: 10.1177/000494410805200104
- Botha, R. J. (2002). Outcomes-based education and educational reform in South Africa. *International Journal of Leadership in Education, 5*, 361-371. doi:  
10.1080/13603120110118831
- Bredenkamp, S. (1992). What is “developmentally appropriate” and why is it important? *Journal of Physical Education, Recreation & Dance, 63*, 31-31.
- Burts, D. C., Hart, C. H., Charlesworth, R., & Kirk, L. (1990). A comparison of frequencies of stress behaviors observed in kindergarten children in classrooms

- with developmentally appropriate versus developmentally inappropriate instructional practices. *Early Childhood Research Quarterly*, 5, 3, 407-423.
- Burts, D., Hart, C., Charlesworth, R., DeWolf, D. Ray, J., Manuel, K. & Fleege, P. (1993). Developmental appropriateness of kindergarten programs and academic outcomes in first grade. *Journal of Research in Childhood Education*, 8, 23-31.
- Carbonneau, K. J., Marley, S. C., & Selig, J. P. (2013). A meta-analysis of the efficacy of teaching mathematics with concrete manipulatives. *Journal of Educational Psychology*, 105, 380-400. doi: 10.1037/a0031084
- Chisholm, L (2000). A South African Curriculum for the Twenty First Century: Report of the Review Committee on Curriculum 2005. *Ministry of Education*. Department of Education and Training, Western Australia (2004). *The teaching workforce: A profile*. Perth.
- Cook, J. L., & Cook, G. (2005). *Child development: Principles and perspectives*. Boston, Mass: Pearson.
- Donnelly, K. (2007). Australia's adoption of outcomes-based education: A critique. *Issues in Education Research*, 17, 183-206.
- Education and Early Childhood Development (2015). *2014-2015 Nova Scotia Assessment: Mathematics in Grade 4*. Retrieved from [http://plans.ednet.ns.ca/sites/default/files/documents/M4/2014%E2%80%932015\\_M4\\_results.pdf](http://plans.ednet.ns.ca/sites/default/files/documents/M4/2014%E2%80%932015_M4_results.pdf)
- Education and Early Childhood Development (2015). *2014-2015 Nova Scotia Assessment: Reading and Writing in Grade 3*. Retrieved from



[http://plans.ednet.ns.ca/sites/default/files/documents/RW3/2014-2015\\_RW3\\_results.pdf](http://plans.ednet.ns.ca/sites/default/files/documents/RW3/2014-2015_RW3_results.pdf)

Elkind, D. (1976). *Child development and education: A Piagetian perspective*. New York: Oxford University Press.

Enidlee Consultants Inc. (2009). Reality check: A review of key program areas in the BLAC Report for their effectiveness in enhancing the educational opportunities and achievement of African Nova Scotian learners. *Nova Scotia Department of Education*. Retrieved from [http://acs.ednet.ns.ca/sites/default/files/REALITY\\_CHECK\\_FINAL\\_REPORT\\_FOR\\_WEB.pdf](http://acs.ednet.ns.ca/sites/default/files/REALITY_CHECK_FINAL_REPORT_FOR_WEB.pdf)

Geary, D. C. (2011). Consequences, Characteristics, and Causes of Mathematical Learning Disabilities and Persistent Low Achievement in Mathematics. *Journal of Developmental and Behavioural Pediatrics*, 32, 250-263.  
doi:10.1097/DBP.0b013e318209edef

Gestwicki, C. (1999). *Developmentally appropriate practice: Curriculum and development in early education* (2<sup>nd</sup> ed.). Albany, N.Y.: Delmar.

Ghetti S., Lyons K.E., Lazzarin F., & Cornoldi C. (2010). The development of metamemory monitoring during retrieval: The case of memory strength and memory absence. *Journal of Experimental Child Psychology*, 99, 157–181.

Helmore, G. A. (1969). *Piaget: A practical consideration*. Oxford: Pergamon Press.

Inhelder, B. & Piaget, J. (1958). *The growth of logical thinking from childhood to adolescence*. New York: Basic Books.

- Jansen, J. D. (1998) Curriculum reform in South Africa: a critical analysis of outcomes-based education. *Cambridge Journal of Education*, 28, 321-331. doi: 10.1080/0305764980280305
- Justice, L. M., Kaderavek, J. N., Fan, X., Sofka, A., & Hunt, A. (2009). Accelerating preschoolers' early literacy development through classroom-based teacher-child storybook reading and explicit print referencing. *Language, Speech, and Hearing Services in Schools*, 40, 1, 67-85.
- Kaliannan, M. & Chandran, S. (2012). Empowering students through outcome-based education (OBE). *Research in Education*, 87, 50-63.
- Karably K. & Zabucky K. M. (2009). Children's metamemory: A review of the literature and implications for the classroom. *International Electronic Journal of Elementary Education*, 2, 32-52.
- Kesselring, T., & Muller, U. (2011). The concept of egocentrism in the context of Piaget's theory. *New Ideas in Psychology*, 29, 327-345. doi: 0.1016/j.newideapsych.2010.03.008
- Killen, R. (2000). Outcome-based education: Principles and possibilities. *Unpublished 4 manuscript*. Newcastle, Australia: University of Newcastle. Retrieved May 8, 2014, from <http://drjj.uitm.edu.my/DRJJ/CONFERENCE/UPSI/OBEKillen.pdf>
- Kohler, R. (2008). *Jean Piaget*. New York: Bloomsbury Academic.
- Kostelnik, M., Soderman, A. K., & Whiren, A. P. (2004). *Developmentally appropriate curriculum: Best practices in early childhood education* (3<sup>rd</sup> ed.). Upper Saddle River, N.J.: Prentice Hall.

- Louden, B., Chapman, E., Clarke, S., & Cullity, House, H. (2007). Evaluation of the Curriculum Improvement Program Phase 2. Crawley, WA: University of Western Australia
- Lawson, M. J. & Askeil-Williams, H. (2007). Outcomes-based education. *Discussion Paper Prepared for the Association of Independent Schools of SA*. Centre for the Analysis of Educational Futures: Flinders University.
- Mooney, C. G. (2013). *Theories of childhood: An introduction to Dewey, Montessori, Erikson, Piaget, and Vygotsk* (2<sup>nd</sup> ed.). New York: Redleaf Press.
- Moore, C. (2006). *The development of commonsense psychology*. Mahwah, N.J: Lawrence Erlbaum Associates.
- Morelock, M. J. & Morrison, K. (1999). Differentiating ‘developmentally appropriate’: The multidimensional curriculum model for young gifted children. *Roeper Review*, 21, 37-41. doi: 10.1080/02783199909553961
- National Association for the Education of Young Children. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8*. Retrieved from <https://www.naeyc.org/files/naeyc/file/positions/position%20statement%20Web.pdf>
- National Curriculum Development Committee (1996). *A framework for life-long learning* Pretoria, SA: Department of Education.
- Nova Scotia Department of Education and Early Childhood Development. (2014a). *Learning outcomes framework: Grades Primary-6*. Halifax, N.S.: Nova Scotia Department of Education.

Nova Scotia Department of Education and Early Childhood Development. (2014b).

*Provincial report card review committee: Results overview and action plan summary*. Retrieved from [ednet.ns.ca/files/reports/Report-Card-Survey-Action-Plan-Summary.pdf](http://ednet.ns.ca/files/reports/Report-Card-Survey-Action-Plan-Summary.pdf)

Nova Scotia Department of Education Early Childhood Development. (2013). *Public school programs: 2013-14*. Halifax, N.S.: Department of Education and Early Childhood Development.

Nova Scotia Department of Education Early Childhood Development (2015). *The 3 Rs: Renew, refocus, rebuild: Nova Scotia's action plan for education*. Halifax, N.S.: Department of Education and Early Childhood Development.

Piaget, J. (1928a). *The child's conception of the world*. London: Routledge and Kegan Paul Ltd.

Piaget, J. (1954). *The construction of reality in the child*. New York: Basic Books.

Piaget, J. (1930). *The language and thought of the child*, 2nd ed., London: Routledge and Kegan Paul.

Piaget, J. (1928b). *Judgment and reasoning in the child*. Totowa, NJ: Littlefield Adams.

Piaget, J. (1973). *Memory and intelligence*. New York: Basic Books.

Piaget, J. (1932). *The moral judgment of the child* (6<sup>th</sup> ed.). London: Trubner & Co.

Piaget, J., Inhelder, B., & Szeminska, A. (1960). *The child's conception of geometry*. (Lunzer, E. A., Trans.). New York: Basic Books. (Original work published 1948)

Pratoomraj, S., & Johnson, R. C. (1966). Kinds of questions and types of conservation tasks as related to children's conservation responses. *Child Development*, 37, 2, 343-353.

- Report of the Minister's Panel on Education. (2014). *Disrupting the status quo: Nova Scotians demand a better future for every student*. Halifax, NS: Province of Nova Scotia.
- Rushton, S. & Larkin, E. (2001). Shaping the learning environment: Connecting developmentally appropriate practice to brain research. *Early Childhood Education Journal*, 29, 25-33. doi: 1082-3301/01/0900-0025
- Siegler, R. S. & Ellis, S. (1996). Piaget on childhood. *Psychological Science*, 7, 211-215.
- Singer, D. & Revenson, T. (1996). *A Piaget primer: How a child thinks*. New York: Penguin Books.
- Spady, W. (1994). *Outcome-based education: Critical issues and answers*. Arlington, VA: American Association of School Administrators.
- Warash, B., Curtis, R., Hursh, B., & Tucci, V. (2008). Skinner meets Piaget on the Reggio playground: Practical synthesis of applied behavioural analysis developmentally appropriate orientations. *Childhood Education International*, 22, 439-451.
- Weil, L. G. Fleming, S. M. Dumontheil, I. Kilford, E. J. Weil, R. S. Rees, G. ... Blakemore, S. J. (2013). The development of metacognitive ability in adolescence. *Consciousness & Cognition*, 22, 264-271.