

Are Secondary School Students Adequately Prepared for University?:  
A Comparative Research on Jamaican and Ontarian Education Systems

Peta-Ann S-J. McCaulsky, Bsc. (Hons)

Department of Graduate and Undergraduate  
Studies in Education

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Faculty of Education, Brock University  
St. Catharines, Ontario

## **Abstract**

University readiness is a crucial issue in 21<sup>st</sup> century education, and it is the responsibility of the secondary school curricula to lay the foundation that thoroughly equips students with the knowledge and skills to be successful at tertiary institutions. The recent demands for countries to align their curriculum with international standards have not, unfortunately, made the pathway to university studies for secondary school students any easier.

Consequently, the purpose of this study was to explore how well the secondary school curricular standards and policies relate to university success in Jamaica and Ontario, and how these policies affect student preparedness for university education. More exclusively, this study compared the curriculum documents of Jamaica and Ontario to uncover their alignment with Conley's (2003) university preparation standards, and their similarities and differences, focusing specifically on content knowledge, core academic skills, and depth of learning. This comparative study concentrated on 11 subject areas for analysis from both jurisdictions. While the findings of this study suggest that students are adequately prepared for university education in certain subject areas, several preparation gaps and discrepancies significantly affect the skill competencies and content knowledge of the secondary school graduate. From the findings of this research, recommendations were made for educational policy-makers to critically assess both the effect of the syllabus and the ability of curriculum documents to thoroughly prepare secondary school graduates for university success.

Keywords: *university readiness, content knowledge, core academic skills, depth of learning*

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## **CHAPTER ONE: INTRODUCTION TO THE STUDY**

This comparative study investigated the effects of the curriculum on the preparation of high school students transitioning into university education in both Jamaica and Ontario, Canada. The primary focus of this research was to compare and contrast the educational programs, specifically regarding the structural requirements and the support necessary for students to complete the secondary school level and transition to university studies. This research used a comparative document analysis to highlight the benefits as well as the drawbacks of the high school curriculum in both Jamaica and Ontario. It provided a review of the current literature on the topic of post-secondary readiness as it related to the secondary school curricula and standardized testing in Ontario and Jamaica to answer the following question: how does the curricula prepare students in Jamaica and Ontario for success in university education?

### **Background to the Study**

Transitioning from secondary studies to university education is a process that has received much attention in the last two decades. Many scholars have written extensively on the topic, focusing on the standards for university success, curriculum alignment, factors affecting student retention, and the academic skills needed for university success (Allingham & Brady, 2005; Bishop, 1998; Conley, 2007). Recent research in Ontario has focused on the preparation of secondary school graduates for university studies. There has especially been an increase in the number of graduates, which has risen from 68% to 83% over the last decade (Ontario Ministry of Education, 2014). The province of Ontario continues to create and implement policies using a developmentalist educational framework and teaching strategies to achieve their goals and vision for students – one of which is to consistently increase the number of students transitioning into post-secondary institutions (Fullan, 2016; Sadovnik, Cookson, & Semel, 2013).

This transition from secondary to post-secondary studies, specifically to the university pathway, has proven successful for many students. However, countless students struggle with this transition due to inadequate preparation (Allingham & Brady, 2005; Rosenbaum, 1998). Furthermore, transferable academic skills such as critical thinking, writing, oral communication, and research skills have proven to be more challenging to learn than rote memorization and recitation of the content knowledge (Conley, 2003). Obtaining these transferable academic skills and content knowledge is important, as it improves student performance and success.

With the insurmountable pressure on student achievement and the significant amounts of money invested in public education in both Ontario – \$23.8 billion for the 2017/2018 academic year – and Jamaica – \$1.4 billion to secondary schools for the 2017/2018 academic year – the need for secondary schools to adequately prepare students with the academic skills required by post-secondary institutions is rising (Ministry of Education, Youth, and Information, Jamaica, 2017; Ontario Ministry of Education, 2017; Rosenbaum, 1998). Many studies have shown that academic skills are significant predictors of student success and scholastic achievement in university education (Conley, 2007; Roderick, Nagaoka, & Coca, 2009;). Consequently, it is important that educational leaders and curriculum developers play their role in ensuring a successful transition for secondary school graduates to university education (Conley, 2005).

### **Problem Context**

Much attention has been given to university education and its effectiveness in North America. The discourse on the successes and failures of transitions between secondary and university education has highlighted the issues of student retention and attrition in post-secondary environments (Rosenbaum, 1998). The performance of students at post-secondary institutions has been an area of concern for educational leaders in Jamaica, but has not been

adequately researched. Contrastingly, the Ontario secondary school program experienced an increase in graduates over the past 10 years, along with contributions to the development of their curriculum from several scholars. This research, therefore, explored the distinctions between the school systems of Jamaica and Ontario, looking specifically at the curricular requirements necessary for the preparation of students entering tertiary institutions.

The use of standardized testing in Jamaica, both in times past and present, sets the foundation for students' future careers, job opportunities, and personal development by ascribing a grade to the student's knowledge on the particular CSEC exit examinations. However, the number of students that tertiary institutions in Jamaica can accept limits the enrolment capacity in undergraduate programs. Subsequently, this creates a competitive atmosphere among secondary school graduates, as they vie for a place at the two publicly funded universities. This competition, and the implications it has on the future success of secondary school graduates, has, to date, not resulted in any critical assessment of the Jamaican secondary education system. Instead, the current literature focuses on teacher training and performance and government-funded school programs such as the Programme of Advancement Through Health and Education (PATH), as this is an imperative agenda of reform for policy-makers. PATH is a social program in primary schools that provides small bursary grants to students of low socio-economic demographics as a fulfillment of the stipulations encouraged by the International Monetary Fund (IMF) (International Monetary Fund, 2017; Ministry of Education, Youth and Information, Jamaica, 2017). Conversely, little to no research has been carried out to assess the effectiveness of the compulsory secondary school exit examinations, or whether the content of the curriculum is appropriate or aligned with university studies.

Currently, the pre-university path in Jamaican high schools consists of a two-year intensive study of 5 to 8 subjects between Grades 10 and 11; these subjects are related to the

field or career students would like to pursue, culminating in a standardized Caribbean-wide graduation examination (Caribbean Secondary Education Certificate, 2016). Conversely, high school students in Ontario are expected to complete 30 credits and 40 hours of community service before entering university. Here, students can customize their studies from a plethora of courses, without being fully restricted by their future career or concerned about high school exit examinations. Students can pursue any course offered that will contribute to the total amount of credits they need to graduate (Ontario Ministry of Education, 2014).

In Ontario, most, if not all, students have the option of attending university to pursue further studies in any of the 23 universities in the province (Ministry of Advanced Education Skills and Development, 2016); contrastingly, students in Jamaica can choose between 3 leading universities and 9 teachers' colleges island-wide. While population difference accounts for a part of the existing disparity, there are other reasons affecting student preparation between both education systems, and this prompted me, as the researcher, to examine the structural requirements and curriculum differences between both systems.

### **Purpose of the Study**

The goal of this research was to explore how well curricula in Ontario relate to the curricula in Jamaica, and how the differences in both jurisdictions affect the level of students' preparation for university education. Specifically, the research sought to answer the following three questions:

- 1) How do the curricula prepare students in Jamaica for success in university?
- 2) How do the curricula prepare students in Ontario for success in university?
- 3) What academic skills are needed to be successful in university?

From the document analysis, the phenomenon of university readiness was explored to uncover the challenges, opportunities, similarities, and differences surrounding the transitioning of secondary school students in Jamaica and Ontario to university pathways. In

investigating the current educational climate of both countries, it is hoped this study will inform policy-makers and educational leaders in making decisions on creating opportunities and formulating the best practices for the development of post-secondary academic choices for students transitioning from secondary to university pathways in Jamaica and Ontario.

### **Rationale**

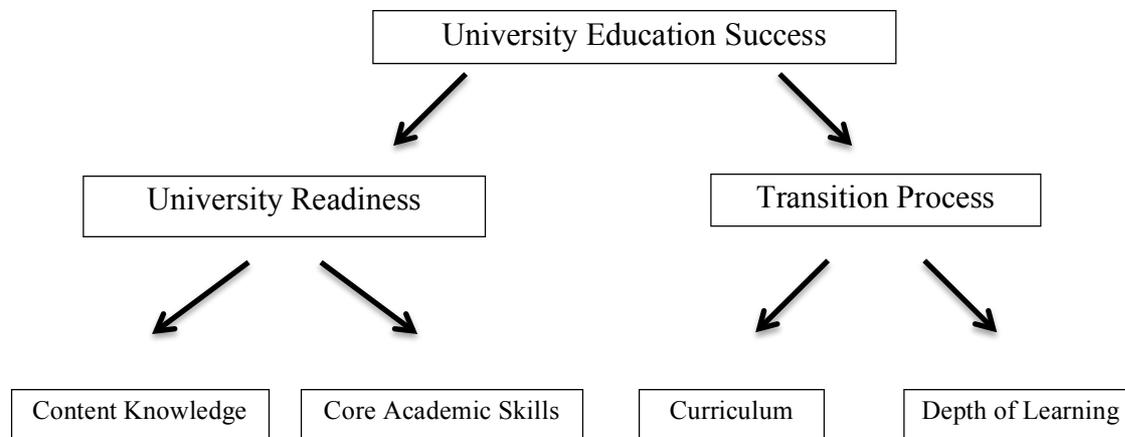
This research contributes to the significant gap in literature regarding West Indian secondary school programs, specifically in Jamaica. This study provides information for curriculum developers and educational leaders of both educational systems on the importance of structuring programs, standards, and the curricula of secondary education to be congruent with university education. Having an alignment between both levels of education will enhance student preparation and achievement, as the structure and organization of the curriculum will aid the smooth transition of students from secondary to university education.

The study illuminated specific pitfalls in the syllabus and curriculum documents from Jamaica and Ontario, and recommends various courses of action necessary in rectifying these issues so that students can be better prepared for university education in both jurisdictions. Moreover, the research provides a solid foundation for further research into student perceptions of university readiness, the transition from secondary to university education, teaching practices, and pedagogy.

### **Conceptual Framework**

From the literature review, two central themes were identified as the overlying mechanism to predict university success. Prior to the data collection, these two themes were (1) university readiness and (2) the transition process from secondary to university education. These central themes were further broken into four sub-themes: (a) content knowledge, (b)

core academic skills, (c) curriculum, and (d) depth of learning. Figure 1 illustrates the relationships between the themes and sub-themes.

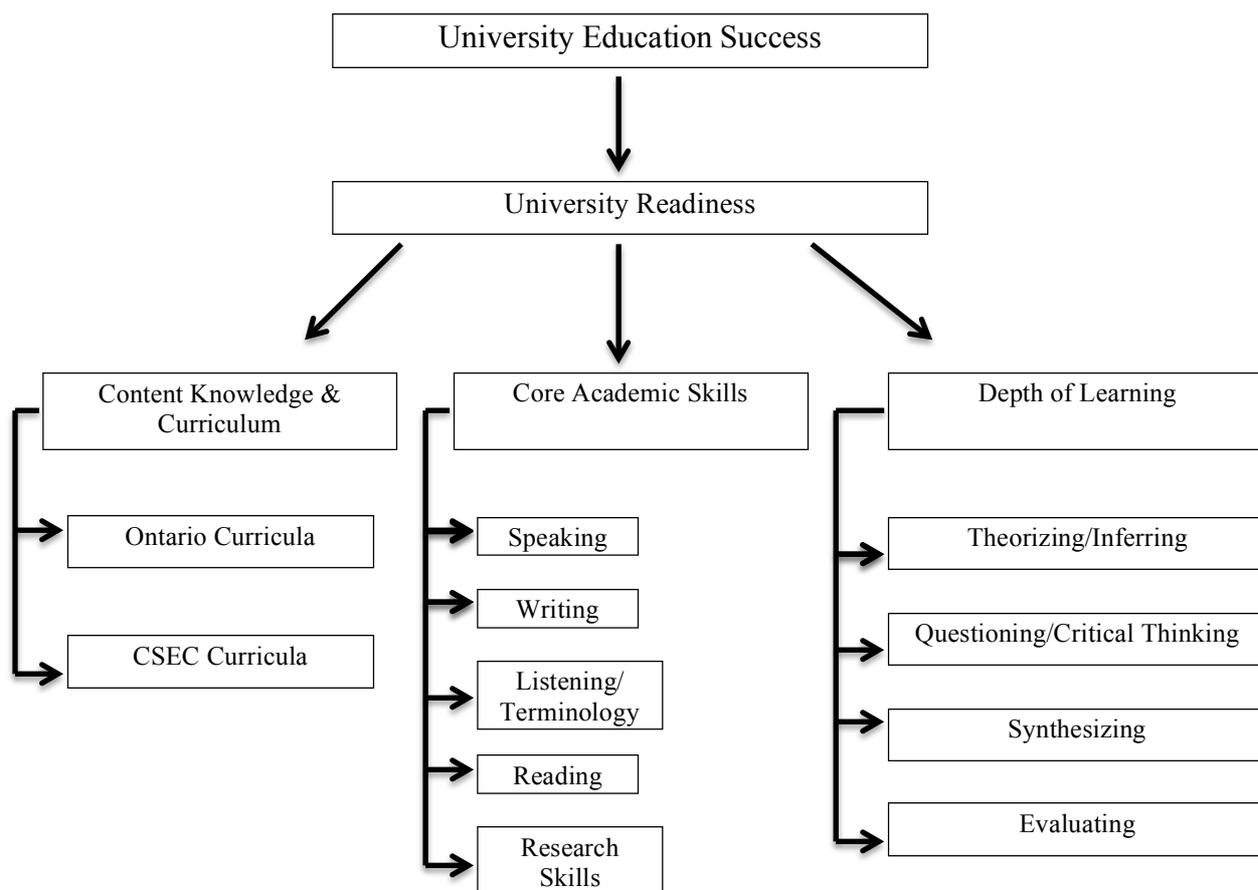


*Figure 1.*

Conceptual Framework: University Education Success.

Seminal work on university success done by Conley (2003) presents various knowledge and skills standards under specific subject categories that are to be covered at the secondary school level. Although his research and conclusions are based on the American educational system, they are applicable to this study because the educational standards proffered by the Organization of Economic Cooperation and Development (OECD), which includes the United States, act as benchmarks for international education around the globe (Spring, 2015). Additionally, Canada's education system, in part, is shaped by American and British educational practices (Putman, 2010; Sheehan, 1985).

After the data collection, an assessment of the conceptual framework was done based on the emerging themes. A revision of the conceptual framework was undertaken to facilitate a better understanding of the data that materialized from the document analysis, which is represented in Figure 2.



*Figure 2.*

The Revised Conceptual Framework.

Although many scholars argue that the transition between secondary and university education is important to student success (Roderick, Nagaoka, & Coca, 2009; Rosenbaum, 1998), the heading of “transition” was eliminated from the revised conceptual framework, as it could not be adequately identified in the curriculum documents of both Jamaica and Ontario. “Core academic skills” and “depth of learning” were also further expanded to better distinguish the codes in the syllabus and curriculum outlines. Table 1 illustrates the definitions of the key concepts in this research. The document analysis was situated within Conley’s (2003) work on “Understanding University Success”, specifically.

Table 1

*Operational Definitions (The Glossary of Educational Reform, 2017)*

<b>Conceptual Framework</b>	<b>Operational Definitions</b>
<b>University Readiness</b>	Generally applies to (1) students who are considered to be equipped with the knowledge and skills deemed essential for success in university (2) the kinds of educational programs and learning opportunities that lead to improved preparation for these four-year university programs.
<b>Transition Process</b>	The transition process focuses on students moving from high school to university studies. In transitioning students often experience significant academic, social, emotional, physical, or developmental changes that may affect their educational performance. During the transition, students may encounter a significant change or increase in academic expectations, and less-prepared students may struggle to keep up with their coursework, acquire new skills, or learn at a more accelerated pace.
<b>Content Knowledge</b>	Refers to the body of knowledge and information that teachers teach and that students are expected to learn in a given subject or content area, such as English language arts, mathematics, science, or social studies. Content knowledge generally refers to the facts, concepts, theories, and principles that are taught and learned in specific academic courses.
<b>Curriculum</b>	Refers to the lessons and academic content taught in a school or in a specific course or program. Curriculum typically refers to the knowledge and skills students are expected to learn, which includes the learning standards or objectives they are expected to meet; the units and lessons that teachers teach; the assignments and projects given to students; the books, materials, videos, presentations, and readings used in a course; and the tests, assessments, and other methods used to evaluate student learning.
<b>Core Academic Skills</b>	Refers to the oral, written, auditory, and visual language proficiency required to learn effectively in schools and academic programs. It is the language used in classroom lessons, books, tests, and assignments that students are expected to learn and achieve fluency in. Academic skills includes a variety of formal-language skills—such as vocabulary, grammar, punctuation, syntax, discipline-specific terminology, or rhetorical conventions—that allow students to acquire knowledge and academic skills while also successfully navigating assignments, expectations, and cultural norms. Non-linguistic skills include thinking, problem solving, interpreting, analyzing, memorizing, recalling), learning modes (questioning, discussing, observing, theorizing, experimenting), and work habits (persistence, self-discipline, curiosity, conscientiousness, responsibility), in addition to other forms of literacy required to succeed in modern schools, such as technological literacy, online literacy, media literacy, or multicultural literacy, among others.
<b>Depth of Learning</b>	Refers to a wide variety of educational and instructional techniques focused on connecting what students are taught in school to real-world issues, problems, and applications. Generally speaking, authentic learning is intended to encourage students to think more deeply, utilize learning modes (questioning, discussing, observing, theorizing, experimenting, synthesizing, inferring, evaluating) raise hard questions, consider multiple forms of evidence, recognize nuances, weigh competing ideas, investigate contradictions, or navigate difficult problems and situations.
<b>Standardized Tests</b>	Any form of test that ((1) requires all test takers to answer the same questions, or a selection of questions from common bank of questions, in the same way, and that (2) is scored in a “standard” or consistent manner, which makes it possible to compare the relative performance of individual students or groups of students. It is primarily associated with large-scale tests administered to large populations of students.

## CHAPTER TWO: LITERATURE REVIEW

In conducting the literature review, it was found that the majority of the literature was written within an American and Canadian educational context. The lack of research on the topic presents a challenge, as there are limited peer-reviewed journal articles directly linked to the assessment of secondary education in Jamaica. However, due to the relevance of the American and Canadian research content in student transitions from secondary to university studies, it was assumed that a review of this current literature was appropriate for use in this study.

### Historical Background

Historically, both the Canadian and Jamaica educational systems are similar because both countries were colonies of Britain. According to Beare and Boyd (1993), “Canada, New Zealand, and Australia were colonies of Britain and their schooling patterns were derived from those in the mother country” (p. 3). Furthermore, Egerton Ryerson and John Strachan, stalwarts in Upper Canada education, introduced private and public schooling in Canada from the influences of European educational structures, particularly Britain and Prussia in the 1800s (Putman, 2010). Moreover, King (1972 as cited in Miller, 1990) mentions that the “Jamaican Schools Commission followed the procedures and practices of the Endowed Schools Commission in England both in manner and the methods it used to establish secondary education in Jamaica” (Miller, 1990, p. 63). Thus, the Canadian education system had its roots in the British system (Sheehan, 1985), and Jamaica structured an education system that modeled itself after the historic British system (Whiteman, 1994). Owing to this, the governance of and structure of the educational system present in Jamaica are still guided by the British system to date. Canada, however, reformed their educational system in the wake of globalization, similar to the reforms undertaken in other countries such as The United Kingdom, The United States, France, and Japan (O'Sullivan, 1999). Subsequently,

refocusing their efforts to creating uniformity through an international curriculum, emphasizing the need to measure and control student learning and achievement (DiCicco, 2016). Therefore, it should be noted that there are myriad of differences in the structure, curriculum, and testing between the two jurisdictions; however, this research paper will use both systems as benchmarks to highlight the similarities and differences among both jurisdictions to inform the best practices of curriculum development in the global community. Countries that maintain best practices in education globally help to create a sound economy for their citizens.

### **The Importance of Education**

Educational leaders and governments all place great emphasis on arming children with knowledge and skills that will create future success (Sadovnik, Cookson, & Semel, 2013). In recent decades, economies across the world have invested large amounts of money in the education of youth (The World Bank, 2008). This has resulted in universities in Western countries increasing their enrolment in the hopes of developing sustainable economies built on knowledge and skills to satisfy the demand for a highly educated and skilled workforce in the global marketplace (Brouwer, Jansen, Hofman, & Flache, 2016). Further, governments construct and implement legislation and public policies to reflect the importance of educating their nation's youth (Delaney, 2015). UNESCO, which supports this view, is one agency that, on a global basis, assists countries in developing sustainability through education. It purports that, "education transforms lives" (UNESCO, 2016) and therefore, providing a solid educational structure is beneficial to a country's economy as it enables sustainable development. According to UNESCO (2016), education should be equitable and available for all. Based on this principle, this international organization has created standards, policies, and guidelines for participating countries, while sanctioning those who fall short of their responsibility, through stricter guidelines and principles.

Historically, education has been a mechanism that teaches the values, morals, and norms of society and creates equal opportunity, while equipping the future workforce (Sadovnik, Cookson, & Semel, 2013). These factors informed this research because from the literature, it is clear that education is an important piece of the future sustainability of a country (UNESCO, 2016) and is recognized as beneficial in curing societal ills. As such, countries utilize their education systems to create skilled workers, which in turn, affords them upward occupational mobility and social status. At the end of World War II, education was identified as a way to resuscitate, develop, and sustain the economies of North America and Europe (Sadovnik, Cookson, & Semel, 2013). Since then, the United States, Canada, and the United Kingdom have created superior educational systems, driven by great, prestigious universities, which endeavoured to make higher education accessible to all (Sadovnik, Cookson, & Semel, 2013). Many of the students who graduate high school look toward college or university because they believe attending post-secondary institutions will enable them to create a successful future and provide them with the opportunity of upward occupational mobility. Sadovnik, Cookson, and Semel (2013) believed that, “occupational and social mobility begin at the schoolhouse door ... [as it is a] ... critical component of the American ethos” (p. 122).

Based on this premise, education is seen by most as the, “great equalizer” (Sadovnik, Cookson, & Semel, 2013, p. 122) in Western societies. However, politicians, policy-makers, educational leaders, teachers, and parents view education as crucial to change, sustainable development, and critical thinking (Fullan, 2016). With growing numbers of individuals entering higher education, it is unsurprising that greater attention has been given to the career choices of graduates. High academic performance in post-secondary institutions has thus become essential for their successful transition into the competitive labour market (Smith & White, 2015). Subsequently, the preparation of students to successfully fill their roles in

society is based on the knowledge and skills taught in post-secondary institutions. An assessment of this knowledge and skill is one way of tackling the ill-preparedness of students for university education. Consequently, by conducting a document analysis, this research can inform curriculum developers, educational leaders, and the public on whether or not Jamaica and Ontario are fulfilling their role concerning student university readiness.

The literature on university readiness or preparedness lays the foundation to indicate the importance of students being successful. Harris (2014) argues that the lack of preparation for university degree learning results in many lost opportunities for students. These lost opportunities suggest that students lack the required skills and knowledge deemed necessary in transitioning into the workplace (Harris, 2014). Balestreri, Duhon, Harris, Sambolt, and Smerdon (2014) agree with Harris (2014) in their report stating that business communities and institutions of higher education share in this plight. Similarly, Harris (2014) indicates that a highly skilled and educated workforce is dependent on higher academic expectations and tougher standards. Cross-collaboration among levels of education is thus essential for students to transition seamlessly from one to the other.

### **Transitioning to University Education**

The transition process focuses on the move of students from one level of education to the next. The literature concerning the transition of secondary students to university studies by Allingham and Brady (2005) suggests that there are factors involved in the transitioning period that affect the success of the student. These factors include a lack of social support, insufficient information during secondary school studies, and the expectations and realities of university life (Allingham & Brady, 2005). Additionally, American researcher Conley (2003) has cited other factors for university readiness among secondary school students, which include a lack of critical thinking skills and insufficient content knowledge. Further, the use of *signaling theory* – the degree to which exit examinations and state standards properly

signal student preparedness for university education – indicates that students were receiving contradicting messages through academic content standards, standardized testing, and grading practices on their level of preparedness in secondary educational institutions (Brown & Conley, 2007; Kirst & Reeves Bracco, 2004, as cited in D’Agostino & Bonner, 2009). D’Agostino and Bonner (2009) also identify that high school curricula and state testing standards are lower in secondary educational institutions, which lull students into a sense of false security, as they believe they are performing at the academic level of university studies.

Further research noted that most state standards and assessments are not designed as post-secondary readiness indicators (Gayler, Chudowsky, Hamilton, Kober, & Yeager, 2004, as cited in D’Agostino & Bonner, 2009). Although students may meet the exit requirements for secondary school, there is a substantial gap between the standards and the preparation needed to succeed in universities (Hoffman, 2003). However, many American states are recognizing the need to address this issue and are working to close the disparity between secondary and university education standards by raising and aligning secondary school standards (D’Agostino & Bonner, 2009), specifically regarding academic skills.

### **Academic Skills**

Conley (2003) found that, “success ... [is] ... the ability to do well enough in college entry-level core academic courses to meet general education requirements and to continue on to major in a particular area” (p. 9). Success at universities differs from the success criteria in secondary schools, as universities require greater specialization in content knowledge and skills (Conley, 2003). Academic skills, according to Conley (2003), include clear written and oral skills, drawing inferences, and arriving at conclusions, in addition to critical thinking skills, a willingness to edit and revise work to reach high-quality standards, research skills, the ability to evaluate information critically and form opinions based on information, and the

capacity to use technology successfully are considered essential markers. Conley (2003) further developed the Knowledge and Skills for University Success (KSUS) framework; within it, he identifies a variety of standards for various subjects. In the KSUS framework, subject areas are broken down into the core knowledge and skills that are learned. A key point in Conley's (2003) research highlights that there is no need for students to master all the subject standards; students who perform at the mastery level in relevant content knowledge are likely to be successful in university education. Furthermore, Conley (2003) argues, "the more of the standards that a student has mastered, the more options the student will have and the more successful the student is likely to be" (p. 9).

However, an analysis of state examinations in America found that the standards for assessment were not aligned with the Knowledge and Skills for University Success (KSUS) standards (Conley, 2003). To evaluate university preparedness from a different perspective, Le (2002) asked reviewers to compare exit state examinations with the Scholastic Achievement Test (SAT). In contrast, they found a, "little misalignment in the types of skills expected from students across the exams, seemingly indicating that state achievement tests are no less rigorous than conventional college [university] readiness indicators" (Lee, 2002, as cited in D'Agostino & Bonner, 2009, p. 26). The implications from this suggest that if academic skills learned at the secondary level are not aligned with the required university educational skills, it can have adverse effects on university readiness.

Building on this insight, researchers at the American Institute for Research (2014) compiled four key tenets in which university and career readiness success topics are organized: (1) goals and expectations, (2) outcomes and measures, (3) pathways and supports, and (4) resources and structures in university studies and career readiness. For students to increase their capacity to be university ready and be successful, consideration must be given to their goals and expectations. Their range of competencies and required

knowledge must also meet their educational and career goals (Balestreri, Duhon, Harris, Sambolt, & Smerdon, 2014). Within the current literature, then, educators and policy-makers are laying the foundation for improving the transition to university by setting higher standards for high school graduates (Roderick, Nagaoka, & Coca, 2009).

### **Standardized Testing**

In the recent decade, there has been an increase in the use of standardized testing in America (Nichols, 2007). Standardized testing requires all test-takers to answer the same questions, in a similar manner. The purpose of standardized testing is to overtly uncover a student's covert knowledge in a subject area (Popham, 2003). Popham (2003) argues that when used effectively, standardized testing can accurately assess student knowledge. Nichols-Barrer, Place, Dillon, and Gill (2016) compared the Massachusetts Comprehensive Assessment System (MCAS) and Partnership for Assessment of Readiness for College and Careers (PARCC) to determine post-secondary readiness, specifically university readiness. Both assessment systems showed high academic performance as the primary indicator of university readiness, and both systems adequately predicted which students needed remedial coursework. Similar results were found when these researchers did a further comparison with the Scholastic Aptitude Test (SAT).

Standardized testing in Jamaica takes on a different form from that of North America, however. Policy-makers, curriculum developers, and educational leaders in the Caribbean Secondary Education Certificate (CSEC) participating territories have implemented programmes to achieve universal secondary education in the region. To date, the researcher has been unable to locate literature analyzing the assessment structure of the CSEC, illustrating the deficit of research in the Caribbean, specifically Jamaica. However, the literature review showed that CSEC administers test across all subject areas in the secondary school curriculum, as it is a Curriculum-Based External Exit Exam System

(CBEEES). One of the main elements of the curriculum is to identify and solidify content knowledge and skills and attitudes required for university education (CSEC Mathematics Syllabus, 2010). Bishop (1998), in his North American research, concludes that there is a positive correlation between Curriculum-Based External Exit Exam Systems (CBEEES) and high student achievement; as a result universities are likely to give greater weight to academic achievement when making admission decisions. Bishop (1998) promotes the use of exit examinations or standardized testing because Curriculum-Based External Exit Exam Systems (CBEEES) acts as useful indicators of academic achievement. Hiring decisions and university admittances are usually based on academic performance, and as such; employers and university recruiters believe the rewards for learning should be visible. Bishop (1998) states further that one examination completed by all students is not sufficient; instead, many countries create the options for students to study their subject areas of interest and sit in high-level exams – namely, universities in the Caribbean. Conversely, the Ontario Secondary School Literacy Test (OSSLT) is the only form of standardized testing in high schools that is carried out by the Education Quality and Accountability Office (EQAO) (Education Quality and Accountability Office, 2015). This examination measures the literacy and numeracy abilities of students at the end of Grade 9 and is stipulated as one of the requirements for obtaining an Ontario Secondary School Diploma (OSSD) (Education Quality and Accountability Office, 2015).

### **University Readiness**

Academically, university readiness is, “the level of preparation a student needs in order to enroll and succeed – without remediation – in a credit-bearing general education course at a post-secondary institution [university] that offers a baccalaureate degree or transfer to a baccalaureate program” (Conley, 2007, p. 5). Simply put, university readiness infers that a secondary school graduate has the mathematics and English knowledge and

skills, among other subjects, necessary for admission and success in university studies. Secondary school graduates in Jamaica and Ontario must complete an extensive and rigorous curriculum substantiated by studies in the core academic disciplines to be university ready (Roderick, Nagaoka, & Coca, 2009). Roderick, Nagaoka, and Coca's (2009) research acknowledges four main areas of skills deemed critical in shaping university readiness; these are content knowledge and basic skills, core academic skills, non-cognitive skills and norms of performance, and "college knowledge", however, two main areas, content knowledge and core academic skills are directly related to the curricula (p. 190). Furthermore, Conley's (2007) work identifies content knowledge and core academic skills as key markers for university readiness. Content knowledge refers to the facts, concepts, theories, and principles that are taught and learned in specific academic courses; for example, the foundational concepts in English, such as different literary techniques. Core academic skills refers to writing, reading, critical thinking, research skills, and oral communication skills, all of which, "are highly valued by college professors ... and are recognized as the weakest areas of preparation in high school" (Roderick, Nagaoka, & Coca, 2009, p. 190). The university ready student can understand the content of the course, taking away from the course the key intellectual concepts (Conley, 2007).

Writing and research are noted as the overarching academic skills that are essential to the ambitious college student. Descriptive, expository, and persuasive writing are the fundamental types of student writing that will be engaged in university studies. University writing demands that students can write clearly and coherently while substantiating each point (Conley, 2007). Conducting research requires that students "identify and utilize appropriate strategies and methodologies to explore and answer problems and to conduct research on a range of questions" (Conley, 2007, p. 14). Students are expected to evaluate, synthesize, and incorporate suitable materials from valid sources in their papers without

plagiarism. Equally, other authors (Roderick, Nagaoka, & Coca, 2009; Rosenbaum, 1998) have stated that university readiness means that students possess basic literacy skills, as well as passing with the minimum coursework requirements for a four-year post-secondary institution.

Secondary school exit examinations are another tool for assessing university readiness. Many American states have such examination; however, it is noted that these examinations are not always strong indicators for judging university readiness because they are not intended for that purpose. Instead, they are merely standards used for secondary school graduation (Roderick, Nagaoka, & Coca, 2009). Additionally, exit examinations are not based specifically on the curriculum taught to students. Key concepts arising from this current research are the secondary school curricula, its alignment to university education, and the depth of students' learning experiences at the high school level, which is vital in transitioning to university studies.

### **Transition Process**

The period of transition between secondary and university education is usually between the months of June and August in both jurisdictions. Here, students complete the final preparatory activities themselves to undertake an intense four-year academic study in an area of their choice. Scholars argue that irrespective of university goals, students must have experienced a thorough curriculum, teaching, and evaluation at the secondary level (Balestreri, Duhon, Harris, Sambolt, & Smerdon, 2014). The National Assessment of Educational Progress (NAEP), "defines a mid-level high school curriculum as four years of English, three years each of social studies, mathematics, and science, and one year of foreign language" (Roderick, Nagaoka, & Coca, 2009, p. 192). Their research suggests that an increasing number of, "high school graduates have taken this core curriculum, which is often deemed the minimal requirement for four-year college admissions" (Roderick, Nagaoka, &

Coca, 2009, p. 193). However, Rosenbaum (1998) argues that students are often lured with the easy access to university studies, so they choose the easy curricula with little to no effort in striving for excellence because university education is expected of them, but high schools fail to mention explicitly how students can attain this goal. Other scholars highlight that some institutions offer undemanding curricula in return for non-delinquent behaviour (Sedlak, Wheeler, Pullin, and Cusick, 1986, as cited in Rosenbaum, 1998).

Remedial courses have been designed by universities to compensate for the lack of content knowledge to improve the student's chance for success in university studies (Rosenbaum, 1998). In contrast, Adelman (2006, as cited in Conley, 2007) notes that completing a challenging curriculum is the greatest predictor of university success. Simply put, increasing the number of courses taken by a student will not suffice; Conley (2007) notes that the type and quality of classes students undertake are of utmost importance. Therefore, it can be understood that depth of learning and curriculum alignment is important in facilitating a smooth transition from secondary to university studies.

### **CHAPTER THREE: METHODOLOGY AND RESEARCH DESIGN**

This chapter discusses the methods of data collection used in this study. The research methodology and design are outlined in the first section, followed by a description of how the data was gathered and analyzed. The third section describes the scope and limitations of the study, and lastly, the chapter will end by discussing the credibility of the research.

This study investigated the policies and structural requirements of secondary school students in Jamaica and Ontario, specifically regarding their preparedness for university education. In particular, the study took an in-depth look at the curriculum, its construction, promulgated standards and academic skills, and the credit-based transition program as an evaluative tool to uncover the similarities and differences between Jamaica and Ontario, to ultimately determine whether or not the curriculum in both contexts prepared secondary students for university studies. The research used a document analysis approach, which is a qualitative research design that explores data from public record documents, magazines, photographs, diaries, statistical data, and online data sources (Merriam, 2001). This document analysis was undertaken to highlight the gaps, discrepancies, similarities, differences, or challenges between both systems that students face in their transition from secondary to university education. It uncovered the relationships between the policies and the curriculum, and helped identify covert standards, expectations, and assessment procedures in the secondary school curriculum.

#### **Research Design**

Researchers who use document analysis code the data based on themes emerging from the study, which align with the questions being asked. The researcher, therefore, gave a voice and meaning to the policy and curriculum documents being assessed. In using document analyses, the trustworthiness of the documents is vital to the researcher's ability to make valid inferences and conclusions (Plano, Clark, & Creswell, 2015). According to

Merriam (2001), a document analysis offers stability; unlike interviewing and observation, the information garnered from the study is not influenced or affected by the presence of the researcher.

Documented data are a good source for qualitative studies in that it provides a solid basis for inquiry. The examination of this data source, “lends contextual richness and helps to ground an inquiry in the milieu of the writer” (Guba & Lincoln, 1981 as cited in Merriam, 2001, p. 126), as it contains clues and insights into the phenomenon under study. The researcher utilized documents that are considered to be public records, including government documents, to assess and report unbiased information by using the appropriate research tools when conducting a document analysis. Essential to document analyses are the materials involved in the data collection. According to Merriam (2001), the authenticity of the documents must be evaluated, as it is important to determine the conditions under which the documents were created. Burgess (1982, as cited in Merriam, 2001) further states that documents should never be used in isolation; the origin, the author, and reasons behind its construction should be assessed before it is used in research. The authenticity of the documents used in this research was verified based on the location of retrieval; specifically, in this case, the documents were retrieved from official government websites, namely the Ontario Ministry of Education, Caribbean Examination Council, and Ministry of Education Jamaica. These documents are in the public domain and are therefore, “free, easily accessible, and contain information” (Merriam, 2001, p. 125) pertinent to the research.

### **Analysis of the Documents**

After assessing the authenticity of the documents, Merriam (2001) suggests that, “the researcher must adopt some system for coding” the data (p. 123). She argues, “by establishing basic descriptive categories for coding, the researcher will have easy access to information in the analysis and interpretation stage” (Merriam, 2001, p. 123). The findings of

the document analysis within this study are organized under three major codes/headings taken from the conceptual framework. These include (1) content knowledge and curriculum, (2) core academic skills, and (3) depth of learning. Core academic skills was further broken down into five smaller subheadings of (a) speaking, (b) writing, (c) listening, (d) reading, and (e) research skills. Depth of learning was also broken down into four subheadings including (a) theorizing/infering, (b) questioning/critical thinking, (c) synthesizing, and (d) evaluating. The subheadings for each original code align with the operational definitions and with Conley's (2003) work on university success, in his report titled "Understanding University Success", coupled with Marzano's (2001) theoretical perspective on the depth of knowledge.

Each curriculum document contains the courses offered by the education ministries. The curriculum and syllabus documents used in this study were from the university preparation strand in Ontario and the general proficiency syllabi from Jamaica. These course objectives and expectations were scanned for information as it related to the content knowledge, core academic skills, and depth of learning codes. When the codes were identified from either being explicitly stated or strongly inferred in the syllabus and curriculum documents, a note was made for each representation. A tally of the number of Conley's (2003) standards was made, and a percentage of alignment was derived from the number of aligned objectives/expectations, divided by the number of expectations/objectives for the specified course, multiplied by 100. For example, in the Ontario Mathematics curriculum document for university preparation, the number of specific objectives was 176, while the number of Conley's (2003) standards identified 158; therefore, by computing  $158/176*100 = 89.772$ , a 90% alignment percentage was identified. This method was calculated for each code, under the individual headings and sub-headings. An assessment of both syllabus and curriculum documents was done, and the similarities and differences were stated. This simple method was used to provide clarity in the analysis of the data from the

documents and can be easily replicated in future studies by coding each specific objective or expectation based on its existence in Conley's (2003) knowledge and skills standards in each subject area.

### **Scope and Limitations of Research Methods**

Limitations regarding the use of public record documents for this study included the fact that the data presented was incongruent with operational definitions under scrutiny and lacked direct correspondence with the conceptual framework (Merriam, 2001). However, the curriculum documents and syllabi were used as primary data sources, and as such, offered an objective viewpoint because they were generated to address public secondary school standards and learning outcomes. Although the data used from public records and documents are not directly related to this study, they are perceived to be great primary and secondary sources of information because they remained unchanged throughout to the research process (Merriam, 2001). Additionally, public documents contain information that would take a considerable amount of time to gather, and the data provided in these, "documents can be used in the same manner as data from interviews or observations" (Merriam, 2001, p. 126).

Another limitation of retrieving online documented data is that data cited today might be unavailable tomorrow, or the content might be radically changed (Merriam, 2001). Mining and managing online data, "assumes a new dimension when its stability can no longer be taken for granted. Version control ... emerges as a critical issue for anyone using the Internet as a reference or a source" (Merriam, 2001, p. 130). Despite this limitation, government documents offer more stability in that any adjustments or revisions made to official documents are noted or described as revised versions.

An additional limitation of this study was the access to information regarding secondary school education in Jamaica. Difficulties were experienced in conducting the literature review due to the unavailability of journal articles related to the topic under study.

The researcher decided to utilize the available resources on secondary education transitions to university studies in North American education systems to act as a benchmark for this comparative investigation. To explore the concept of university readiness and transitions, the researcher found scholarly articles that applied to create a feasible conceptual framework to situate the study.

The resource required for this investigative study was access to the Internet to retrieve policy and curriculum documents from the Ontario Ministry of Education, the Caribbean Examination Council (CXC), and Conley's (2003) report titled "Understanding University Success". Strict focus was placed on the policy and curriculum documents; therefore, demographic and ethnographic considerations such as race, ethnicity, gender, and culture did not have any influence on the data collected. The researcher's biases, approaches, and knowledge did impact the study, particularly in the interpretation of the data. However, the principle focus of the study was to examine how well secondary school students are being prepared for university studies, this was investigated and the results were presented.

### **Credibility of the Research**

During this study, a few strategies were employed to maximize the reliability and validity of the data collected. First, data were collected from the official websites of Ontario Ministry of Education and the Caribbean Examination Council (CXC), and Conley's (2003) report "Understanding University Success". The curriculum documents retrieved from these web pages were created independently from this study; therefore, the data were unchanged and unaffected by the analysis (Merriam, 2001). Secondly, a simple tallying system was used to identify and calculate the codes that were identified based on the operational definitions stated in Chapter One. This tallying system can be easily replicated by analyzing the curriculum and syllabus documents for key terms, phrases, and statements. Lastly, the stability of the document was ensured based on the fact that official government documents

are always available, regardless of the newer released versions. This allowed the researcher to engage in a straightforward comparative analysis of the policy documents in both jurisdictions.

## CHAPTER FOUR: PRESENTATION OF RESULTS

This section presents the findings of the document analysis conducted by taking an in-depth look at the Caribbean Secondary Education Certificate (CSEC) Secondary School syllabi and the Ontario Ministry of Education Secondary School curricula. The purpose of the study was to assess the readiness of secondary school students for university education. The following research questions directed the study:

- 1) How do the curricula prepare students in Jamaica for success in university?
- 2) How do the curricula prepare students in Ontario for success in university?
- 3) What academic skills are needed to be successful in university?

In an attempt to answer these questions, the work of Conley (2003) was used as a foundation for the document analysis. In “Understanding University Success”, Conley (2003) identifies English, Mathematics, the natural sciences, social sciences, second languages, and the arts as key subject areas that could dictate university readiness for secondary school graduates. He argues that the knowledge and skills garnered from these broad subject areas present a solid foundation for students to be competent, knowledgeable, curious, and prepared for university studies and success. The subjects under the categories of natural sciences, social sciences, and the arts are as follows in Table 2. The subjects represented here were then matched to similar subjects in both the Caribbean Secondary Education Certificate (CSEC) syllabi and the Ontario Curriculum documents for Grade 12. Table 3 outlines the subjects that were selected for evaluation in both curricula.

Table 2

*Subjects Identified in Conley's (2003) Understanding University Success*

<b>Natural Sciences</b>	<b>Social Sciences</b>	<b>The Arts</b>
<b>Science</b>	Economics	Art History
<b>Biology</b>	History	Dance
<b>Chemistry</b>	Geography	Music
<b>Physics</b>	Political Science	Theatre
	Sociology	Visual Arts
	Inquiry Research & Analysis	

Table 3

*Subjects for Assessment Table*

<b>Conley's Subjects</b>	<b>Ontario Curriculum</b>	<b>CSEC Syllabus</b>
<b>Mathematics</b>	Mathematics	Mathematics
<b>English</b>	English	English
<b>Biology</b>	Biology	Biology
<b>Chemistry</b>	Chemistry	Chemistry
<b>Physics</b>	Physics	Physics
<b>Science and Society</b>	Science	Integrated Science
<b>Political Science</b>		
<b>Geography</b>	Geography	Geography
<b>History</b>	Canadian and World History	Caribbean History
<b>Economics</b>		
<b>Sociology</b>		
<b>Inquiry Research and Analysis</b>		
<b>Second Languages</b>	French as a Second Language	Modern Languages
<b>Music</b>	Music	Music
<b>Theatre</b>		Theatre Arts
<b>Dance</b>		
<b>Visual Arts</b>	Visual Arts	Visual Arts

The first section presents findings from the document analysis in regards to the alignment of content knowledge and curriculum. The second section examines the core academic skills specified in both the curriculum and syllabus documents for English. The third section presents the findings on depth of learning within the Ontario curriculum and Caribbean Secondary Education Certificate (CSEC) educational documents. Finally, the chapter ends with a summary of the findings for the three sections.

### **Content Knowledge and Curriculum**

To assess the degree to which the curriculum documents and syllabi for both Ontario and Jamaica prepare students for university studies, a detailed evaluation of the relevant curriculum documents was performed. The assessment encapsulated the content area of each subject to uncover the richness of the content being taught in both the Jamaican Caribbean Secondary Education Certificate (CSEC) syllabi and the Ontario Ministry of Education curricula to ascertain the level of preparedness for university success. The learning outcomes/expectations/objectives were identified and coded if the outcome/expectation/objective was aligned with Conley's standards in regards to a subject's content. Of the 11 subjects in both the Ontario Secondary School university preparation curricula and the Jamaican Caribbean Secondary Education Certificate (CSEC) school syllabi, all courses had explicitly-stated content to be taught. Through the evaluation, several similarities and differences were uncovered in the breadth, complexity, and the overall objectives for all subjects in both jurisdictions.

The Ontario Ministry of Education Grade 12 university preparation curricula can be characterized as having depth and breadth regarding of the content Grade 12 students are expected to cover before moving into university education. The Ontario Ministry of Education offers 56 courses to the high school student, with the graduation requirement of 30 completed credits and 40 hours of community service. Outlined at the beginning of each subject area are the overall expectations and specific objectives of the course. Each subject area encourages the evaluation of information and critical thinking, as well as practical implications of the content in the specified subject area.

The Caribbean Secondary Education Certificate (CSEC) syllabi for the two-year intensive study program can be characterized as generally having a limited spectrum of topics for Grade 10 and 11 students to cover before transitioning into university studies. At the

beginning of the syllabus, the aims, skills, and abilities to be assessed, as well as the general objectives and specific objectives, are outlined. The content area of the 11 subjects for both jurisdictions is presented below. These were chosen because they were identifiable in both jurisdictions and Conley's (2003) "Understanding University Success". The subjects under review are: Mathematics, English, Biology, Chemistry, Physics, Science, Geography, History, Modern Languages, Music, and Visual Arts. The presentation of the each subject includes the rationale of the courses, general and specific expectations/objectives, and the similarities or differences uncovered in the documents.

The CSEC subjects are not broken down into courses, each subject represents the broad content area to be covered. Students choose the subject area they would like to study. The subjects that the Ontario Ministry of Education offers are broken down into courses. For example, the subject Geography has four university preparation courses, (1) World Issues: A Geographic Analysis and (2) World Geography: Urban Patterns and Population Issues, (3) The Environment and Resource Management, and (4) Spatial Technologies in Action. Students choose one course from the options in Geography to study. A "strand" in the Ontario curriculum document is similar to a "topic/section" in the CSEC syllabus. Consequently, the subjects from the CSEC syllabus and the courses from the Ontario curriculum outline are evaluated based on Conley's (2003) educational standards for each subject area, and a percentage of alignment is calculated based on its representation in the learning outcomes and expectations of the syllabus and curriculum documents.

### **Mathematics**

Conley (2003) states that students need to know basic mathematical concepts – computation, algebra, trigonometry, and geometry, for instance – so that they have the tools to work with increasingly complex conceptual mathematical and quantitative procedures and analyses in their university courses. There are 84 mathematical standards in Conley's (2003)

framework regarding topics such as computation, algebra, trigonometry, geometry, mathematical reasoning, and statistics.

Table 4 is a pictorial representation for Conley's (2003) standards, Ontario's curriculum expectations, and the CSEC syllabus objectives. The bracketed numbers represent the number of standards, expectations, and objectives in a given curricular topic. In Conley's (2003) work, statistics is not a pre-requisite for success in most first-year university mathematics courses in university; nevertheless, it is still mentioned.

Table 4

*Mathematics Standards, Expectations, and Objectives*

<b>Conley's Mathematics Standards</b>	<b>Ontario Mathematics Curriculum</b>	<b>CSEC Mathematics Syllabus</b>
<b>1. Computation (11)</b>	1. Advanced Functions	1. Computation (10)
<b>2. Algebra (24)</b>	A. Exponential and Logarithmic Functions (12)	2. Number Theory (10)
<b>3. Trigonometry (4)</b>	B. Trigonometric Functions (15)	3. Consumer Arithmetic (8)
<b>4. Geometry (15)</b>	C. Polynomial and Rational Functions (22)	4. Sets (8)
<b>5. Mathematical Reasoning (27)</b>	D. Characteristics of Functions (20)	5. Measurement (15)
<b>6. Statistics (3)</b>	2. Calculus and Vectors	6. Statistics (15)
	A. Rate of Change (19)	7. Algebra (20)
	B. Derivatives and their Applications (10)	8. Relations, Functions, and Graphs (25)
	C. Geometry and Algebra of Vectors (22)	9. Geometry & Trigonometry (21)
	3. Management of Data	10. Vectors and Matrices (13)
	A. Counting and Probability (1(1))	
	B. Probability Distributions (15)	
	C. Organization of Data for Analysis (8)	
	D. Statistical Analysis (13)	
	E. Culminating Data Management Investigation (9)	
<b>Total Standards = 84</b>	<b>Total Expectations = 176</b>	<b>Total Objectives = 145</b>

The Mathematics curriculum from The Ontario Ministry of Education identifies 3 courses available for students to complete in the university preparation strand: Advanced Functions, Calculus and Vectors, and Mathematics of Data Management. Each course is broken down into strands, and their focus is explained and discussed in the curriculum document.

The Advanced Functions course has 4 strands: (1) exponential and logarithmic functions, (2) trigonometric functions, (3) polynomial and rational functions, and (4) characteristics of functions. There are 3 overall expectations for the exponential and logarithmic functions strand, which covers (a) evaluating logarithmic expressions, which includes 4 specific expectations, (b) connecting graphs and equations of logarithmic functions, which includes 4 specific expectations, and (c) solving exponential and logarithmic equations, which includes 4 specific expectations. The trigonometric functions strand has 3 overall expectations for the unit, which include (a) understanding and applying the radian measure, containing 4 specific expectations, (b) connecting graphs and equations of trigonometric functions, containing 7 specific expectations, and (c) solving trigonometric equations, containing 4 specific expectations. The polynomial and rational functions strand has 4 overall expectations including (a) connecting graphs and equations of polynomial functions, which contains 9 specific expectations, (b) connecting graphs and equations of rational functions, which contains 3 specific expectations, (c) solving polynomial and rational equations, which contains 7 specific expectations, and solving inequalities, which contains 3 specific expectations. The characteristics of functions strand have 3 overall expectations, comprising of (a) understanding rate of change, containing 9 specific expectations, (b) combining functions, containing 8 specific expectations, and (c) using function models to solve problems, containing 3 specific expectations.

The course Calculus and Vectors contains 3 strands: (1) rate of change, (2) derivatives and their applications, and (3) geometry and algebra of vectors. The strand rate of change has 3 overall expectations within the curriculum document, including (a) investigating instantaneous rate of change at a point, which includes 6 specific expectations, (b) investigating the concept of the derivative function, which includes 8 specific expectations, and (c) investigating the properties of derivatives, which includes 5 specific expectations. The derivatives and their applications strand has 2 overall expectations: (a) connecting graphs and equations of functions and their derivatives, which involves 5 specific expectations, and (b) solving problems using mathematical models and derivatives, which has 5 specific expectations. The geometry and algebra of vectors strand has 4 overall expectations, including (a) representing vectors geometrically and algebraically, which includes 4 specific expectations, (b) operating with vectors, which includes 8 specific expectations, (c) describing lines and planes using linear equations, which includes 3 specific expectations, and (d) describing lines and planes using scalar, vector, and parametric equations, which includes 7 specific expectations.

The course Management of Data comprises of 5 strands: (1) counting and probability, (2) probability distributions, (3) organization of data for analysis, (4) statistical analysis, and (5) culminating data management investigation. The counting and probability strand has 2 overall expectations, including (a) solving probability problems involving discrete sample spaces, including 6 specific expectations, and (b) solving problems using counting principles, including 5 specific expectations. The strand of probability distribution has 2 overall expectations, which are (a) understanding probability distributions for discrete random variables, which includes 7 specific expectations, and (b) understanding probability distributions for continuous random variables, which includes 8 specific expectations. The strand for organization of data analysis has 2 overall expectations, including (a)

understanding data concepts, which include 3 specific expectations, and (b) collecting and organizing data, which includes 5 specific expectations. The statistical analysis strand comprises of 3 overall expectations, which include (a) analyzing one-variable data, which has 5 specific expectations, (b) analyzing two-variable data, which has 5 specific expectations, and (c) evaluating validity, which has 3 specific expectations. The last strand, culminating data management, has 2 overall expectations: (a) designing and carrying out a culminating investigation, which has 5 specific expectations, and (b) presenting and critiquing the culminating investigation, which has 4 specific expectations.

There are thus a total of 176 expectations within the Ontario Mathematics curriculum, and 90% of these specific expectations are aligned with Conley's (2003) 81 Mathematics standards.

The Caribbean Secondary Education Certificate (CSEC) Mathematics syllabus identifies 11 units: Computation, Number Theory, Consumer Arithmetic, Sets, Measurements, Statistics, Algebra, Relations, Functions and Graphs, Geometry and Trigonometry, and Vectors and Matrices. The Computation unit has 5 general objectives and 10 specific objectives. The general objectives are (a) demonstrate an understanding of place value, (b) demonstrate computational skills, (c) be aware of the importance of accuracy in computation, (d) appreciate the need for numeracy in everyday life, and (e) demonstrate the ability to make estimates fit for purpose.

The Number Theory unit has 5 general objectives and 10 specific objectives. The general objectives include (a) understand and appreciate the decimal numeration system, (b) appreciate the development of different numeration systems, (c) demonstrate the ability to use rational approximations of real numbers, (d) demonstrate the ability to use number properties to solve problems, and (e) develop the ability to use patterns, trends, and investigative skills.

The Consumer Arithmetic unit has 5 general objectives and 8 specific objectives. The general objectives are (a) develop the ability to perform the calculations required in normal business transactions, and in computing their own budgets, (b) appreciate the need for both accuracy and speed in calculations, (c) appreciate the advantages and disadvantages of different ways of investing money, (d) appreciate that business arithmetic is indispensable in everyday life, and (e) demonstrate the ability to use concepts in consumer arithmetic to describe, model, and solve real-world problems.

The fourth unit on Sets has 3 general objectives and 8 specific objectives. The general objectives include (a) demonstrate the ability to communicate using set language and concepts, (b) demonstrate the ability to reason logically, and (c) appreciate the importance and utility of sets in analyzing and solving real-world problems.

The unit on Measurement has 3 general objectives and 15 specific objectives. The general objectives include (a) understand that the attributes of an object can be quantified using measurement, (b) appreciate that all measurements are approximate and that the relative accuracy of a measurement is dependent on the measuring instrument and the measurement process, and (c) demonstrate the ability to use concepts in measurement to model and solve real-world problems.

The Statistics unit has 3 general objectives and 15 specific objectives. The general objectives are as follows: (a) appreciate the advantages and disadvantages of the various ways of presenting and representing data, (b) appreciate the necessity for taking precautions in collecting, analyzing, and interpreting statistical data and making inferences, and (c) demonstrate the ability to use concepts in statistics and probability to describe, model, and solve real-world problems.

The Unit on algebra has 3 general objectives and 20 specific objectives in the syllabus. The general objectives are as follows: (a) appreciate the use of algebra as a

language and a form of communication, (b) appreciate the role of symbols and algebraic techniques in solving problems in mathematics and related fields, and (c) demonstrate the ability to reason with abstract entities.

The Relations, Functions, and Graphs unit has 3 general objectives and 25 specific objectives. The general objectives are (a) appreciate the importance of relations in mathematics, (b) appreciate that many mathematical relations may be represented in symbolic form, pictorial form, and (c) tabulate or appreciate the usefulness of concepts in relations, functions, and graphs to solve real-world problems.

The Geometry and Trigonometry unit has 5 general objectives and 21 specific objectives. The general objectives are (a) appreciate the notion of space as a set of points with subsets of that set (space) having properties related to other mathematical systems, (b) understand the properties and relationship among geometrical objects, (c) understand the properties of transformations, (d) demonstrate the ability to use geometrical concepts to model and solve real-world problems, and (e) appreciate the power of trigonometrical methods in solving authentic problems.

Lastly, the Vectors and Matrices unit has 3 objectives and 13 specific objectives in the curriculum document. The general objectives are as follows: (a) demonstrate the ability to use vector notation and concepts to model and solve real-world problems, (b) develop awareness of the existence of certain mathematical objects, such as matrices, that do not satisfy the same rules of operation as the real number system, and (c) demonstrate how matrices can be used to represent certain types of linear transformation in the plane.

The CSEC Mathematics syllabus has a total of 145 specific objectives within the document; 77% of these objectives are aligned with Conley's (2003) 84 Mathematics standards.

In the Ontario curriculum outline and CSEC Mathematics syllabus, similar content areas were identified. Both documents showed general areas of commonality, namely functions, trigonometry, and geometry. The difference between both documents pertains to the course on the Mathematics of Data Management in the Ontario Mathematics curriculum outline, which focuses on the collection, analysis, interpretation, and evaluation of data and the understanding of the applications of data management used by the media and the advertising industry, as stated in the course details.

### English

Conley identifies 4 principal categories for English that will prepare the secondary school student for university studies and success: (1) reading and comprehension, having 26 standards; (2) writing, having 30 standards; (3) research skills, having 11 standards; and (4) critical thinking skills, having 6 standards. These standards total to 73 English standards which Conley (2003) recognized for university success.

Table 5 gives a side-by-side comparison chart of the content areas covered in both the Ontario English curriculum outline and the CSEC syllabus. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 5

#### *English Standards, Expectations, and Objectives*

Conley's Standards	CSEC Syllabus Objectives	Ontario Curriculum Expectations
1. <b>Reading &amp; Comprehension (26)</b>	Understanding:	Oral Communication:
2. <b>Writing (30)</b>	1. Grammar and Mechanics ((1)	1. Listening to understand (9)
3. <b>Research Skills (11)</b>	2. Informative Discourse (10)	2. Speaking to communicate (7)
4. <b>Critical Thinking Skills (6)</b>	3. Literary Discourse (8)	3. Reflecting on skills and strategies (2)
	4. Persuasive Discourse (4)	
	Expression:	Reading and Literature Studies:
	5. Grammar and Mechanics ((1)	1. Reading for meaning (8)
	6. Informative Discourse ((1)	2. Understanding form and style (3)
	7. Literary Discourse (3)	3. Reading with fluency (3)
	8. Persuasive Discourse (3)	4. Reflecting on skills and strategies (2)

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 Writing

1. Developing and organizing content (5)
2. Using knowledge of form and style (7)
3. Applying knowledge of conventions (7)
4. Reflecting on skills and strategies (3)

## Media Studies

1. Understanding media texts (6)
2. Understanding media form, conventions, and techniques (2)
3. Creating media texts (4)
4. Reflecting on skills and strategies (2)

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**Total Standards =**  
73
**Total Objectives = 32****Total Expectations = 70**


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The Ontario English curriculum document offers both compulsory and optional courses for Grade 12 students who are preparing for university studies. The courses are as follows: English, Grade 12 university preparation (mandatory), Studies in Literature (optional), and The Writer's Craft (optional).

The rationale of the English course is to strengthen the literacy, communication, and critical and creative thinking skills necessary for the success in academic and daily life. This course has 4 overarching strands: (1) oral communication, (2) reading and literature studies, (3) writing, and (4) media studies.

The oral communication strand has 3 overall expectations including (a) listening to understand, with 9 specific expectations; (b) speaking to communicate, which has 7 specific expectations; and (c) reflecting on skills and strategies, which has 2 specific expectations.

The reading and literature studies strand has 4 overall expectations, including (a) reading for meaning, which contains 8 specific expectations; (b) understanding form and style, which contains 3 specific expectations; (c) reading with fluency, containing 3 specific

expectations; and (d) reflecting on skills and strategies, which contains 2 specific expectations.

The writing strand comprises of 4 overall expectations: (a) developing and organizing content, which contains 5 specific expectations; (b) using knowledge of form and style, which contains 7 specific expectations; (c) applying knowledge of conventions, which includes 7 specific expectations; and (d) reflecting on skills and strategies, which contains 3 specific expectations.

Lastly, the media studies strand has 4 overall expectations, including (a) understanding media texts, which contains 6 specific expectations; (b) understanding media forms, conventions, and techniques, which contains 2 specific expectations; (c) creating media texts, which contains 4 specific expectations; and (d) reflecting on skills and strategies, which contains 2 specific expectations.

The 70 specific expectations within the Ontario curriculum document are aligned 100% with Conley's English standards; an explanation of this is included in Chapter Five of this study. Under each overall expectation, critical literacy is classified as a specific expectation, while the research component, a specific expectation, is identified under the writing strand.

The English syllabus for CSEC contains a combination of the subjects English Language (English A) and English Literature (English B), with English A being the compulsory of the two. The rationale of the subject is to equip students with the ability to listen to, read, and view literature, as well as to express themselves clearly in speech and in writing, which are critical factors in managing their personal and social well-being. The English A syllabus has two main categories: (1) understanding and (2) expression. These are each broken down further into four main subheadings: (a) grammar and mechanics, (b) informative discourse, (c) literary discourse, and (d) persuasive discourse.

For both understanding and expressing grammar and mechanics, each has 1 specific objective. Understanding informative discourse has 10 specific objectives, and expressing informative discourse has 1 specific objective. Understanding literary discourse has 8 specific objectives, while expressing literary discourse has 3 specific objectives. Understanding persuasive discourse has 4 specific objectives, and expressing persuasive discourse has 3 specific objectives.

Of the 31 objectives documented in the CSEC English, 69% are aligned with Conley's (2003) 73 English standards. There is no evidence of critical literacy or thinking or any mention of research skills being cultivated within the proposed syllabus.

The similarities between both documents lie in the shared aims of the CSEC syllabus and the content areas of the Ontario English curriculum document, as both identify the 5 facets of language arts: listening, speaking, reading, writing, and viewing. The difference between both documents is the structure and the specific expectations discussed in the document, specifically regarding the gap in critical literacy and research skills in the CSEC syllabus.

## **Geography**

Conley's (2003) standards in the social sciences are introduced with the required general knowledge and skills in each subject area. In Geography, Conley (2003) identifies 4 basic standards for students studying this course content. For instance, well-prepared students know how to read, interpret, and locate countries on a global map. They are familiar with worldwide immigration and migration movement. Table 6 shows the standards, expectations, and objectives in Geography for Conley, Ontario, and CSEC. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 6

*Geography Standards, Expectations, and Objectives*

<b>Conley's Standards</b>	<b>Ontario Curriculum Expectations</b>	<b>CSEC Syllabus Objectives</b>
<b>1. Use maps and atlases to find locations and other geographical information.</b>	1. Geographic Inquiry and Skill Development (13)	1. Map Reading and Field Study (5)
<b>2. Understand the nature, distribution and migration patterns of human populations on Earth's surface</b>	2. Spatial Organization: Relationships and Disparities (9)	2. Natural Systems (24)
<b>3. Understand the role of geography in explaining processes of environmental and human change.</b>	3. Sustainability and Stewardship (10)	3. Human Systems (20)
<b>4. Realize the advantages and disadvantages of maps, globes and other geographic tools used to illustrate data sets</b>	4. Interaction and Interdependence: Globalization (9)	4. Human-Environment Systems (10)
	5. Social Change and Quality of Life (12)	
<b>Total Standards = 4</b>	<b>Total Expectations = 53</b>	<b>Total Objectives = 59</b>

The Ontario Geography curriculum has 4 main university preparation courses; these include World Issues: A Geographic Analysis, World Geography: Urban Patterns and Population Issues, The Environment and Resource Management, and Spatial Technologies in Action. For this study, a detailed evaluation of the course World Issues: A Geographic Analysis was undertaken, because the information provided in the course was similar to the content of the CSEC Geography syllabus. The rationale of the course is to explore issues involving topics on globalization, human rights, international agreements, and the individual responsibilities relating to them. The students are to apply geographic thinking, using spatial technologies to investigate compound issues in their environment and around the world.

The course comprises of five strands: (1) geographic inquiry and skill development, (2) spatial organization: relationships and disparities, (3) sustainability and stewardship, (4) interaction and interdependence: globalization, and (4) social change and quality of life. Under these strands are overall and specific expectations that guide course instruction.

The geographic inquiry and skill development strand has 2 overall expectations: (a) geographic inquiry, which contains 9 specific expectations; and (b) developing transferable

skills, containing 4 specific expectations. The spatial organization: relationships and disparities strand has 3 overall expectations: (a) natural resource disparities, which has 3 specific expectations that focus on spatial significance and interrelationships; (b) population disparities, which has 3 specific expectations that focus on population disparities, interrelationships, and geographic perspectives; and (c) classifying regions of the world, which has 3 specific expectations that focus on spatial significance and patterns and trends.

The strand on sustainability and stewardship has 3 overall expectations including (a) strategies and initiatives, which has 5 specific expectations focusing on interrelationships and geographic perspectives; (b) population growth, which has 2 specific expectations focusing on spatial significance, and patterns and trends; and (c) caring for the commons, which has 3 specific expectations focusing on interrelationships and geographic perspectives.

The interaction and interdependence: globalization strand comprises of 3 overall expectations: (a) trade immigration, with 2 specific expectations focusing on interrelationships and geographic perspectives; (b) impacts and management, with 4 specific expectations focusing on spatial significance and geographic perspectives; and (c) characteristics and driving forces, with 3 specific expectations focusing on patterns and trends and interrelationships.

Lastly, the social change and quality life strand has 3 overall expectations: (a) leadership and policy, with 4 specific expectations focusing on patterns and trends and geographic perspectives; (b) agents of change, with 3 specific expectations focusing on interrelationships and geographic perspectives; and (c) continuing challenges, with 5 specific expectations focusing on spatial significance and patterns and trends.

Conley's (2003) 4 main standards can be identified within the 53 specific expectations stated in the Ontario curriculum document. This includes the use of maps and atlases, understanding the nature of human population, understanding the role of geography

in environmental and human change, and realizing the advantages and disadvantages of using maps and other geographic tools to illustrate data sets associated with the subject of geography. However, a percentage of alignment was not calculated because the standards expressed in Conley's (2003) work were not sufficient for a fair evaluation<sup>1</sup>.

The Caribbean Secondary Education Certificate (CSEC) curriculum document on geography has 4 sections: Map Reading and Field Study, Natural Systems, Human systems, and Human-Environment Systems. The rationale of the course is to develop the spatial expressions, human and natural systems, and the interrelationships between them, as well as issues emerging from human exploitation of natural resources in the environment and how these can be managed to ensure sustainability.

Section I on Map Reading and Field Study has 5 specific objectives, including maps (large and small scale), photographs, tables, diagrams, and field study. Section II on Natural Systems has 24 specific objectives and its content area focus on internal forces – including plate tectonics and volcanoes – external forces – including weathering, rivers, limestone environment, coasts, weather, climate, vegetation, and soil. Section III on Human Systems comprises of 20 specific objectives, with a focus on population, settlement, and economic activity. Section IV on Human-Environment Systems comprises of 2 specific objectives, natural hazards and environmental degradation, with the content area focusing on pollution, global warming, coral reef destruction, and deforestation.

Conley's (2003) 4 standards on the subject of geography were represented in the 59 specific objectives of the CSEC geography. However, a percentage of alignment was not calculated because the information proffered by Conley was insufficient for a fair assessment<sup>1</sup>.

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<sup>1</sup> The knowledge and skills identified by Conley (2003) lacked depth, in addition to the vast difference of content knowledge in the selected Geography course curriculum outline and syllabus documents of Ontario and Jamaica. Therefore, a percentage of alignment was not calculated.

The similarities across both geography curriculums lie in the identification of common topics such as human population, graphical representations, and to a limited extent, the subject of sustainability. However, the CSEC Geography objectives focus heavily on the natural environment, while Ontario Geography expectations concentrate, to a large degree, on human and social themes in a geographical context.

## History

Conley's (2003) History standards focus primarily on the knowledge of significant historical events, people, and periods. According to Conley (2003), students should know important events and documents that have shaped the course of their country's history and constitution. A clear understanding of significant periods in Western and non-Western world history is crucial for success. The 10 History standards help students synthesize relevant historical information and create awareness about significant issues resulting from historical events. Table 7 presents the standards, curriculum expectations, and syllabus objectives in History. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 7

### *History Standards, Expectations, and Objectives*

<b>Conley's Standards</b>	<b>Ontario Curriculum Expectations</b>	<b>CSEC Syllabus Objectives</b>
<b>A. Know significant periods ((1)</b>	A. Historical Inquiry and Skills Development (14)	Section A 1. The Indigenous People and the Europeans (6)
<b>B. Know significant periods and events in world history and social, religious political movements, and historical Tables ((1)</b>	B. Canada Origins to 1774 (12)	2. Caribbean Economy and Slavery (10) 3. Resistance and Revolt (6)
<b>C. Understand historical perspective and historical analysis (8)</b>	C. Canada 1774-1867 (15)	Section B 4. Metropolitan Movements Towards Emancipation (7)
	D. Canada 1867-1945 (16)	5. Adjustments to Emancipation (7)
	E. Canada since 1945 (16)	6. Caribbean Economy (6)
		Section C 7. The United States in the Caribbean (7)
		8. Caribbean Political Development up to

		1985 (6)
		9. Caribbean Society 1900-1985 (5)
<b>Total Standards = 10</b>	<b>Total Expectations = 73</b>	<b>Total Objectives = 60</b>

In the Caribbean Secondary Education Certificate Caribbean History curriculum, it presents the historical stories of indigenous peoples, slavery, and its abolition. The syllabus contains 10 mandatory topics and 9 optional themes, which are presented in three sections. Students are required to study the core and one theme in detail from each section. The core comprises of 10 topics: (1) The Indigenous Peoples of the Americas, (2) The Europeans, (3) The Economic Revolution and the Coming of the Africans, (4) Slave Resistance, (5) Emancipation and Apprenticeship, (6) The Coming of the Chinese, Europeans, Indians and Africans, (7) The Establishment of the Peasantry: 1838 to 1900, (8) The United States' Influence in the Caribbean, (9) Popular Protests in the 1930s, and (10) Movements Towards Independence and Regional Integration to 1985. The optional sections are as follows, with specific objectives for each bracketed after the theme name:

#### Section A

- Theme 1: The Indigenous People and the Europeans (6)
- Theme 2: Caribbean Economy and Slavery (10)
- Theme 3: Resistance and Revolt (6)

#### Section B

- Theme 4: Metropolitan Movements Towards Emancipation (7)
- Theme 5: Adjustments to Emancipation (7)
- Theme 6: Caribbean Economy (6)

#### Section C

- Theme 7: The United States in the Caribbean (7)
- Theme 8: Caribbean Political Development up to 1985 (6)

- Theme 9: Caribbean Society: 1900-1985 (5)

The Ontario History curriculum outline for University preparation Grade 12 classes has two main courses: Canada: History, Identity, and Culture, and World History Since the Fifteenth Century. The rationale behind the course Canada: History, Identity, and Culture focuses on the evolution of Canada's national identity and the various groups that contribute to their nation's diversity. Students investigate the development of their culture and identity and see how much Canada has changed over the country's history.

The course has 5 strands: (a) historical inquiry and skills development, (b) Canada's origins to 1774, (c) Canada: 1774-1867, (d) Canada: 1867-1945, and (e) Canada since 1945. The first strand, historical inquiry and skills development, has two overall expectations: (a) historical inquiry, with 10 specific expectations; and (b) developing transferable skills, with 4 specific expectations.

The second strand, Canada's origins to 1774 has 3 overall expectations: (a) setting the context, focusing on historical significance and historical perspectives, with 4 specific expectations; (b) interactions and interdependence, focusing on cause and consequence, and continuity and change, with 4 specific expectations; and (c) diversity and citizenship, focusing on continuity and change, and historical perspectives, with 4 specific expectations.

The third strand, Canada: 1774-1867, has 3 overall expectations: (a) setting the context, focusing on historical significance and continuity and change, with 5 specific expectations; (b) interactions and interdependence, focusing on cause and consequence and historical perspectives, with 6 specific expectations; and (c) diversity and citizenship, focusing on continuity and change and historical perspectives, with 4 specific expectations.

The fourth strand, Canada: 1867-1945, has 3 overall expectations: (a) setting the context, with 6 specific expectations focusing on continuity and change and historical perspectives; (b) interactions and interdependence, with 4 specific expectations focusing on

historical significance and cause and consequence; and (c) diversity and citizenship, with 6 specific expectations focusing on continuity and change and historical perspectives.

Lastly, the fifth strand, Canada since 1945, has 3 overall expectations: (a) setting the context, focusing on cause and consequence and continuity and change, with 5 specific expectations; (b) interactions and interdependence, focusing on historical significance and continuity and change, with 6 specific expectations; and (c) diversity and citizenship, focusing on continuity and change and historical perspectives, with 5 specific expectations.

The History curriculum of both jurisdictions is dissimilar in the topics covered. However, the similarity between the CSEC syllabi and the Ontario curriculum outline is the focus on historical themes, in addition to the cultural and national issues represented in the documents. Of the 60 CSEC objectives, 82% are aligned with Conley's (2003) standards, while 100% of the 73 Ontario expectations are aligned with Conley's (2003) 10 specific standards in History.

## **Science**

In the first section of the Natural Sciences, Conley (2003) introduces the general foundational skills necessary for students to be successful in this area of academia, in addition to the specific subject standards for each content area. The 10 general foundational skills include (1) the ability for students to differentiate between a theory and a hypothesis, (2) know basic mathematical conventions, (3) recognize basic algebraic forms, (4) demonstrate the ability to work with formulas and symbols, (5) understand basic trigonometric principles, (6) understand the relationships between geometry and algebra, (7) demonstrate the ability to problem-solve, (8) understand the symbolic language of mathematics, (9) apply concepts of probability and statistics, and (10) apply the concepts of measurement.

Conley (2003) has 8 core standards for Science and Society. Table 8 displays his standards, the Ontario Science curriculum expectations, and the CSEC Science syllabus objectives. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 8

*Science Standards, Expectations, and Objectives*

Conley's Standards	Ontario Curriculum Expectations	CSEC Syllabus Objectives
<b>1. Understand that science and the theories of science are not absolute and should be questioned and challenged.</b>	A. Scientific Investigation Skills and Career Exploration (15)	A. The Organism and its Environment 1. The Cell (3) 2. Food and Nutrition (6) 3. Respiration/Air Pollution (8) 4. Transport Systems (7) 5. Excretion (3) 6. Sense organs and coordination (6) 7. Reproduction and Growth (10)
<b>2. Know ways in which science and society influence each other.</b>	B. Medical Technologies (1(1)	
<b>3. Understand that science involves different types of work in many different disciplines.</b>	C. Pathogens and Diseases (13)	
<b>4. Know that scientists throughout history have had many difficulties convincing their contemporaries to acknowledge what are now generally accepted scientific ideas.</b>	D. Nutritional Science (13)	
<b>5. Understand that a host of perplexing new problems is generated by our society's new powers.</b>	E. Science and Public Health Issue (12)	
<b>6. Know that technology is the systematic use of materials, energy, and information to design, build, maintain and operate devices, processes and systems with a goal of serving individual and societal human needs.</b>	F. Biotechnology (9)	B. The Home and Workplace 1. Temperature Control and Ventilation (6) 2. The Terrestrial Environment (14) 3. Water and the Aquatic Environment (11) 4. Pests and Parasites/ Sanitation (5) 5. Safety Hazards (5) 6. Metals and Non- Metals (9) 7. Acids, Bases and Mixtures (9)
<b>7. Understand that interactions between science and technology have led to refined tools</b>		
<b>8. Know that investigations and public communication among scientists must meet certain criteria in order to result in new understanding and methods</b>		C. Energy 1. Electricity and Lighting (13) 2. Fossils Fuels and Alternative

Sources of Energy (7)  
 3. Machines and Movement (4)  
 4. Conservations of Energy (4)  
 5. Forces (5)

<b>Total Standards = 8</b>	<b>Total Expectations = 73</b>	<b>Total Objectives = 135</b>
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The Science course in the Ontario Ministry of Education curriculum document allows students to increase their understanding of science and contemporary social and environmental issues in health-related fields. The course is broken down into 6 main strands: (1) scientific investigation skills and career exploration, (2) medical technologies, (3) pathogens and disease, (4) nutritional science, (5) science and public health, and (6) biotechnology.

In the first strand, there are 15 total specific expectations, and the topics for instruction include (a) initiating and planning, (b) performing and recording, (c) analyzing and interpreting, and (d) communication.

The second strand, medical technologies, contains 3 overall expectations including (a) relating science to technology, society, and the environment, which contains 2 specific expectations; (b) developing skills of investigation and communication, containing 4 specific expectations; and (c) understanding basic concepts, which contains 5 specific expectations.

Pathogens and disease is the third strand in the course, which has 4 overall expectations including (a) relating science to technology, society, and the environment, which has 2 specific expectations; (b) developing skills of investigation and communication, which has 4 expectations, and (c) understanding basic concepts, which has 7 specific expectations.

The fourth strand is nutritional science, which has 3 overall expectations including (a) relating science to technology, society, and the environment, which has 2 specific

expectations; (b) developing skills of investigation and communication, which has 6 specific expectations; and (c) understanding basic concepts, which contains 5 specific expectations.

The fifth strand, science and public health, has 3 overall expectations including (a) relating science to technology, society, and the environment, which has 2 specific expectations; (b) developing skills of investigation and communication, which has 4 specific expectations; and (c) understanding basic concepts, which has 6 specific expectations.

The last strand, biotechnology, has 3 overall expectations including (a) relating science to technology, society, and the environment, (b) developing skills of investigation and communication, and (c) understanding basic concepts, which have 2, 4, and 3 specific expectations respectively. The total number of expectations in the Ontario Science curriculum is 73.

In the CSEC curriculum, the Integrated Science course provides an overview of the sciences, encompassing topics from physics, biology, and chemistry with elements of earth sciences and meteorology. The principal content areas include (1) the organism and its environment, (2) the home and workplace, and (3) energy.

The content area for the organism and its environment has 7 units: Unit 1: The Cell, having 3 specific objectives; Unit 2: Food and Nutrition, having 6 specific objectives; Unit 3: Respiration/Air Pollution, having 8 specific objectives; Unit 4: Transport Systems, having 7 specific objectives; Unit 5: Excretion, having 3 specific objectives; Unit 6: Sense Organs and Co-ordination, having 6 specific objectives; and Unit 7: Reproduction and Growth, having 10 specific objectives.

The content area for the home and workplace comprises of 7 units: Unit 1: Temperature, Control and Ventilation, having 6 specific objectives; Unit 2: The Terrestrial Environment, having 14 specific objectives; Unit 3: Water and the Aquatic Environment, having 11 objectives; Unit 4: Pests and Parasites/Sanitation, having 5 specific objectives;

Unit 5: Safety Hazards, having 5 specific objectives; Unit 6: Metals and Non-Metals, having 9 specific objectives; and Unit 7: Acids, Bases and Mixtures, having 9 specific objectives.

The last content area on energy contains 5 units: Unit 1: Electricity and Lighting, having 13 specific objectives; Unit 2: Fossils Fuels and Alternative Sources of Energy, having 7 specific objectives; Unit 3: Machines and Movement, having 4 specific objectives; Unit 4: Conservations of Energy having 4 specific objectives; and Unit 5: Forces having 5 specific objectives. The total number of objectives in the CSEC Science curriculum is 135.

One of the main differences between both jurisdictions' Science curriculum is the content focus of the syllabi. Of the 8 standards identified in Conley's Science and Society area, the topics and objectives within the CSEC Integrated Science, and the Ontario Science expectations, a percentage of alignment could not be reached because the information necessary for a comparison was not readily apparent<sup>2</sup>.

## Biology

Conley's (2003) standards in Biology are organized into 4 main categories: (1) the structure and function of the cell, (2) genetic principles, (3) organization and classification of living systems, and (4) the evolution of species. Table 11 displays his standards, the Ontario Biology curriculum expectations, and the CSEC Science syllabus objectives. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 9

### *Biology Standards, Expectations, and Objectives*

Conley's Standards	Ontario Curriculum Expectations	CSEC Syllabus Objectives
<b>1. Structure and Function of Cell (13)</b>	A. Scientific Investigation Skills and Career Exploration (15)	A. Living Organisms in the Environment (7)
<b>2. Genetic Principles (3)</b>	B. Biochemistry (13)	B. Life Processes and Disease
<b>3. Organization and</b>	C. Metabolic Processes (9)	1. The Cells (7)

<sup>2</sup> The content knowledge of the Science curriculum and syllabus documents of Ontario and Jamaica were dissimilar. The content knowledge and skills noted by Conley (2003) did not provide a fair basis of evaluation. Therefore, a percentage of alignment was not calculated.

<b>Classification of Living Systems (2)</b>		2. Nutrition (1(1))
<b>4. Biological Change and Evolution of Species (3)</b>	D. Molecular Genetics (13)	3. Respiration (5)
	E. Homeostasis (9)	4. Transport (13)
		5. Excretion (4)
		6. Movement (4)
		7. Irritability (1(1))
		8. Growth (3)
		9. Reproduction (1(1))
		10. Disease (6)
	F. Population Dynamics (10)	C. Continuity and Variation (6)
<b>Total Standards = 21</b>	<b>Total Expectations = 69</b>	<b>Total Objectives = 88</b>

The Ontario Biology University preparation Grade 12 course provides an in-depth study of the concepts and processes that occur in biological systems. Students learn theory and conduct investigations in areas of biochemistry, molecular genetics, and population dynamics. The course is broken down into six strands: (1) scientific investigation and career exploration, (2) biochemistry, (3) metabolic processes, (4) molecular genetics, (5) homeostasis, and (6) population dynamics.

The first strand, scientific investigation skills and career exploration, has 15 overall expectations and explores the themes of (a) initiating and planning, (b) performing and recording, (c) analyzing and interpreting, and (d) communication.

The second strand, biochemistry, has 3 overall expectations. There are 3 main themes in this strand: (a) relating science to technology, society, and the environment, which contains 2 specific expectations; (b) developing skills of investigation and communication, which contains 5 specific expectations; and (c) understanding basic concepts, which contains 6 expectations.

The third strand, metabolic processes, consists of 3 overall expectations. There are 3 reoccurring themes in this strand: (a) relating science to technology, society, and the environment, containing 2 specific expectations; (b) developing skills of investigation and communication, containing 3 specific expectations; and (c) understanding basic concepts, containing 4 specific expectations.

The fourth strand, molecular genetics, has 3 overall expectations. The 3 overarching themes include (a) relating science to technology, society, and the environment, which has 2 specific expectations; (b) developing skills of investigation and communication, which has 4 specific expectations; and (c) understanding basic concepts, which has 7 specific expectations.

There are 3 overall expectations in the fifth strand, homeostasis. The 3 themes in this strand include (a) relating science to technology, society, and the environment, with 2 specific expectations; (b) developing skills of investigation and communication, with 4 specific expectations; and (c) understanding basic concepts, with 3 specific expectations. There are 69 specific expectations in total for biology.

The CSEC syllabus was redesigned to strengthen relationships between the other natural sciences and mathematics, with a greater emphasis on the application of scientific concepts and principles. It recognizes the interrelatedness among topics in biology and the social and environmental issues that are present. The syllabus promises to provide a solid foundation for future study in life science at the university level. The main areas of concentration include Section A: Living Organisms in the Environment, Section B: Life Processes and Disease, and Section C: Continuity and Variation.

Living Organisms in the Environment has 7 general objectives and 7 specific objectives, to which each specific objective is broken down into 3 to 4 additional nodes. Life Processes and Disease is the second section in the curriculum document and contains 10 general objectives. Within this section, there are 10 units: Unit 1: Cells, Unit 2: Nutrition, Unit 3: Respiration, Unit 4: Transport, Unit 5: Excretion, Unit 6: Movement, Unit 7: Irritability, Unit 8: Growth, Unit 9: Reproduction, and Unit 10: Disease. The last section, Continuity and Variation, has 7 general objectives and 6 specific objectives, and each specific objective is broken down with 2 to 4 additional nodes. The CSEC Biology curriculum also

has a practical/experimental aspect and is incorporated into the units as the instructor covers them. There are 88 specific objectives for Biology.

Conley (2003) identifies 4 themes in the study of Biology: (1) cells, (2) genetics, (3) living systems, and (4) evolution of species, totalling to 21 learning standards. Both the Ontario curriculum expectations and the CSEC objectives are 100% aligned with the Biology standards, knowledge, and skills expressed by Conley (2003). The difference between both curriculum documents is how the information is documented; for instance, included in the Ontario curriculum document is the introductory section on scientific investigation skills and career development.

## Chemistry

Conley's (2003) standards in Chemistry are organized into 3 main standards: (1) the nature of physical and chemical properties of matter, (2) the atomic structure and bonding, and (3) the principles that explain chemical reactions. Table 10 displays these standards, the Ontario Chemistry curriculum expectations, and the CSEC Chemistry syllabus objectives. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 10

*Chemistry Standards, Expectations, and Objectives.*

Conley's Standards	Ontario Curriculum Expectations	CSEC Syllabus Objectives
<b>A. Nature of Physical and Chemical Properties of Matter (3)</b>	A. Scientific Investigation Skills and Career Exploration (15)	A. Principles of Chemistry 1. States of Matter (3) 2. Mixtures and Separations (6)
<b>B. Atomic Structure and Bonding (3)</b>	B. Organic Chemistry (1(1))	3. Atomic Structure (7) 4. Periodic Table and Periodicity (5)
<b>C. Principles that explain Chemical Reactions (3)</b>	C. Structure and Properties of Matter (13) D. Energy Changes and Rates of Reaction (17) E. Chemical Systems and Equilibrium (15) F. Electrochemistry (14)	5. Structure and Bonding (8) 6. Mole Concept (7) 7. Acids, Bases, and Salts (1(1)) 8. Oxidation-Reduction Reactions (6) 9. Electrochemistry (1(1)) 10. Rates of Reaction (4)

## 11. Energetics (3)

## B. Organic Chemistry

1. Sources of Hydrocarbon Compounds (3)
2. Organic Chemistry- An Introduction (8)
3. Reactions of Carbon Compound (1(1))

## C. Inorganic Chemistry

1. Characteristics of Metals (2)
2. Reactivity and Extraction of Metals (3)
3. Use of Metals (2)
4. Impact of Metals on Living Systems and the Environment (3)
5. Non-Metals (10)
6. Qualitative Analysis (3)

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<b>Total Standards = 9</b>	<b>Total Expectations = 95</b>	<b>Total Objectives = 116</b>
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The Caribbean Secondary Education Certificate (CSEC) Chemistry syllabus was redesigned to allow students to work individually and collectively in practical and theoretical activities. The principles of Chemistry are to help students to understand everyday life, nature and technology, and the wellbeing of man and the environment. The principal themes in this subject area are threefold: Section A: Principles of Chemistry, Section B: Organic Chemistry, and Section C: Inorganic Chemistry. The introduction to the subject area, Principles of Chemistry, has 12 general objectives. Within this section, there are 11 units, each having 3 to 4 specific objectives. The units are Unit 1: States Of Matter, Unit 2: Mixtures And Separations, Unit 3: Atomic Structure, Unit 4: Periodic Table And Periodicity, Unit 5: Structure And Bonding, Unit 6: Mole Concept, Unit 7: Acids, Bases, And Salts, Unit 8: Oxidation- Reduction Reactions, Unit 9: Electrochemistry, Unit 10: Rates Of Reaction, and Unit 11: Energetics.

Organic Chemistry has 4 general objectives and 3 units. The units are Unit 1: Sources of Hydrocarbon Compounds, Unit 2: Organic Chemistry – An Introduction, and Unit 3: Reactions of Carbon Compound. Each unit has 3 to 4 specific objectives.

Inorganic Chemistry has 9 general objectives and 6 units. These include Unit 1: Characteristics of Metals, Unit 2: Reactivity and Extraction of Metals, Unit 3: Use of Metals, Unit 4: Impact of Metals on Living Systems and the Environment, Unit 5: Non-Metals, and Unit 6: Qualitative Analysis. Each unit has 4 to 5 specific objectives. There are 116 specific objectives in the CSEC Chemistry syllabus.

The Ontario Ministry of Education Chemistry curriculum document distinguishes the course as one to deepen the understanding of chemistry through the study of organic chemistry, structure and properties of matter, and electrochemistry. The course has 6 strands: (1) scientific investigation skills and career exploration, (2) organic chemistry, (3) structure and properties of matter, (4) energy changes and rates of reaction, (5) chemical systems and equilibrium, and (6) electrochemistry.

The first strand, scientific investigation skills and career exploration, has 2 overall expectations and is broken down into 5 sub-themes, with a total of 15 specific expectations: (a) scientific investigation skills, (b) initiating and planning, (c) performing and recording, (d) analyzing and interpreting, and (e) communication.

The second strand, organic chemistry, has 3 overall expectations and 3 sub-themes: (a) relating science to technology, society, and the environment, with 2 specific expectations; (b) developing skills of investigation and communication, with 4 specific expectations; and (c) understanding basic concepts, with 5 specific expectations.

The structure and properties of matter is the third strand of the course and has 3 overall expectations. The sub-themes of the strand are (a) relating science to technology, society, and the environment, having 2 specific expectations; (b) developing skills of

investigation and communication, having 6 specific expectations; and (c) understanding basic concepts, having 5 specific expectations.

The fourth strand, energy changes and rates of reaction, has 3 overall expectations and 3 sub-themes: (a) relating science to technology, society, and the environment, having 2 specific expectations; (b) developing skills of investigation and communication, having 8 specific expectations; and (c) understanding basic concepts, having 7 expectations.

The fifth strand is chemical systems and equilibrium, which has 3 overall expectations. The themes under this strand are (a) relating science to technology, society, and the environment, having 2 specific expectations; (b) developing skills of investigation and communication, having 5 specific expectations; and (c) understanding basic concepts, having 8 specific expectations.

The last strand, electrochemistry, has 3 overall expectations and sub-themes: (a) relating science to technology, society, and the environment, having 2 specific expectations; (b) developing skills of investigation and communication, having 6 specific expectations; and (c) understanding basic concepts, having six specific expectations. There are 95 specific expectations in the Ontario Chemistry curriculum.

From content areas covered in the CSEC Chemistry curriculum, objectives are 51% aligned, while within the Ontario Chemistry curriculum, expectations are 76% aligned with the learning standards of Conley (2003). Conley (2003) classified chemical properties of matter, atomic structure, and chemical reactions as key concepts in learning the content area, which both syllabi covers. The differences between both jurisdictions lie in the focus on scientific investigative skills and connections made between theory and real world applications. These were stated as the overall and specific expectations of the Ontario curriculum document.

## Physics

Conley's (2003) standards in Physics are organized into 6 principal categories: (1) concepts of energy, (2) principles of motion, (3) kinds of force, (4) modern physics, (5) matter and its properties, and (6) basic laws as it relates to physics. Table 11 displays his standards, the Ontario Physics curriculum expectations, and the CSEC Physics syllabus objectives. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 11

*Physics Standards, Expectations, and Objectives*

Conley's Standards	Ontario Curriculum Expectations	CSEC Syllabus Objectives
<b>A. Concepts of Energy (8)</b>	A. Scientific Investigation Skills and Career Exploration (15)	A. Mechanics 1. Scientific Method (10)
<b>B. Principles of Motion (4)</b>	B. Dynamics (12)	2. Vectors (4)
<b>C. Kinds Forces (3)</b>	C. Energy and Momentum (14)	3. Statics (14)
<b>D. Modern Physics (2)</b>	D. Gravitational Electric and Magnetic Fields (10)	4. Dynamics: Motion in a straight line (8)
<b>E. Matter and its Properties (4)</b>	E. The Wave Nature of Light (10)	5. Energy (13)
<b>F. Basic Laws (3)</b>	F. Resolutions in Modern Physics: Quantum Mechanics and Special Relativity (10)	6. Hydrostatics (3)
		B. Thermal Physics & Kinetic Theory 1. Nature of Heat (2)
		2. Macroscopic Properties & Phenomena (12)
		3. Thermal Measurement (7)
		4. Transfer of Thermal Energy (6)
		C. Waves and Optics 1. Wave Motion (3)
		2. Sound (5)
		3. Electromagnetic Waves (3)
		4. Light Waves (13)
		5. Lenses (5)
		D. Electricity & Magnetism 1. Electrostatics (5)
		2. Current Electricity (7)
		3. Electrical Quantities (4)
		4. Circuit & Components (16)
		5. Electronics (6)
		6. Magnetism (7)
		7. Electromagnetism (15)
		E. The Physics of the Atom 1. Models of the Atom (2)
		2. Structure of the Atom (6)

The Caribbean Secondary Education Certificate (CSEC) Physics curriculum is designed to promote greater emphasis on the application of scientific concepts and principles. Such an approach has been used to develop transferable skills of ethical conduct, problem-solving, critical thinking, innovation, and communication. The syllabus is arranged in 5 main sections: Section 1: Mechanics, Section 2: Thermal Physics and Kinetic Theory, Section 3: Waves and Optics, Section 4: Electricity and Magnetism, and Section 5: The Physics of the Atom.

The first section, Mechanics, has 6 general objectives and 6 sub-themes, which each contain 5 to 6 specific objectives. The sub-themes include (a) scientific method, (b) vectors, (c) statics, (d) dynamics: motion in a straight line, (e) energy, and (f) hydrostatics. The second section, Thermal Physics and Kinetic Theory, has 4 general objectives. These are (a) nature of heat, (b) macroscopic properties and phenomena, (c) thermal measurement, and (d) transfer of thermal energy – each including 3 to 5 specific objectives. The third section, Waves and Optics, has 5 general objectives and 5 sub-themes: (a) wave motion, (b) sound, (c) electromagnetic waves, (d) light waves, and (e) lenses – each including 3 to 5 specific objectives. The fourth section, Electricity and Magnetism, has 7 general objectives and 7 sub-themes: (a) electrostatics, (b) current electricity, (c) electrical quantities, (d) circuit and components, (e) electronics, (f) magnetism, and (g) electromagnetism – each including 2 to 7 specific objectives. The last section, The Physics of the Atom, has 5 general objectives and 3 sub-themes. These are (a) models of the atom, (b) structure of the atom, and (c) radioactivity – each including 2 to 7 specific objectives. There are a total of 189 specific objectives in the CSEC Physics syllabus.

The Ontario Ministry of Education Physics curriculum enables the student to deepen their understanding of physics concepts and theories as they explore energy transformations and the forces that affect motion, and will investigate electrical, gravitational, and magnetic fields and electromagnetic radiation. The course is arranged in 6 strands: (1) scientific investigation skills and career exploration, (2) dynamics, (3) energy and momentum, (4) gravitational, electric, and magnetic fields, (5) the wave nature of light, and (6) revolutions in modern physics: quantum mechanics and special relativity.

The first strand, scientific investigation skills and career exploration has 2 overall expectations. The scientific investigation skills section is broken down into 4 sections with 13 total specific expectations: (a) initiating and planning, (b) performing and recording, (c) analyzing and interpreting, and (d) communication. Career exploration has 2 specific expectations.

The second strand, dynamics, has 3 overall expectations and 3 sub-categories: (a) relating science to technology, society, and the environment, with 2 specific expectations; (b) developing skills of investigation and communication, with 7 specific expectations; and (c) understanding basic concepts, with 3 specific expectations.

The third strand, energy and momentum, has 3 overall expectations and 3 sub-categories: (a) relating science to technology, society, and the environment, having 2 specific expectations; (b) developing skills of investigation and communication, having 7 specific expectations; and (c) understanding basic concepts, having 5 expectations.

Gravitational, electric, and magnetic fields is the fourth strand, having 3 overall expectations and 3 sub-categories: (a) relating science to technology, society, and the environment has 2 specific expectations; (b) developing skills of investigation and communication has 5 specific expectations; and (c) understanding basic concepts has 3 specific expectations.

The fifth strand, the wave nature of light has 3 overall expectations and 3 sub-categories: (a) relating science to technology, society, and the environment, having 2 specific expectations; (b) developing skills of investigation and communication, having 4 specific expectations; and (c) understanding basic concepts, having 4 specific expectations.

The sixth strand, revolutions in modern physics: quantum mechanics and special relativity, has 3 overall expectations and 3 sub-categories: (a) relating science to technology, society, and the environment, having 2 specific expectations; (b) developing skills of investigation and communication, having 4 specific expectations; and (c) understanding basic concepts, having 4 expectations. There are a total of 71 specific expectations in the Ontario Physics curriculum document.

Conley's (2003) 24 educational standards in Physics relating to energy, motion, forces, modern physics, matter, and basic laws can be identified in both CSEC and Ontario curricula. The CSEC objectives are 84% aligned, and the Ontario expectations are 100% with the educational standards of Conley (2003) in Physics.

## **Second Languages**

Conley's (2003) standards for second languages are organized into 4 themes: (1) communication skills, (2) culture, (3) structure, and (4) learning behaviours. The section begins with knowledge and skills foundations, focusing on the basics, communication, culture, comparisons, and learning strategies. Table 12 displays Conley's standards, the Ontario French curriculum expectations, and the CSEC Modern Languages syllabus objectives. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 12

*Second Languages Standards, Expectations, and Objectives*

<b>Conley's Standards</b>	<b>Ontario Curriculum Expectations</b>	<b>CSEC Syllabus Objectives</b>
<b>1. Communication Skills</b>	A. Oral Communication	1. Establishing and Maintaining Social Relationships (17)
<b>A. Interpersonal mode (2)</b>	1. Listening (3)	2. Giving, Seeking, and Responding to Information (9)
<b>B. Presentational mode (4)</b>	2. Speaking (5)	3. Expressing Opinions (4)
<b>C. Interpretive mode (5)</b>	3. Application of Language Conventions (3)	4. Expressing Emotions, Attitudes, and Other Responses (18)
<b>2. Culture (5)</b>	B. Reading	5. Connectives (13)
<b>3. Structure (6)</b>	1. Comprehension and Response to Text (5)	
<b>4. Learning Behaviours (1(1))</b>	2. Application of Language Conventions (5)	
	C. Writing	
	1. Communication of Information and Ideas (6)	
	2. Application of Language Conventions (5)	
<b>Total Standards = 33</b>	<b>Total Expectations = 32</b>	<b>Total Objectives = 61</b>

The Caribbean Secondary Education Certificate (CSEC) syllabus on Modern Languages focus on both Spanish and French as second languages, providing students with the opportunity to develop an understanding and appreciation of the cultural and historical contexts of Caribbean societies. There are 7 general objectives in the syllabus that are grouped under the following headings: receptive and productive. Following the general objectives, there are 14 specific objectives. The content is organized around 3 main concepts: (1) functions and notions, (2) setting and topics, and (3) grammar and lexis.

The themes under functions and notions include: (a) establishing and maintaining social relationships; (b) giving, seeking, and responding to information; (c) expressing opinions; (d) expressing emotions, attitudes, and other responses; and (e) connectives that are connected to various settings and topics that are appropriate in given situations.

The setting and topics and grammar and lexis sections include vocabulary associated with (a) nature, (b) country and inhabitants, (c) home and family, (d) occupation, (e) religion, (f) society and politics, (g) culture, and (h) technology for both Spanish and French

languages. There are a total of 61 specific objectives in the CSEC Modern Language syllabus.

The Ontario Ministry of Education French as a Second Language (FSL) curriculum comprises of 3 university preparation Grade 12 courses: Core French, Extended French, and French Immersion. These programs reflect the differing needs of students studying French and are designed to provide different levels of intensity in developing their French language knowledge and skills. The Core French program provides students with fundamental communication skills and understanding of the nature and language and its culture. The course is organized into 3 main strands: (1) oral communication, (2) reading, and (3) writing.

The first strand, oral communication, has 4 specific expectations and 3 sub-categories: (a) listening, having 3 specific expectations; (b) speaking, having 5 specific expectations; and (c) application of language conventions, having 3 specific expectations. The second strand, reading, has 3 overall expectations and 2 sub-categories of (a) comprehension and response to text, having 5 specific expectations; and (b) application of language conventions, having 5 specific expectations.

The last strand, writing, has 3 overall expectations and 2 sub-categories: (a) communication of information and ideas, having 6 specific expectations; and (b) applications of language conventions, having 5 specific expectations. There are 32 total specific expectations in the Ontario French curriculum document.

Conley (2003) has 33 learning expectations that are organized under 4 categories for this subject area. The CSEC objectives are aligned only in structure and communication skills, therefore making the alignment with Conley's learning expectations approximately 27%. The Ontario expectations are more closely aligned with Conley's (2003) standards, specifically regarding its correlation to communication skills, structure, learning behaviours, and culture, contributing to a 93% alignment.

## Music

Conley's (2003) standards on Music are organized into 3 categories: (1) technical knowledge and skills, (2) cultural and historical knowledge and skills, and (3) aesthetic and art criticism knowledge and skills. Table 13 displays his standards, the Ontario Music curriculum expectations, and the CSEC Music syllabus objectives. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 13

*Music Standards, Expectations, and Objectives*

Conley's Standards	Ontario Curriculum Expectations	CSEC Syllabus Objectives
<b>1. Technical Knowledge and Skills (10)</b>	A. Creating and Performing 1. The Creative Process (2)	A. Listening and Appraising (5)
<b>2. Cultural &amp; Historical Knowledge and Skills (3)</b>	2. The Elements of Music (3) 3. Techniques and Technologies (3)	B. Performing (4)
<b>3. Aesthetic &amp; Arts Criticism Knowledge and Skills (8)</b>	B. Reflecting, Responding, and Analyzing 1. The Critical Analysis Process (4) 2. Music and Society (3) 3. Skills and Personal Growth (3) 4. Connections beyond the Classroom (3) C. Foundations 1. Theory and Terminology (3) 2. Characteristics and Development of Musical Forms (2) 3. Conventions and Responsible Practices (3)	C. Composing (4)
<b>Total Standard = 21</b>	<b>Total Expectations = 29</b>	<b>Total Objectives = 13</b>

The Ontario Music curriculum enables students to enhance their musical literacy through the creation, appreciation, analysis, and performance of music. Students will perform traditional, commercial, and art music and will respond with insight to live and recorded performances. The course is organized into 3 main categories: (1) creating and performing, (2) reflecting, responding, and analyzing, and (3) foundations.

The first strand, creating and performing, has 3 overall expectations: (a) the creative process, with 2 specific expectations; (b) the elements of music, with 3 specific expectations; and (c) techniques and technologies, with 3 specific expectations.

The second strand, reflecting, responding and analyzing, has 4 overall expectations: (a) the critical analysis process, with 4 specific expectations; (b) music and society, with 3 specific expectations; (c) skills and personal growth, with 3 specific expectations; and (d) connections beyond the classroom, with 3 specific expectations.

The last strand, foundations, has 3 overall expectations: (a) theory and terminology, with 3 specific expectations; (b) characteristics and development of musical forms, with 2 specific expectations; and (c) conventions and responsible practices, with 3 specific expectations.

The Caribbean Secondary Education Certificate (CSEC) Music curriculum provides opportunities for the development of practical knowledge of music and skills of analysis that forms the basis for further studies in teaching, performing, conducting, composing, and arranging in music related fields. The course has 8 general objectives and is organized into 3 sections: (a) listening and appraising, with 5 specific objectives; (b) performing, with 4 specific objectives; and (c) composing, with 4 specific objectives.

The sum of music educational standards from the 3 categories – technical knowledge and skills, cultural and historical knowledge, and skills and aesthetic and arts criticism knowledge and skills – from Conley's (2003) framework totals to 21. The CSEC Music specific objectives are 46% aligned, while 76% of the Ontario expectations are aligned with Conley's (2003) music standards.

### **Visual Arts**

Conley's (2003) standards on Visual Arts are organized into 3 categories: (1) technical knowledge and skills, (2) cultural and historical knowledge and skills, and (3)

aesthetic and art criticism knowledge and skills. Table 14 displays Conley's (2003) standards, the Ontario Visual Arts curriculum expectations, and the CSEC Visual Arts syllabus objectives. The bracketed numbers represent the number of standards, expectations, and objectives in a given topic.

Table 14

*Visual Arts Standards, Expectations, and Objectives*

<b>Conley's Standards</b>	<b>Ontario Curriculum Expectations</b>	<b>CSEC Syllabus Objectives</b>
<b>1. Technical Knowledge and Skills (5)</b>	A. Creating and Presenting 1. The Creative Process (3)	A. Two-dimensional Expressive Forms
<b>2. Cultural &amp; Historical Knowledge and Skills (5)</b>	2. The Elements and Principles of Design (2)	1. Drawing (5) 2. Painting and Mixed-Media (7)
<b>3. Aesthetic &amp; Arts Criticism Knowledge and Skills (8)</b>	3. Production and Presentation (4) B. Reflecting, Responding, and Analyzing 1. The Critical Analysis Process (4) 2. Art, Society, and Values (3) 3. Connections beyond the Classroom (3)	3. Graphic and Communication Design (8) 4. Printmaking (9) 5. Textile Design and Manipulation (8)
	C. Foundations 1. Terminology (3) 2. Conventions and Techniques (2) 3. Responsible Practices (3)	B. Three-dimensional Expressive Forms 1. Sculptures and Ceramics (8) 2. Leathercraft (8) 3. Fibre and Decorative Arts (7)
<b>Total Standards = 18</b>	<b>Total Expectations = 27</b>	<b>Total Objectives = 60</b>

The Ontario Ministry of Education Visual Arts curriculum outline focuses on enabling students to refine their use of the creative process when creating and presenting two- and three-dimensional artworks using a variety of traditional and emerging media and technologies. The course is organized into 3 strands: (1) creating and presenting, (2) reflecting, responding, and analyzing, and (3) foundations.

The creating and presenting strand has 3 overall expectations: (a) the creative process, having 3 specific expectations; (b) the elements and principles of design, having 2 specific expectations; and (c) production and presentation, having 4 specific expectations.

The second strand, reflecting, responding, and analyzing, has 3 overall expectations: (a) the critical analysis process, having 4 specific expectations; (b) art, society, and values,

having 3 specific expectations; and (c) connections beyond the classroom, having 3 specific expectations.

The third strand, foundations, has 3 overall expectations: (a) terminology, with 3 specific expectations; (b) conventions and techniques, with 2 specific expectations; and (c) responsible practices, with 3 specific expectations. There are 27 total specific expectations that are noted in the Ontario Visual Arts curriculum outline.

The Caribbean Secondary Education Certificate (CSEC) Visual Arts syllabus assists students in building conceptual and practical skills that can be applied in art, craft, design, and related careers in the world of work. It will provide students with a basis for further study, enhance leisure time pursuits, and foster aesthetic, practical, spiritual, personal, and cultural development. The course is organized into 2 main sections: (1) two-dimensional expressive forms and (2) three-dimensional expressive forms. There are 12 general objectives for this course.

The first section, two-dimensional expressive forms, is broken into 5 units: Unit 1: Drawing, with 5 specific objectives; Unit 2: Printing and Mixed-Media, with 7 specific objectives; Unit 3: Graphic and Communication Design, with 8 specific objectives; Unit 4: Printmaking, with 9 specific objectives; and Unit 5: Textile Design and Manipulation, with 8 specific objectives.

The second section, three-dimensional expressive forms, is broken into 3 units: Unit 1: Sculpture and Ceramics, with 8 eight specific objectives; Unit 2: Leathercraft, with 8 specific objectives, and Unit 3: Fibre and Decorative Arts, with 7 specific objectives. There are, in total, 60 specific objectives noted in the CSEC Visual Arts syllabus.

Conley's (2003) 18 educational standards are reflected both in the CSEC Visual Arts syllabus and the Ontario curriculum outline. The CSEC objectives are 32% aligned, while the Ontario expectations are 70% aligned Conley's (2003) Visual Arts standards.

### Summary of Content Knowledge

An assessment of the syllabus and curriculum documents of CSEC and Ontario showed varying degrees of alignment with Conley's (2003) standards in Mathematics, English, the Natural Sciences, the Social Sciences, the Arts, and Second Languages. Of the 11 subjects in Ontario, English, Biology, Physics, and History had a 100% alignment along with CSEC Biology. All of the remaining subjects in Ontario showed more than or equal to a 70% alignment with Conley's (2003) expressed standards. 5 of the CSEC subjects showed more than a 50% alignment, while the remaining 3 subjects were below 50% alignment with Conley's (2003) standards. Table 17 gives a pictorial representation of the summary on content knowledge.

Table 15

*Total Standards, Expectations, and Objectives for Ontario CSEC.*

	Subjects	Total Standards/ Expectations/Objectives			Ontario Curriculum Expectations		CSEC Syllabus Objectives	
		Conley	ON	CSEC	(#)	(%) Aligned	(#)	(%) Aligned
1	English	73	70	32	70	100	22	69
2	Mathematics	84	176	145	158	90	112	77
3	Biology	21	69	88	69	100	88	100
4	Chemistry	9	95	116	73	76	59	51
5	Physics	24	71	189	71	100	158	84
6	Science	8	73	135	-	-	-	-
7	History	10	73	60	73	100	49	82
8	Geography	4	53	59	-	-	-	-
9	Music	21	29	13	22	76	6	46
10	Visual Arts	18	27	60	19	70	19	32
11	Modern Languages	33	32	61	30	93	17	27

### Core Academic Skills

To determine the degree to which the secondary school curriculum for both Ontario and Jamaica served to support the development of the core academic skills that are essential to university success, a detailed review of the pertinent curriculum documents was performed. The learning outcomes or expectations listed in each curriculum document were

identified and coded if the outcome/expectation was aligned with Conley's indicators of core academic skills, which included speaking, writing, listening, reading, and research skills. After the assessment of the curriculum and syllabus documents, it was revealed that the subject English would be best suited for the analysis of the core academic skills deemed necessary for university success. For instance, explicit in both curriculum documents from Ontario and Jamaica is the expectation for students to communicate effectively with the language.

In "Understanding University Success", Conley (2003) presents several important points relevant to the knowledge and academic skills necessary for success in English. Successful students employ reading skills and strategies to understand literature, informational texts, recognize a variety of literary forms and genres, demonstrate familiarity with a range of world literature, and are aware of the relationships between literature and its historical and social contexts. Successful students are ready to answer, "How does this text make you feel?" (Conley, 2003, p. 17) In writing, Conley (2003) states, grammar is the basis for good writing; writers should consistently use proper sentence structure, consider the audience, carefully select the evidence used to support ideas, and effectively edit their work. Using research skills, students can identify primary and secondary sources, formulate research topics, develop a plan for research, and organize what is known about the topic.

The Ontario Ministry of Education's (2007) English curriculum outline for university preparation offers students both mandatory course and optional courses in English. The optional courses include Studies in Literature and The Writer's Craft. The compulsory English, Grade 12 emphasizes the consolidation of literacy, communication, and critical and creative thinking skills necessary for success in academic and daily life. Students will analyze a range of challenging literary texts from various periods, countries, and cultures; interpret and evaluate informational and graphic texts and create oral, written, and media texts in a

variety of forms. An important focus will be on using academic language coherently and confidently, selecting the reading strategies best suited to particular texts and particular purposes for reading, and developing greater control in writing. The course is intended to prepare students for university, college, or the workplace. The course is organized into 4 strands: (1) oral communication, (2) reading and literature studies, (3) writing, and (4) media studies.

In oral communication, (1) listening to understand is the first overall expectation. Cited within this overall expectation are specific expectations of the following: (1.1) purpose; (1.2) using active listening strategies; (1.3) using listening comprehension strategies; (1.4) demonstrating understanding of content; (1.5) interpreting texts; (1.6) extending understanding of texts; (1.7) analyzing texts; (1.8) critical literacy; and (1.9) understanding presentation strategies. The second overall expectation is (2) speaking to communicate. Under this overall expectation are the specific expectations of the following: (2.1) purpose; (2.2) interpersonal speaking strategies; (2.3) clarity and coherence; (2.4) diction and devices; (2.5) vocal strategies; (2.6) non-verbal cues; and (2.7) audio visual aids. The third overall expectation is (3) reflecting on skills and strategies, broken further down into the two specific expectations of (3.1) metacognition; and (3.2) interconnected skills.

The second strand, reading and literature studies, has 4 overall expectations: (1) reading for meaning, (2) understanding form and style, (3) reading with fluency, and (4) reflecting on skills and strategies. Reading for meaning is the first overall expectation; under this are the specific expectations of (1.1) variety of texts; (1.2) using reading comprehension strategies; (1.3) demonstrating understanding of content; (1.4) making inferences; (1.5) extending understanding of texts; (1.6) analyzing texts; (1.7) evaluating texts; and (1.8) critical literacy. Understanding form and style is the second overall expectation in reading and literature studies, including the following specific expectations: (2.1) text forms; (2.2)

text features; and (2.3) elements of style. Reading with fluency is the third overall expectation, including specific expectations of (3.1) reading familiar words; (3.2) reading unfamiliar words; and (3.3) developing vocabulary. The fourth overall expectation is reflecting on skills and strategies, including the two specific expectations of (4.1) metacognition; and (4.2) interconnected skills.

The third strand, writing, has 4 overall expectations: (1) developing and organizing content, (2) using knowledge of form and style, (3) applying knowledge of conventions, and (4) reflecting on skills and strategies. Developing and organizing content is the first overall expectation, which involves specific expectations as follows: (1.1) identifying topic, purpose, and audience; (1.2) generating and developing ideas; (1.3) research; (1.4) organizing ideas; and (1.5) reviewing content. Using knowledge of form and style is the second overall expectation, which involves the following specific expectations: (2.1) form; (2.2) voice; (2.3) diction; (2.4) sentence craft and fluency; (2.5) critical literacy; (2.6) revision; and (2.7) producing drafts. The third overall expectation is applying knowledge and conventions, which has the following specific expectations included: (3.1) spelling; (3.2) vocabulary; (3.3) punctuation; (3.4) grammar; (3.5) proofreading; (3.6) publishing; and (3.7) producing finished works. Reflecting on skills and strategies is the fourth specific expectation; this includes 3 specific expectations – (4.1) metacognition; (4.2) interconnected skills; and (4.3) portfolio.

Media Studies is the last strand in the Ontario English course. This strand has 4 overall expectations: (1) understanding media texts, (2) understanding media forms, conventions, and techniques, (3) creating media texts, and (4) reflecting on skills and strategies. Understanding media texts is the first overall expectation in this strand which encompasses the following specific expectations: (1.1) purpose and audience; (1.2) interpreting messages; (1.3) evaluating texts; (1.4) audience response; (1.5) critical literacy;

and (1.6) production perspectives. The second specific expectation is understanding media forms, conventions, and techniques, which includes two specific expectations: (2.1) form; and (2.2) conventions and techniques. Creating media texts is the third overall expectation in the strand. It involves the following specific expectations: (3.1) purpose and audience; (3.2) form; (3.3) conventions and techniques; and (3.4) producing media texts. The fourth overall expectation is reflecting on skills and strategies, involving the two specific expectations of (4.1) metacognition and (4.2) interconnected skills. Of the 70 specific expectations in the Ontario English curriculum, 56 specific expectations (80%) focus on the core academic skills of reading, listening, writing and speaking stated by Conley (2003).

The Caribbean Secondary Education Certificate (CSEC) English syllabus is mandatory for all students. The rationale of the syllabus is to provide students with the ability to understand fully what they listen to, read, and view, as well as to express themselves clearly in speech and in writing are critical factors in managing their personal and social wellbeing. The study of language and literature provides opportunity for students to develop competence and confidence in speaking and writing for personal and public purposes in everyday activities. It also seeks to develop students' ability to read and enjoy literary texts, to explore social/moral issues, and to evaluate how language grows, develops, and is used.

The organization of the syllabus document is structured by 2 themes – understanding and expression – as they related to the topics of grammar and mechanics, informative discourse, literary discourse, and persuasive discourse. In understanding grammar and mechanics, special note is made of word choice, grammar, punctuation, and paragraphing. In expressing grammar and mechanics, diction, grammar, punctuation, and paragraphing is mentioned. In the column labeled *suggestions for teaching*, using grammar check, oral, then written language comparison and restructuring drills, proofreading exercises to identify and correct errors of number, reported speech, journal writing, oral interviews, and impromptu

speeches is mentioned. Dictation, writing notices, job application, expository essays, completing forms, explaining how things work, and preparing notes for informational talks are also in the column for *suggestions for teaching*. The following sections on understanding and expression are not broken down into additional themes: informative discourse, literary discourse, and persuasive discourse.

In reviewing the Caribbean Secondary Education Certificate (CSEC) English (2010) syllabus for the core academic skills of speaking, reading, listening, and writing, the document showed limited documentation of the skills mentioned above. These core academic skills are not stated as general or specific objectives, but rather noted under the sections for *Suggestions for Teaching* or *Suggestions for Assessment*. Of the 32 specific expectations, 6 (19%) specific expectations directly correlate with speaking, reading, writing, and research skills. Table 16 gives a pictorial representation alignment of the core academic skills in both curriculum documents.

Table 16

*Core Academic Skills Comparison Table*

Conley Standards	Ontario English Expectations		CSEC English Objectives	
	#	%	#	%
Core Academic Skills	56	80	6	19

### Depth of Learning

To measure the extent to which the syllabus and curriculum documents of Ontario and Jamaica aided in developing students' critical literacy and thinking skills – so as to be thoroughly prepared and successful in their university studies – an analysis of the curriculum documents was performed. The learning expectations stated by Conley (2003) were reviewed and coded if they were identified in these curriculum documents. The depth of learning category was organized into 4 sub-categories based

on the operational definitions stated previously, to make it distinguishable in the curriculum outlines under review. The sub-categories are as follows:

Theorizing/Inferring, Questioning/Critical Literacy, Synthesizing, and Evaluating.

In this section, five subjects are assessed to uncover whether or not students are learning through the encouragement of critical literacy, synthesizing, theorizing, and evaluating. The subjects under review are Mathematics, English, Biology, Chemistry, and Physics. These specific subjects were chosen because they were most representational of the standards, knowledge, and skills expressed in Conley's (2003) "Understanding University Success". The content areas of these subjects were comparative in nature; therefore, it was fit to evaluate the extent to which depth of learning was embodied in these subjects.

### **Mathematics**

The Ontario Mathematics curriculum document for university preparation offers 3 courses in Grade 12: Advanced Functions, Calculus and Vectors, and Mathematics of Data Management. The CSEC syllabi concentrates on 10 topics: (1) Computation, (2) Number Theory, (3) Consumer Arithmetic, (5) Sets, (6) Measurements, (7) Statistics, (8) Algebra, Relations, Functions, and Graphs, (9) Geometry and Trigonometry, and (10) Vectors and Matrices.

**Theorizing/Inferring.** Conley (2003) identifies that mathematical problem-solving involves logical reasoning; it is important, for instance, to explore the reasons why step two follows step one. Of the 3 courses, inferring was encouraged in the Ontario Mathematics (2007) curriculum outline through 7 specific expectations in the course Mathematics of Data Management and 1 specific expectation in Advanced Functions. Theorizing/inferring accounts for 5% of the curriculum expectations. For example, in the Mathematics of Data Management course, statistical analysis includes: "(a) interpret statistical summaries (e.g.,

graphical, numerical) to describe the characteristics of a one-variable data set and to compare two related one-variable data sets (e.g., compare the lengths of different species of trout; compare annual incomes in Canada and in a third-world country; compare Aboriginal and non-Aboriginal incomes) (b) describe how statistical summaries (e.g., graphs, measures of central tendency) can be used to misrepresent one-variable data; and make inferences, and make and justify conclusions, from statistical summaries of one-variable data orally and in writing, using convincing arguments (c) answer questions about the culminating investigation and respond to critiques (e.g., by elaborating on the procedures; by justifying mathematical reasoning)” (Ontario Mathematics, 2007, p. 113-121). These examples show how students are expected to theorize and infer from the mathematical data presented and how to employ mathematical reasoning.

The CSEC Mathematics syllabus encourages theorizing/infering through 1 general objective in Statistics. This accounts for 1% of the CSEC specific objectives. In Statistics, for example, students are encouraged through the specific objectives to: “appreciate the necessity for taking precautions in collecting, analyzing and interpreting statistical data and making inferences” (CSEC Mathematics, 2010, p. 20). This example shows that students are required to analyze statistical data and make inferences.

**Questioning/Critical Literacy.** Conley (2003) states that students need to question results until they can explain their answers and defend them. Using experimental thinking, inquisitiveness, and a willingness to investigate the steps used to reach a solution, successful students understand there can be multiple approaches to solving a problem.

Questioning/critical literacy accounts for 5% of the Ontario curriculum expectations. Questioning/critical literacy is encouraged through 3 specific expectations in the Advanced Functions course, 1 specific expectation in the Calculus and Vectors course, and 4 specific expectations in the course Mathematics of Data Management. In Advanced Functions, for

example, students are encouraged through the specific expectation to: “(a) develop and apply reasoning skills (e.g., use of inductive reasoning, deductive reasoning, and counter-examples; construction of proofs) to make mathematical conjectures, assess conjectures, and justify conclusions, and plan and construct organized mathematical arguments (b) recognize real-world applications of combinations of functions (e.g., the motion of a damped pendulum can be represented by a function that is the product of a trigonometric function and an exponential function; the frequencies of tones associated with the numbers on a telephone involve the addition of two trigonometric functions), and solve related problems graphically” (Ontario Mathematics, 2007, p. 86, 96) . Here students are required to question and critically assess mathematical arguments regarding the topic of functions and apply them to real-world situations.

**Synthesizing.** Conley (2003) states that mathematics classes are prepared to translate real situations into mathematical representation and, conversely, extract meaning from mathematical expression. Synthesizing accounts for 13% of the Ontario Mathematics expectations. It encourages synthesizing through the 12 specific expectations in the Advanced Functions class, 8 specific expectations in the Calculus and Vectors course, and 3 specific expectations in the Mathematics of Data Management course. For example, in the Mathematics of Data Management and Advanced Functions course, respectively, students are required to synthesize information by: “(a) make[ing] connections among mathematical concepts and procedures, and relate mathematical ideas to situations or phenomena drawn from other contexts (e.g., other curriculum areas, daily life, current events, art and culture, sports) (b) make connections between related logarithmic and exponential equations (c) make connections, through investigation using graphing technology (e.g., dynamic geometry software), between a polynomial function given in factored form [e.g.,  $f(x) = 2(x - 3)(x +$

(2)(x – 1)] and the x-intercepts of its graph, and sketch the graph of a polynomial function given in factored form using its key features” (Ontario Mathematics, 2007, p. 87, 112).

The CSEC Mathematics syllabus encourages synthesizing through 2 general objectives in Consumer Arithmetic, 1 in Sets, 1 in Measurement, 1 in Statistics, 1 in Relations, Functions, and Graphs, 1 in Geometry and Trigonometry, and 1 general objective in Vectors and Matrices. It accounts for 5% of the Mathematics objectives. For example, in Consumer Arithmetic, students are required to: “(a) appreciate that business arithmetic is indispensable in everyday life (b) demonstrate the ability to use concepts in consumer arithmetic to describe, model and solve real-world problems” (CSEC Mathematics, 2010, p.15). Students are expected to make connections mathematically to everyday life and demonstrate how consumer arithmetic solves real world problems.

**Evaluating.** Conley (2003) notes that by using logical reasoning and common sense to work on and find mathematical solutions, successful students can provide supporting evidence to construct compelling arguments to explain processes and solutions. The Ontario curriculum encourages evaluation through the 2 specific expectations in Advanced Functions and 5 specific expectations in Mathematics of Data Management. This accounts for 4% of the overall specific expectations. For example, in Calculus and Vectors and Advanced Functions, respectively, students are expected to use: “(a) a variety of representations of mathematical ideas (e.g., numeric, geometric, algebraic, graphical, pictorial representations; onscreen dynamic representations), connect and compare them, and select and apply the appropriate representations to solve problems (b) compare the characteristics of functions, and solve problems by modeling and reasoning with functions, including problems with solutions that are not accessible by standard algebraic techniques” (Ontario Mathematics, 2007, p. 95,100). In the Ontario Mathematics curriculum outline for university preparation, students are

encouraged to evaluate various representations of mathematical ideas and solve problems with mathematical reasoning.

The CSEC Mathematics syllabus encourages evaluation through 1 general objective in Consumer Arithmetic and one in Statistics. This accounts for 1% of the syllabus objectives. For example, in Consumer Arithmetic section, students are encouraged to: “(a) appreciate the advantages and disadvantages of different ways of investing money” (CSEC Mathematics, 2010, p. 15). The specific objective here requires students to assess the advantages and disadvantages of investments.

### **English**

The CSEC English syllabus is organized by 4 discourses – Grammar and Mechanics, Informative, Literary, and Persuasive – which are classified by understanding and expression. The Ontario English curriculum outline is organized under the four strands of oral communication, reading and literature studies, writing, and media studies.

**Theorizing/Inferring.** Conley (2003) states students should make supported inferences and draw conclusions based on textual features, seeking such evidence in text, format, language use, expository structures, and arguments used. In the CSEC curriculum, theorizing/inferring is identified in 2 specific objectives from understanding informative discourse and 1 from understanding literary discourse. This accounts for 9% of the overall English objectives. Examples taken from the English syllabus show students are expected to: (a) “extract implied information (b) draw valid conclusions and inferences from information presented” (CSEC English, 2010, p. 2, 9). The specific objectives stated above are vague, but suggest that students should use inference strategies to extract information accordingly.

In the Ontario English curriculum outline, theorizing/inferring is promoted through 1 specific expectation in oral communication, 1 in reading and literature studies, and 6 times in media studies. This accounts for 11% of the overall expectations. For example, in the

Reading and Literature Studies strand specific expectations 1.4, students are encouraged to: “(a) make and explain inferences of increasing subtlety and insight about texts, including complex and challenging texts, supporting their explanations with well-chosen stated and implied ideas from the texts (e.g., explain what the details in a story suggest about the author’s attitude towards the subject; explain what made them begin to doubt the reliability of the narrator in a novel; identify and explain inferences that can be drawn from the home page of a website)” (Ontario English, 2007, p. 96).

**Questioning/Critical Literacy.** Conley (2003) notes successful students demonstrate connective intelligence, the ability to think independently, and comfortably express themselves. They are able to discuss with the understanding how personal experiences and values affect their reading and comprehension, for instance. In the CSEC English syllabus, critical thinking is encouraged through 1 specific objective in understanding literary discourse. This accounts for 3% of the courses objectives. Specific objectives 8 in the section on understanding – literary discourse, students are encouraged to: “respond[ing] to good literature (West Indian and other literature in English): novels short stories, poems and plays; making critical appraisal of values and concepts expressed in literature, and relating these to everyday living” (CSEC English, 2010, p. 14).

Critical literacy, as a specific expectation, is encouraged in each strand in the Ontario English curriculum outline. It is identified twice in oral communication and once in reading and literature studies, writing, and media studies, respectively. This accounts for 7% of the course expectations. In the Oral Communication and Writing strand, under specific expectation 1.8, students are expected to: (a) “identify and analyze in detail the perspectives and/or biases evident in oral texts, including complex and challenging texts, commenting with understanding and increasing insight on any questions they may raise about beliefs, values, identity, and power (b) explain, with increasing insight, how their own beliefs, values,

and experiences are revealed in their writing (e.g., examine their writing to check for bias and to determine whether their language and ideas are inclusive and appropriate; explain how a script they have written for a scene between two co-workers subtly depicts one as patronizing the other)” (Ontario English, 2007, p. 93, 102) . As stated in the specific expectations, critical literacy is promoted thorough the questioning of the students’ own understanding, beliefs and values.

**Synthesizing.** Conley (2003) reports students should go beyond the facts presented in reading and lectures and allow questions to emerge from the text. They should identify connections with other concepts they have learned and imagine alternative to a text’s final content message or conclusion. There is no mention of synthesizing in either the general or specific objectives in the CSEC English syllabus. This accounts for 0% of the CSEC English syllabus.

In the Ontario English curriculum document, synthesizing information is introduced through 1 specific expectation in oral communication, 2 in reading and literature studies, and one in writing. This accounts for 6% of the learning outcomes. In the Reading and Literature Studies strand, specific expectation 1.5 states students should: “extend understanding of texts, including complex and challenging texts, by making rich and increasingly insightful connections between the ideas in them and personal knowledge, experience, and insights; other texts; and the world around them” (Ontario English, 2007, p. 97). From this specific expectation, students are expected to make thoughtful connections between literary texts and their personal experiences.

**Evaluating.** Conley (2003) states that students should be aware of the differences between summary, description, interpretation, and analysis. They should think comparatively and make connections across texts and points of view, enriching and expanding the understanding of the materials. The CSEC English syllabus encourages evaluating through 2

specific objectives in understanding persuasive discourse and 1 in expressing persuasive discourse. This accounts for 9% of the course objectives. In the CSEC English syllabus, students are encouraged to evaluate texts through the specific objectives of: “(a) evaluate the effectiveness of language devices used to persuade (b) recognize the range of techniques of persuasion employed in social intercourse and by the mass media and assess the persuasive effects (c) present reasoned comments on proposals and situations of various kinds, in language that is clear and appropriate to the occasion” (CSEC English, 2010, p. 3, 16).

The Ontario English curriculum document introduces evaluating through 6 specific expectations in oral communication, 4 in reading and literature studies, 3 in writing, and 3 in media studies. This accounts for 23% of the learning outcomes of the course. For example, in the Oral Communication strand, the specific expectation states that students should: “(a) identify a range of their skills in viewing, representing, reading, and writing and explain how the skills help them improve their oral communication skills (e.g., identify the oral communication skills they will require for post- secondary education and write an action plan that addresses their identified needs; explain how deconstructing literary texts helps them create oral texts” (Ontario English, 2007, p. 95)

## **Biology**

The Ontario Biology curriculum outline is organized into 6 strands: (1) scientific investigation and career exploration, (2) biochemistry, (3) metabolic processes, (4) molecular genetics, (5) homeostasis, and (6) population dynamics. The CSEC Biology syllabus’ areas of concentration are Section A: Living Organisms in the Environment, Section B: Life Processes and Disease, and Section C: Continuity and Variation.

**Theorizing/Inferring.** In the Ontario Biology curriculum document, the second strand Biochemistry encourages theorizing/inferring through 2 specific expectations, 1 in metabolic processes, 1 in molecular genetics, 1 in homeostasis, and 3 in population dynamics. This

accounts for 12% of the course expectations. In the Biochemistry and Population Dynamics strand, examples include: “(a) explain the roles of various organelles, such as lysosomes, vacuoles, mitochondria, internal cell membranes, ribosomes, smooth and rough endoplasmic reticulum, and Golgi bodies, in cellular processes (b) explain factors such as carrying capacity, fecundity, density, and predation that cause fluctuation in populations, and analyze the fluctuation in the population of a species of plant, wild animal, or microorganism” (Ontario Science, 2008, p. 79, 87). Students are not only required to distinguish or differentiate but should be able to explain the functions of various organelles, thus encouraging students to move beyond the surface to deep thinking.

The CSEC syllabus encourages theorizing/infering through 2 specific objectives in Living Organisms in the Environment, 1 in Life Processes and Disease, and 2 in Continuity and Variation. This accounts for 6% of the learning outcomes. In the Biology syllabus, specific objectives 2.4 and 2.9 include: “(a) explain how environmental factors affect the rate of photosynthesis (b) predict the results of crosses involving one pair of alleles in the heterozygous, homozygous dominant and recessive conditions” (CSEC Biology, 2017, p. 22, 40). These objectives require students to explain by theorizing the environmental factors that affect photosynthesis. It requires students to use existing knowledge along with knowledge gained from the course to make strong inferences.

**Questioning/Critical Literacy.** The Ontario curriculum encourages questioning/critical literacy through 1 expectation in biochemistry, metabolic processes, molecular genetics, and population dynamics, respectively. This accounts for 5% of the course expectations. From the Population Dynamics strand, specific expectation 1.1, students are expected to: “analyze the effects of human population growth, personal consumption, and technological development on our ecological footprint (e.g., the deforestation resulting from expanding development and demand for wood products causes the destruction of habitats that

support biological diversity; the acidification of lakes associated with some industrial processes causes a decrease in fish populations)” (Ontario Science, 2008, p. 86). From this expectation, students are encouraged to make informed assessments on human population on the ecological footprint; this promotes deep thinking and critical literacy.

**Synthesizing.** The Ontario curriculum document cultivates synthesizing through 2 specific expectations in homeostasis and 1 in scientific investigation skills and career development, biochemistry, metabolic processes, molecular genetics, and population dynamics respectively. This accounts for 10% of the expected learning outcomes. In the Biology curriculum outline, students are expected to: “(a) synthesize, analyze, interpret, and evaluate qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis and whether it is consistent with scientific theory; identify sources of bias and/or error; and suggest improvements to the inquiry to reduce the likelihood of error” (Ontario Science, 2008, p. 76).

**Evaluating.** Of the specific expectations in the Ontario curriculum document, evaluating is cultivated through 3 specific expectations in scientific investigation skills and career development, 3 in biochemistry, 2 in metabolic processes, 4 in molecular genetics, 1 in homeostasis, and 2 in population dynamics. This accounts for 25% of the expected learning outcomes. An example of evaluating in the Biology curriculum outline is in the specific expectation 1.1: “(a) analyze the role of metabolic processes in the functioning of and interactions between biotic and abiotic systems (e.g., specialized microbes and enzymes in biotechnological applications to treat wastewater in the pulp and paper industry; microbes and enzymes in bioremediation, such as in the cleanup of oil spills; energy transfer from producers to consumers)” (Ontario Science, 2008, p. 80). Students are required to critically assess the role of the metabolic processes and its interactions with various systems. Through this process

students cement their understanding of the biological processes and make real world applications.

In the CSEC syllabus, evaluating is encouraged through 4 specific objectives in Living Organisms in the Environment, 8 in Life Processes and Disease, and 2 in Continuity and Variation. This accounts for 16% of the learning objectives of the syllabus. In the section on living organisms in the environment, specific objective 7 requires students to: “(a) apply the knowledge of the interrelationship of organisms with the environment to identify problems affecting the growth and survival of populations” (CSEC Biology, 2017, p. 12).

## **Chemistry**

The CSEC Chemistry syllabus is organized into 3 sections: Section A: Principles of Chemistry; Section B: Organic Chemistry; and Section C: Inorganic Chemistry. The Ontario Ministry of Education Chemistry curriculum document offers a course containing 6 strands: (1) scientific investigation skills and career exploration, (2) organic chemistry, (3) structure and properties of matter, (4) energy changes and rates of reaction, (5) chemical systems and equilibrium, and (6) electrochemistry.

**Theorizing/Inferring.** In the Ontario curriculum document for Chemistry, theorizing/inferring is encouraged through 4 specific expectations in organic chemistry, 4 specific expectations in structure and properties of matter, 1 specific expectation in energy changes and rates of reaction, 3 specific expectations in chemical systems and equilibrium, and 2 specific expectations in electrochemistry. This accounts for 15% of the learning expectations. An example of how theorizing is represented in the Chemistry curriculum outline is taken from specific expectation 1.2: “(a) propose a personal course of action to reduce the use of compounds that are harmful to human health and the environment (e.g., weed lawns by hand rather than using herbicides, use cloth bags for shopping to reduce the

number of plastic bags in landfill sites, choose fuel-efficient or hybrid vehicles to reduce fossil fuel emissions)” (Ontario Science, 2008, p. 108).

Theorizing/infering in the CSEC Chemistry syllabus is encouraged through the 6 specific objectives in Principles of Chemistry and 3 in Inorganic Chemistry. This accounts for 8% of the learning outcomes for the subject. An example of theorizing in the CSEC Chemistry syllabus is that students are required to: “(a) distinguish among the three states of matter; explain the changes between the three states of matter in terms of energy and arrangement of particles” (CSEC Chemistry, 2016, p. 12).

**Questioning/Critical Literacy.** Questioning/critical literacy is encouraged in the Ontario curriculum document for Chemistry through the one specific expectation in scientific investigation skills and career development, three in energy changes and rates of reaction, and one in chemical systems and equilibrium. This accounts for 5% of the learning outcomes for Chemistry. In specific expectation 2.4 of the Ontario Chemistry curriculum document, students are expected to: “plan and conduct an inquiry to calculate, using a calorimeter, the heat of reaction of a substance (e.g., the heat of solution of ammonium nitrate, or of combustion of a hydrocarbon), compare the actual heat of reaction to the theoretical value, and suggest sources of experimental error” (Ontario Science, 2008, p. 113).

**Synthesizing.** In the Ontario curriculum document for Chemistry, synthesizing is stimulated through the specific expectations in 2 specific expectations in scientific investigation skills and career development, 1 specific expectation in structure and properties of matter, 1 specific expectation in chemical systems and equilibrium, and 4 specific expectations in electrochemistry. This accounts for 7% of the learning expectations. In the Organic Chemistry strand, specific expectation 2.2 requires students to synthesize information by: “(a) use[ing] International Union of Pure and Applied Chemistry (IUPAC) nomenclature conventions to identify names, write chemical formulae, and create structural formulae for the

different classes of organic compounds, including hydro- carbons, alcohols, aldehydes, ketones, carboxylic acids, esters, ethers, amines, amides, and simple aromatic compounds” (Ontario Science, 2008, p. 108).

In the CSEC syllabus for Chemistry, synthesizing is encouraged through 3 specific objectives in Principles of Chemistry. This accounts for 3% of the learning objectives. In specific objective 2.5, students are encouraged to synthesize information by: “(a) apply[ing] suitable separation techniques based on differences in properties of the components of mixtures (CSEC Chemistry, 2016, p. 13).

**Evaluating.** The Ontario curriculum encourages evaluating through 1 specific expectation specific expectation in scientific investigation skills and career development, 3 specific expectations in organic chemistry, 2 specific expectations in structure and properties of matter, 5 specific expectations in energy changes and rates of reaction, 2 specific expectations in chemical systems and equilibrium, and 4 specific expectations in electrochemistry. This accounts for 18% of the learning outcomes. In specific expectation 1.1, students are encouraged to evaluate by: “(a) assess[ing] the impact on human health, society, and the environment of organic compounds used in everyday life (e.g., polymers, nutritional supplements, food additives, pharmaceuticals, pesticides” (Ontario Science, 2008, p. 108).

The CSEC syllabus for Chemistry encourages evaluating through 2 specific objectives in Principles of Chemistry, 1 specific expectation in Organic Chemistry, and 3 specific expectations in Inorganic Chemistry. This accounts for 6% of the learning objectives. In specific objective 7.3, students are encouraged to evaluate by: “(a) discuss[ing] the strength of acids and alkalis on the basis of their completeness of ionization (CSEC Chemistry, 2016, p. 18).

## Physics

The Ontario Physics curriculum document is organized into 6 strands: (1) scientific investigation skills and career exploration, (2) dynamics, (3) energy and momentum, (4) gravitational, electric, and magnetic fields, (5) the wave nature of light, and (6) revolutions in modern physics: quantum mechanics and special relativity. The CSEC Physics syllabus is arranged into 5 main sections: (1) mechanics, (2) thermal physics and kinetic theory, (3) waves and optics, (4) electricity and magnetism, and (5) the physics of the atom.

**Theorizing/Inferring.** The Ontario curriculum document for Physics encourages theorizing/inferring through 2 specific expectations stated in dynamics, 4 specific expectations in energy and magnetism, 1 specific expectation in gravitational, electric, and magnetic fields, and 1 specific expectation in the wave nature of light. This accounts for 11% of the learning expectations. In the specific expectation 2.4, for example, students should: predict, in qualitative and quantitative terms, the forces acting on systems of objects (e.g., masses in a vertical pulley system [a “dumb waiter”], a block sliding off an accelerating vehicle, masses in an inclined-plane pulley system), and plan and conduct an inquiry to test their predictions”(Ontario Physics, 2008, 198).

In the CSEC syllabus for Physics, theorizing/inferring is encouraged through 1 specific objective in mechanics, 3 specific expectations in thermal physics and kinetic theory, 1 specific expectation in waves and optics, and 2 specific expectations in physics. This accounts for 4% of the learning objectives. For example in specific objective 2.8, students are encouraged to: “(a) explain observations of the effects of thermal expansion” (CSEC Physics, 2015, p. 22).

**Questioning/Critical Literacy.** Questioning/critical literacy is stimulated in the Ontario curriculum outline for Physics through 1 specific expectation in scientific investigation skills and career exploration, 2 specific expectations in dynamics, 1 specific

expectation in energy and magnetism, 1 specific expectation in gravitational, electric, and magnetic fields, 1 specific expectation in the wave nature of light, and 2 specific expectations in revolutions in modern physics: quantum mechanics and special relativity. This accounts for 11% of the learning outcomes. In specific expectation 2.2, students are encouraged to: “(a) solve problems related to motion, including projectile and relative motion, by adding and subtracting two-dimensional vector quantities, using vector diagrams, vector components, and algebraic methods (b) conduct inquiries into the uniform circular motion of an object (e.g., using video analysis of an amusement park ride, measuring the forces and period of a tether ball), and analyze, in qualitative and quantitative terms, the relationships between centripetal acceleration, centripetal force, radius of orbit, period, frequency, mass, and speed”(Ontario Science, 2008, 198).

**Synthesizing.** In the Ontario curriculum for Physics, synthesizing is encouraged through 2 specific expectations in scientific investigation skills and career exploration, 1 specific expectation in dynamics, 3 specific expectations in energy and magnetism, 1 specific expectation in gravitational, electric, and magnetic fields, 2 specific expectations in the wave nature of light, and 2 specific expectations in revolutions in modern physics: quantum mechanics and special relativity. This accounts for 15% of the learning outcomes. In the Physics curriculum outline, specific expectation 1.2 states students should: “assess the impact on society and the environment of technological devices that use linear or circular motion (e.g., projectile weapons, centrifuges, elevators)” (Ontario Science, 2008, p. 198).

Synthesizing in the CSEC syllabus is encouraged through 1 specific objective in waves and optics. This accounts for 1% of the learning objectives. For example, in specific objective 2.3 of the CSEC Physics syllabus, students should: “apply the speed of sound to practical situations” (CSEC Physics, 2015, p. 29).

**Evaluating.** The Ontario curriculum document encourages evaluating in Physics through 1 specific expectation in scientific investigation skills and career exploration, 4 specific expectations in dynamics, 4 specific expectations in energy and magnetism, 6 specific expectations in gravitational, electric, and magnetic fields, 2 specific expectations in the wave nature of light, and 1 specific expectation in revolutions in modern physics: quantum mechanics and special relativity. This accounts for 25% of the learning expectations. In the Physics curriculum outline, students are encouraged in specific expectation 1.1 to: “(a) analyze a technological device that applies the principles of linear or circular motion (e.g., a slingshot, a rocket launcher, a race car, a trebuchet 2.3 (b) analyze, in qualitative and quantitative terms, the relationships between the force of gravity, normal force, applied force, force of friction, coefficient of static friction, and coefficient of kinetic friction, and solve related two-dimensional problems using free-body diagrams, vector components, and algebraic equations (e.g., calculate the acceleration of a block sliding along an inclined plane or the force acting on a vehicle navigating a curve)”(Ontario Science, 2008, p. 198).

Evaluating is stimulated through the specific objectives for Physics stated in all sections of the CSEC syllabus. The sections include 5 specific objectives in mechanics, 2 specific expectations in thermal physics and kinetic theory, 1 specific expectation in waves and optics, 2 specific expectations in electricity and magnetism, and 4 specific expectations in the physics of the atom. In specific objective 1.1, students are encouraged to: (a) discuss how the methodology employed by Galileo contributed to the development of Physics (b) assess the suitability of instruments on the basis of sensitivity, accuracy and range (c) discuss the use of energy from alternative sources, and its importance to the Caribbean (d) give qualitative explanations of the gas laws in terms of the Kinetic theory”(CSEC Physics, 2015, p. 10).

**Table 17***Depth of Learning Comparison Table*

	<b>Theorizing/ Inferring</b>		<b>Questioning/ Critical Literacy</b>		<b>Synthesizing</b>		<b>Evaluating</b>	
	ON	CSEC	ON	CSEC	ON	CSEC	ON	CSEC
<b>Math</b>	5%	1%	5%	-	13%	5%	4%	1%
<b>English</b>	11%	9%	7%	3%	6%	5%	23%	9%
<b>Biology</b>	12%	6%	5%	-	10%	-	25%	16%
<b>Chemistry</b>	15%	8%	5%	-	7%	3%	18%	5%
<b>Physics</b>	11%	4%	11%	-	15%	1%	25%	7%

**Summary**

From the investigation of the CSEC syllabi, 7 of the 11 subjects (64%) based on the phrase and word match showed an alignment of more than 60% with Conley's (2003) standards on content knowledge. Conley's (2003) identification of core academic skills in English accounted for 19% of the CSEC syllabus: 7% in Mathematics, 26% in English, 22% in Biology, 16% in Chemistry, and 12% in Physics were aligned with Conley's standards on depth of learning.

All 11 (100%) subjects assessed from the Ontario curricula showed a minimum alignment of 70% with Conley's (2003) standards on content knowledge. The core academic skills recognized by Conley (2003) showed an 80% alignment with his standards. In regards to depth of learning, the Mathematics curriculum showed an alignment of 27%, English was 47% aligned, Biology was 52% aligned, Chemistry was 45% aligned, and Physics was 62% aligned.

## CHAPTER FIVE: DISCUSSION AND CONCLUSION

As Ministries of Education create curriculum documents that set educational expectations and provide direction for students to achieve educational excellence, what is apparent is the common misalignment between secondary school standards and university expectations. According to Conley (2006), “the effect of poor alignment is that as high schools prepare students to pass state tests, they are not considering how they are preparing students for college success” (p. 2). Additionally, the lack of university readiness has resulted in many lost opportunities (Harris, 2014). It is therefore quite timely to assess how well the Caribbean Secondary Education Certificate (CSEC) syllabi and the Ontario Ministry of Education curriculum documents prepare secondary school students for university success.

The present study referenced the standards expressed in Conley’s (2003) work on “Understanding University Success” and, from this, a conceptual framework was tailored to facilitate this investigation. The overarching codes structured in this framework have been broken down into sub-codes and stated clearly to provide the theoretical underpinning for why it is important for students to be university ready. With the grave importance of university studies in Western countries, which has been identified as the key to developing sustainability, it was essential to determine whether or not students were being prepared for university success or failure in Jamaica and Ontario, as evidenced by the mandated curricula (Brouwer, Jansen, Hofman, & Flache, 2016).

### Discussion of Findings

The purpose of the study was to investigate how well the policies and the curriculum designed for secondary studies in both Jamaica and Ontario supported the transition and preparation of students into university education. This study unearthed the extent to which the content knowledge and curriculum, core academic skills, and depth of learning of both jurisdictions were aligned with Conley’s (2003) standards. This discussion is structured into

the following sections based on the presentation of the conceptual framework and findings: content knowledge and curriculum, core academic skills, and depth of learning.

### **Content Knowledge and Curriculum**

Successful academic preparation for university education is substantiated in two main dimensions: key cognitive strategies and content knowledge. Comprehending and mastering key content knowledge is achieved through the application of broader cognitive skills expressed through cognitive strategies (Conley, 2007). According to Roderick, Nagaoka, and Coca (2009), successful secondary school graduates possess the knowledge and skills in Mathematics and English, among other subjects, which are necessary for admittance and success in university education. The secondary school graduate must complete a comprehensive and thorough curriculum grounded by education in the core academic disciplines, to be university ready (Roderick, Nagaoka, & Coca, 2009). Therefore, to determine whether or not students in Jamaica and Ontario were university ready, it was necessary to look at the content that was to be learned. In “Redefining College Readiness”, Conley (2007) identifies content knowledge and core academic skills as principle indicators for post-secondary readiness, which also applies to university readiness. Content knowledge refers to the foundational concepts in a particular subject area. Consequently, students who are university ready are those who comprehend content knowledge, deducing from the course key intellectual conceptions (Conley, 2007).

The Caribbean Examination Council (CXC) designed 28 Caribbean Secondary Education Certificate (CSEC) subjects, of which students choose at least 5 subjects, which serves as a minimum requirement for admittance to any of the 2 publicly funded universities and 1 privately owned university in Jamaica. Contrastingly, the Ontario Ministry of Education secondary school system is a credit-based programme, where students must earn a minimum of 30 credits to obtain a high school diploma. In Ontario, the ministry offers 56 courses, of

them “eighteen of the credits are compulsory, earned in a specified number of courses from a list of subjects that every student must take. The remaining twelve credits are optional, earned in courses that the student may select from the full range of courses offered by the school” (Ontario Ministry of Education, 2014, p. 1). The findings drawn from the content knowledge and curriculum documents from both jurisdictions proved useful in assessing the level of preparedness of secondary school students. Out of the 16 courses identified by Conley (2003), 25% (14 of 56) was accounted for in the Ontario Ministry of Education secondary school program, and 46% (13 of 28) was identified in the Caribbean Secondary Education Certificate (CSEC) secondary school program. 11 subjects from both jurisdictions were assessed because they possessed similar content and course name to the courses Conley (2003) acknowledged. These included Mathematics, English, Biology, Chemistry, Physics, Science, Geography, History, Second Languages, Music, and Visual Arts.

### **English**

The knowledge and skills developed in the English course enable students to critically create well-written, structured, and supported work in both oral and written presentations. The foundations of English include reading comprehension, writing, editing, researching, analysis, critiques, and syntheses. To succeed, students need to build vocabulary, strengthen word analysis skills, and utilize reading strategies. Knowing how to extract relevant information from a text and employing various strategies that aid comprehension and retention of information, is key to succeed in English (Conley, 2007).

An analysis of the CSEC English (2010) objectives showed an alignment of 69% with Conley’s (2003) English standards. Reading and comprehension, writing, research skills and critical literacy were the 4 standards proffered by Conley (2003). The organization of the CSEC syllabus is stratified under 2 major sections: understanding and expression. In each sub-section – grammar and mechanics, informative discourse, literary discourse, and

persuasive discourse – there is little mention of developing the academic writing skills of students from the specific objectives noted. Strict emphasis is placed on grammar, diction, punctuation, and tone; while these are important principles in learning English, Conley (2003) stresses that students should be able to use research methodologies and connective intelligence to evaluate and synthesize information when studying English, as well as having a good understanding of linguistics. Conley (2003) states successful students, “use a variety of print or electronic primary and secondary sources including books, magazines, newspapers, journals, periodicals and the Internet [and] evaluate sources critically from the Internet to ascertain their credibility” (p. 26). Additionally, Conley (2003) argues that students should possess the ability to think independently and, “discuss with understanding how personal experiences and values affect reading comprehension and interpretation” (p. 27), as this is a crucial step in critical thinking and literacy. Within the CSEC English (2010) syllabus, it was uncovered that there is neither emphasis placed on gaining listening or research skills, nor critical literacy proficiency. While emphasis is placed on writing argumentatively under the section expressing persuasive discourse (revised in the CSEC English (2015) syllabus as argumentative discourse), the construction of writing thesis statements is not expressed in the syllabus.

The revised CSEC English (2015) syllabus has included reflection as one of the main objectives of the English curriculum, noting that students are encouraged to complete three reflections on an issue or topic of their choice.

According to the CSEC English (2015) syllabus:

Reflection -THREE entries in which the student reflects on the issue/topic/ theme/ event selected should be completed. In the first entry the student must indicate how each piece of data helped shape his or her thinking about the issue/topic/ theme/event. The second journal entry should discuss the use of language in the data selected and the third entry

should state how the process of doing the SBA helped the student to become a better person. The reflection should be written in class under the teacher's supervision. (p. 29)

Encouraging student reflection is essential to 21<sup>st</sup> century teaching. However, a closer look at the syllabus document reveals that reflection is mentioned only once in a specific objective under understanding literary discourse. It states, "literature – a reflection of life-experience as well as a vicarious extension and enrichment of it; a means of evaluating personal values and those expressed in literature, and sometimes forming new values" (CSEC English, 2015, p. 20). There is no mention of it in the additional sections of the course. Conley (2003) acknowledges the importance of critical reflection once information is gathered. He argues that critical reflection, "goes beyond "I liked it" or "I didn't like it"... Writing reflections require reflective and critical thinking. It is crucial that students be able to discuss questions in-depth and adequately defend a position based on their analysis of the material" (p. 20). This suggests that proper integration of critical reflection is necessary in the syllabus objectives and the absence of this depreciates the learning outcomes to be experienced by the student. More instances of reflective practices should be evident within the syllabus document, therefore promoting reflection as a critical educational and life skill. Conley (2003) states, "successful students are able to integrate personal experiences and knowledge with the material they encounter in their coursework" (p. 20). Reflective students produce deeper assessments, critiques, and informed opinions, which aids their writing of argumentative essays or the conduction of peer discussions.

In addition to the minimal presentation of critical literacy are research skills, Conley (2007) argues that university courses "require students to be able to identify and utilize appropriate strategies and methodologies to explore and answer problems and to conduct research on a range of questions" (p. 14). The CSEC syllabus fails to mention the importance of developing research skills, understanding the methodologies involved in research, and how

to use a variety of sources. In “Understanding University Success”, Conley (2003) states that students should be able to differentiate between primary and secondary sources as well as using, “research to support and develop their own opinions, as opposed to simply restating existing information or opinion” (p. 26). Subsequently, the CSEC English (2015) syllabus should be better aligned with Conley’s (2003) standards on research skills and critical literacy, as a lack in these key areas depreciate the learning experience of the student. Moreover, the CSEC English (2015) document lacks specificity, as well as extensiveness. There is limited explanation provided for the stated objectives, therefore fundamentally lacking clarity and instruction. An example of this is taken from understanding grammar and mechanics: “identify effective use of adjectives, word combinations, unusual turn of a phrase” (CSEC English, 2015, p.8). To the researcher, the “...unusual turn of phrase” is not an English terminology or a known concept; therefore, this can be perceived as an elusive, unattainable, and immeasurable objective. This can be problematic for teachers and examiners alike when using assessment tools to evaluate this and other similar learning outcomes stated in the syllabus, in addition to inhibiting the level of preparedness of the student for university studies.

Educational institutions, as Conley (2007) suggests, should, “facilitate a more logical progression and development” when organizing its curriculum, structuring “each subject area around a set of core concepts and supporting information” (p. 26). To facilitate this organization of knowledge, the school should adopt exit standards that specify the learning outcomes of the core academic areas involved (Conley, 2007). In the case of English, building on the most essential skills of listening, speaking, reading, writing, and reflection; Caribbean educational leader and curriculum developers should redesign the syllabus to address the existing deficiencies, and in so doing, better equip secondary school students with the relevant knowledge and skills in English for university success.

The Ontario Ministry of Education (2007) English curriculum expectations showed a 100% alignment with Conley's (2003) English standards. The curriculum expectations are organized from the core standards of speaking, listening, reading, and writing. The high congruency with the Conley's (2003) standards and the Ontario English curriculum was unforeseen, as there is no mention of Conley's (2003) standards in the curriculum document. Both documents were done independent of each other. This consistency was found in the strands of reading and literature studies, writing, and oral communication.

Additionally, the curriculum document focuses on critical literacy and research skills, identified as essential to the learning of the English language by Conley (2003). The strand of reading and literature studies requires the student to read a variety of texts and understand literary essays, as well as identify thesis statements and other structural elements in texts. The learning outcomes of the curriculum document emphasize the importance of speaking to communicate effectively, listening to understand, and reflecting on skills and strategies, among various targeted expectations, that aid in preparing students for university studies. In the oral communication strand of the course, students are encouraged to, "communicate orally for a wide range of purposes, using language effective for the intended audience (e.g., perform a readers' theatre presentation of a written text; deliver a eulogy for a Shakespearean character; role-play an entrance interview at a post-secondary institution; lead a panel discussion)" (The Ontario Ministry of Education, 2007, p. 93). Emerging from the curriculum document is the consistency of critical literacy and research. Each strand has a specific expectation geared towards critical literacy. For example, in the English curriculum document, the critical literacy expectation states students will:

Identify and analyze in detail the perspectives and/or biases evident in oral texts, including complex and challenging texts, commenting with understanding and increasing insight on any questions they may raise about beliefs, values, identity, and

power (e.g., compare and analyze the meaning in the songs of several hip-hop artists; analyze the perspectives of various participants on an expert panel about global warming). (Ontario Ministry of Education, 2007, p. 92)

Here, we see critical literacy is encouraged through a series of important current affairs topics and music, which makes for stimulating classroom discussions. Students will use themes such as these and be able to confidently create oral or written presentations on current issues, critically. The last strand in the English course, Media Studies, takes learning English a step further by critically assessing media texts and presentations. This strand allows students to evaluate media presentations based on their purpose and audience. It facilitates an understanding of the various conventions and techniques that are used to communicate, shape content and create meaning. Under the specific expectation of critical literacy in the Ontario curriculum outline, it requires students to:

Identify and analyze the perspectives and/or biases evident in texts, including complex and challenging texts, commenting with understanding and increasing insight on any questions they may raise about beliefs, values, identity, and power (e.g., debate the implicit assumption in an anti-smoking campaign that it is acceptable to limit some individual freedoms to achieve a collective social benefit; determine whether and how mainstream media coverage of a war or conflict manufactures consent or creates support for the war effort). (Ontario Ministry of Education, 2007, p. 106)

Furthermore, the writing strand encourages the development of the student's research skills throughout the course. In the curriculum document, students will:

Locate and select information to fully and effectively support ideas for writing, using a variety of strategies and print, electronic, and other resources, as appropriate (e.g., create a research plan and track their progress; identify a wide range of sources that

could provide appropriate information relevant to their assignment, such as books, periodicals, blogs, streamed media, online databases, audio and video recordings and films, and archived newspapers and multicultural community newspapers; search digital media and community resources such as university libraries and government agencies, as appropriate to their topic; conduct interviews with community and other experts in person or online to obtain leads about reliable and informative print and online sources, or to confirm and augment information gathered from other sources.

(Ontario Ministry of Education, 2007, p. 100-101)

Emerging from the entire curriculum document is its focus on developing critical literacy and research as skills for university studies. Comprehensively, the Ontario English curriculum document is constructed with the essential principles of learning the English language, and as such, throughout the document, the standards illustrated by Conley (2003) are consistently realized.

### **Mathematics**

According to Conley (2007), “most important for success in college math is a thorough understanding of the basic concepts, principles, and techniques of algebra. This is different than simply having been exposed to these ideas” (p. 15). He argues that having learned mathematical thinking on a deeper level will facilitate the understanding of other subsequent mathematical concepts. University ready students must acquire more than a, “formulaic understanding” (Conley, 2007, p. 15) of mathematics, they should possess the ability to apply conceptual understandings in various contexts to problem solve or interpret solutions and use technologies in mathematics wisely.

From the study, it was realized that the Ontario Mathematics (2007) curriculum document showed an alignment of 90%, while the CSEC (2010) Mathematics syllabus showed an alignment of 77% with Conley’s (2003) standards. The CSEC syllabus covered all

five sections posited by Conley (2003), but lacked greatly in the area of mathematical reasoning. Although this area is difficult to identify, the importance of mathematical reasoning cannot be negated and therefore, should be thoroughly developed through the specific objectives of the syllabus, according to Conley (2003). The absence of this in the CSEC syllabus is cause for concern, in that it can be argued that students are only applying formulaic expressions but not utilizing the metacognitive skills necessary to problem solve in mathematics. An example of the absence of mathematical reasoning is seen in the area of worded problems from the CSEC Mathematics (2010) syllabus. Of the 176 specific objectives, there was only 1 mention of “solve word problems” in Section 7 – Algebra. This objective is superficial in its instruction and therefore insufficient for students to cultivate the mathematical reasoning skills necessary for university studies. Conley (2003) acknowledges the importance of incorporating worded problems in Mathematics, as he states, “successful students are able to work with mathematical notation to solve problems and to communicate solutions; translate simple statements into equations (e.g., “Bill is twice as old as John” is expressed by the equation  $b=2j$ )” (p. 36). The Ontario Mathematics (2007) curriculum document incorporates worded problems in their Advanced Functions and Calculus and Vectors courses:

1.1 Gather, interpret, and describe information about real-world applications of rates of change, and recognize different ways of representing rates of change (e.g., in words, numerically, graphically, algebraically), 1.3 sketch a graph that represents a relationship involving rate of change, as described in words, and verify with technology (e.g., motion sensor) when possible. *Sample problem:* John rides his bicycle at a constant cruising speed along a flat road. He then decelerates (i.e., decreases speed) as he climbs a hill. At the top, he accelerates (i.e., increases speed) on a flat road back to his constant cruising speed, and he then accelerates down a hill.

Finally, he comes to another hill and glides to a stop as he starts to climb. Sketch a graph of John's speed versus time and a graph of his distance travelled versus time.

(Ontario Ministry of Education, 2007, p. 95)

This representation in the Ontario curriculum document is specific, gives substantial information on what is expected, and provides suitable examples for correct interpretation.

Likewise, Conley (2003) argues that successful students recognize the broad range of applications for mathematical reasoning; they “know that mathematical applications are used in other fields. (E.g. carbon dating, exponential growth, amortization tables, predator/prey models, periodic motion and the interactions of waves)” (Conley, 2003, p. 36). There is no mention of these suggested fields in the CSEC syllabus document. However, the Ontario Mathematics curriculum outline identifies exponential growth. This example is seen in the Advanced Functions course, as it states:

Pose problems based on real-world applications of exponential and logarithmic functions (e.g., exponential growth and decay, the Richter scale, the pH scale, the decibel scale), and solve these and other such problems by using a given graph or a graph generated with technology from a table of values or from its equation. (Ontario Ministry of Education, 2007, p. 88)

The Ontario Mathematics curriculum outline goes further to introduce the course Mathematics of Data Management. Although Conley (2003) states that statistical studies are not a prerequisite to university introductory math courses, he acknowledges statistics as useful for data analysis in the social and natural sciences. The Mathematics of Data Management course contains a strand on Statistical Analysis that fulfills the basic standards Conley (2003) identifies. Covering 90% of Conley's (2003) standards, the Ontario Mathematics curriculum outline is structured to assist students to think deeply, apply mathematical reasoning skills and strategies, while learning the core content necessary for

university success.

Additionally, the CSEC Mathematics course recognizes Statistics as an important topic in their Mathematics course, therefore satisfying the optional Statistics standards in Mathematics expressed by Conley (2003). Although the CSEC curriculum shows an alignment of 77% to Conley's (2003) standards, it suggests that the existing content knowledge is a good foundation to build on. Interweaving mathematical reasoning, which is a large part of Conley's (2003) standards, would solidify and broaden the knowledge base of students as well as improve the learning outcomes.

### **Natural Sciences**

The courses organized under the Natural Sciences emphasize scientific thinking in all areas. Successful students synthesize the information learned by communication conventions followed by scientists. Students are able to appreciate the nature of science, that it is both constant and evolving (Conley, 2007). In the natural sciences, students, "master core concepts, principles, laws, and vocabulary of the scientific discipline being studied. Laboratory settings are the environments where content knowledge and scientific key cognitive strategies converge to help students think scientifically and integrate learned content knowledge" (Conley, 2007, p. 15).

The Ontario Ministry of Education (2008) Chemistry curriculum showed 76% alignment in Chemistry and 100% alignment for Biology and Physics with Conley's (2003) standards in Natural Sciences. The topics identified under the various courses and strands showed a direct alignment with the knowledge and skills encouraged in the Natural Sciences indicated by Conley (2003). Apparent in the curriculum document for the Natural Sciences are the foundational concepts, as well as historical perspectives that are coupled with modern applications. The content knowledge and structure in the Ontario curriculum for the Natural Sciences show a detailed presentation of the expectations, in addition to the breadth of the

content covered. In the Biology course identified in “Understanding University Success”, successful students are knowledgeable of the, “general structure and function of cells, understand the genetic principles that guide inheritance of biological traits, understand the organization and classification of living systems, and understand concepts of biological change and the evolution of species” (Conley, 2003, pp. 47-48). In the Chemistry course, students understand the nature of the physical and chemical properties of matter, atomic structure and bonding, and the principles that explain chemical reactions. Successful students in the Physics course understand the concepts of energy, comprehend the principles of motion, and understand the concepts related to matter and its properties. Within the Ontario Chemistry curriculum document, students are encouraged to, “assess the benefits to society of technologies that are based on the principles of atomic and molecular structures. (E.g., magnetic resonance imaging [MRI], infrared spectroscopy, X-ray crystallography, nuclear energy, medical applications of spectroscopy and mass spectrometry)” (Ontario Ministry of Education, 2008, p. 110). Noted in this expectation is the relevant information on imaging software, machines, and nuclear energy, which are critical knowledge areas in 21<sup>st</sup> century education. However, the document moves beyond the basics Conley (2003) identifies to using relevant concepts, terminologies, and technological advancement as the basis for a conversation. All the standards Conley (2003) expressed in “Understanding University Success”, except for Electrochemistry, are covered in the Ontario Chemistry curriculum outline.

The CSEC Chemistry (2013) syllabus, on the other hand, focuses on the knowledge gained from the foundational theories and concepts central to the understanding of Chemistry. The syllabus showed an alignment of 51% for Chemistry, 84% for Physics, and 100% for Biology with Conley’s (2003) standards in the Natural Sciences. The low percentage of alignment with Conley (2003) standards in Chemistry, for example, stems from

the various superficial specific objectives documented in the syllabus. The common learning outcomes are definitions, descriptions, historical theories, identification of different concepts, and the explanation of relevant concepts. An example in the section on Organic Chemistry emerges from specific objective 3.8, stating, “describe the fermentation process by which ethanol is produced from carbohydrates” (CSEC Chemistry, 2016, p. 31), while a description of a process is necessary to the understanding of the fermentation process, broadening the student’s understanding of this process should be encouraged, allowing them to theorize on a wider scale, utilizing current data or making better use of real world applications.

The use of modern technological practices or advancements is hardly synthesized in the CSEC natural science syllabus documents to ensure students are informed of the modern applications and information in content areas such as these. According to Conley (2003), the content area must be extensive and relevant to ensure students are adequately prepared to be successful in university studies. Since universities require greater specialization (Conley, 2003), the content knowledge of the courses offered at the secondary level should form a solid foundation for university courses to build on. Low expectations and lack of relevancy at the secondary school significantly impacts the learning potential of the student, as well as impeding preparation for richer university study. As cited in D’Agostino and Bonner (2009), “because high school curricula and state tests and exit exams are based on standards that are below college expectations, students believe that they are ready for college by receiving good high school grades and meeting or exceeding performance standards on state tests” (p. 26). The implications of low secondary school standards, stated by D’Agostino and Bonner (2009), are that it creates false assurance, as students believe that they are ready for university studies. Therefore, it is crucially necessary that the content knowledge and curriculum of the syllabus used to prepare students is extensive, relevant, and provides up-to-date information in the specified area of academia. The standards and expectations in the natural sciences

should be reflective of the complexity of academia to promote university readiness and success.

### **Core Academic Skills**

Successful university preparation involves the acquisition of core academic skills, which guarantees a student's ability to thrive in tertiary environments. Conley (2003) identifies two overarching academic skills, which are writing and research. He posits, "expository, descriptive, and persuasive writing are particularly important types of writing in college" (Conley, 2007, p. 14). University writing requires students to write lengthy presentations of arguments, clearly substantiating each point. Students must be able to edit, organize, and formulate a variety of writing formats. University courses require the evaluation of information from various sources, in addition to the knowledge and application of research methodologies. This study addressed the core academic skills in English, deconstructing these core academic skills into speaking, reading, writing, listening, and research skills.

Of the 70 specific expectations in the Ontario English (2007) curriculum, 56 specific expectations (80%) focused on the core academic skills of reading, listening, writing, speaking, and research skills. It is imperative to note that the Ontario English curriculum document is organized by these core academic skills. The first strand, oral communication, allows students to cultivate the essential skills needed for effective communication. It gives students the opportunity to master one skill at a time, whether it be using active listening strategies, using listening comprehension strategies, or demonstrating an understanding of the content. The organization of the course allows students to focus on gaining the necessary skills they need before they are asked to produce written presentations. The emphasis placed on each core academic skill gives students the opportunity to thoroughly develop a deeper understanding of how to utilize the strategies associated with the specified skill.

The CSEC English (2015) syllabus is organized into 4 sections: grammar and mechanics, informative discourse, literary discourse, and persuasive discourse. Here, the focus of the syllabus is on the production of the subject area, instead of the skills and strategies needed for this production. Hence, only 19% of the CSEC syllabus is aligned with the core academic skills. There is minimal reference to writing, listening, speaking, and reading, when compared to the 32 specific objectives in the syllabus. Therefore, the core academic skills of reading, writing, critical thinking, research skills, and oral communication, which are highly valued by professors, “are recognized as the weakest areas of preparation in high school” (Roderick, Nagaoka, & Coca, 2009, p. 190). The CSEC syllabus is characterized by descriptive, expository, and persuasive writing styles, which are the types of writing secondary school graduate students, will engage in in university studies.

Nevertheless, to adequately support these writing styles, attention must be placed on garnering the skills that facilitate this production. The CSEC curriculum predominately focuses on the production, ignoring the importance of reading, listening, oral communication, and research skills. Consequently, this reinforces a sense of false security, as students believe they are performing at the academic level required from universities. However, without the sufficient development of each core academic skill, students will be unable to evaluate, synthesize, and critically assess materials before producing written work. This creates a deficit in the actualization of learning outcomes, which drastically reduces university preparedness and success.

### **Depth of Learning**

According to Conley (2007), “the success of a well-prepared college student is built upon a foundation of key cognitive strategies that enable students to learn content from a range of disciplines” (p. 12). Regrettably, the development of key cognitive strategies in secondary school is often minimized by an instructional emphasis on, “de-contextualized

content and facts necessary to pass exit examinations or simply to keep students busy” (Conley, 2007, p. 12). High-stakes standardized tests require students to recall fragmented information, often resulting in the absence of depth and breadth in the content (Conley, 2007). According to Marzano, Pickering, and McTighe (1993), “the tests rarely require students to apply their learning and almost never require students to exhibit proficiency in higher forms of cognition” (Marzano, Pickering, & McTighe, 1993, as cited in Conley, 2007, p.12). Conley (2003) acknowledges the work of Marzano (2001), who developed the depth of knowledge categories, stating that:

Marzano’s New Taxonomy is hierarchical; one level builds off of another, so that each level requires progressively more cognitive skill, effort, and sophistication. The hierarchy is based on the conception that each level requires more sophisticated processing in short-term memory before information is moved to long-term memory. This empirically derived framework is based on brain research and on cognitive and information processing sciences. (p. 10)

Based on the importance of the key cognitive strategies mentioned by Conley (2003) and Marzano’s (2001) depth of knowledge, the researcher combined these theories to use as codes for this study. The study addressed the concept of depth of learning to evaluate the presence of this in both the syllabus and curriculum documents of Jamaica and Ontario. The subjects evaluated were Mathematics, English, Biology, Chemistry, and Physics.

### **Mathematics**

Of the one 176 specific expectations in the Ontario Mathematics (2007) curriculum document, 27% represented depth of learning, while of the 38 general objectives noted in the CSEC Mathematics (2016) syllabus, 7% represented depth of learning. The topics of the CSEC syllabus are aligned with the standards of Conley (2003); however, the existence of mathematical reasoning is scarcely found in the document. The sub-code synthesizing (at

5%) is the strongest representation of depth of learning in the syllabus. In the Ontario Mathematics (2007) curriculum outline, it was uncovered that synthesizing (at 13%) was also the strongest representation of the learning outcomes in the document. Additionally, theorizing/infering and questioning/critical literacy represented 5% and evaluating represented 4% of the standards expressed by Conley (2003). The CSEC Mathematics (2016) syllabus, notwithstanding the content, is depreciating the learning outcomes students need to be proficiency by focusing on short-term knowledge retention rather than long-term, as Marzano (2001) suggested. The overall percentage of depth of learning represented in the Ontario curriculum suggests that students are engaging in critical thinking. However, seeing that the curriculum document was created in 2007, it is recommended that the Ministry provide a revised document for an updated analysis.

### **English**

Of the 32 specific objectives noted in the CSEC English (2015) syllabus, depth of learning represents 26% of the learning outcomes, while in the Ontario English (2007) curriculum outline depth of learning represents 47%. The strongest areas in the CSEC English (2015) curriculum document was theorizing/infering and evaluating; this suggests that there is some representation of cognitive challenge, as students experience higher cognition levels through the learning outcomes of the syllabus. Contrastingly, the Ontario English (2007) curriculum outline showed the highest representation in evaluating at 23%; this is consistent with evaluation being a necessary step in concretizing the information to be learned. It suggests that students are encouraged to spend time assessing the credence of information, collate information within the given contexts, therefore improving their metacognitive skills (Conley, 2003). Based on the level of critical literacy (3%) in the CSEC syllabus document, it suggests that students are not given the opportunity to assess or question information presented critically, nor is it practiced when students are undertaking a

research because the development of research skills is not evident in the syllabus document. The absence of this, among the other areas of depth of learning, needs a significant push forward so that students can employ their metacognitive skills when producing oral and written formats. The learning expectations of the CSEC syllabus require greater detail and organization, as well as a better fusion of the stated goals of the document.

The topic of reflection in the CSEC English (2015) syllabus is inconsistent within the document and this highlights the lack of proper synthesis. In the rationale of the document it states,

This syllabus strongly promotes reflection on the principle that reflection is the tool, which helps individuals to clarify their own understanding, and enables them to provide themselves and others with satisfying responses. This recognition is seen as being fundamental if teachers are to help students to reach their full creative potential.

(CSEC English, 2015, p. 1)

Within the expressed specific objectives of the syllabus, there is mention of this skill once. This begs the question of how important it is being a reflective student and suggests that it is not necessary for university success.

The construction of the Ontario English (2007) curriculum document facilitates the depth of learning of the student through the cross-application of each specific expectation. For instance, the specific expectation noted under evaluating can also be applied to that of theorizing/infering, and so on. For example, one expectation is to, “identify and analyze the perspectives and/or biases evident in texts, including complex and challenging texts, commenting with understanding and increasing insight on any questions they may raise about beliefs, values, identity, and power” (Ontario English, 2007, p. 97). Another area of cross-application is seen in the specific expectation titled interconnected skills, which is noted in every strand. Here, students are encouraged to,

Identify a variety of their skills in listening, speaking, writing, viewing, and representing and explain how the skills help them read more effectively. (e.g., describe the insights they gained into a short story after viewing a short film based on the story). (Ontario English, 2007, p. 99)

The Ontario English (2007) curriculum document is by no means exhaustive, but it introduces depth of knowledge in ways that are relevant to encouraging deeper critique and analysis of content.

### **Natural Sciences**

Of the 69 specific objectives in the Ontario Biology (2008) curriculum document, 52% of the curriculum accounts for depth of learning based on Conley's (2003) standards. 21% of the CSEC Biology (2017) syllabus represents depth of learning. 45% of the Ontario Chemistry (2008) curriculum accounts for depth of learning, while 16% of depth of learning is represented in the CSEC Chemistry (2016) syllabus. Depth of learning accounts for 12% of the CSEC Physics (2015) syllabus and 63% of the Ontario Physics (2008) curriculum document, based on standards identified by Conley (2003).

The metacognitive skills referenced in this study, as it relates to depth of learning, suggest a close relation to university preparedness and success. Conley (2007) found that his key cognitive strategies involved student engagement in, "active inquiry and dialogue about subject matter and research questions" where students seek to answer and "defend arguments, explanations and lines of reasoning" (p. 13). Conley (2007) argues students should analyze competing and conflicting descriptions to determine commonalities and flaws, synthesize results of the analysis, and make the most reasonable interpretations on a topic or issue. Conley (2007) posits that the student should, "develop and apply multiple strategies to solve routine problems, generate strategies to solve non-routine problems ... and apply methods of problem solving to complex problems require[ing] method-based problem solving" (Conley,

2007, p. 14). He states that these key cognitive strategies represent various “ways of knowing” (Conley, 2007, p. 14).

The minimum representation depth of learning in the CSEC natural sciences syllabi suggests a lack of the needed skills and strategies to be successful in university studies. Noted in the syllabi is its focus on the knowledge of the key concepts and theories in the subject areas. However, there is little mention of analysis, which can be seen when comparing and contrasting a select number of items within the curriculum. The aims expressed in the CSEC Biology (2017) syllabus are to develop problem-solving and critical thinking skills of the students; however, there is no detailed reference in any of the specific objectives and insufficient reference in the suggested practical teaching activities on how this will be carried out. An in-depth look at the CSEC Biology (2017) syllabus showed connections between Biology, Chemistry, and Physics from the stated specific objectives. For example, “discuss the importance of and difficulties encountered in recycling manufactured materials” was a connection to Chemistry and Social Sciences (p. 16); this was mentioned in the Skills and Interrelationships column. Although the column requires greater detail, the effort in mentioning the synthesis is commendable, as students will know that there’s a connection between the natural sciences and the social sciences.

In the study, it was revealed that the specific objectives in the natural sciences syllabi support superficial analysis of the content through the construction of the document and the language used. In the CSEC natural sciences syllabi, the language used were describe, understand, state, relate, and recall. These verbs are indicative of superficial knowledge and analysis and suggest that the utilization of the student’s metacognitive skills is not necessary for meeting the learning expectations of the syllabi. In a report on *Candidate’s Work in the Caribbean Secondary Education Certificate Examination, May/June 2012* on the Chemistry General Proficiency Examination, it was noted that the, “overall performance of candidates in

the 2012 examination was slightly below that of previous years” (p. 2). The Caribbean Examination Council (CXC) examined the strengths and weaknesses they identified from this standardized exit examination and presented the information in the first section under the heading of Factors Contributing to Poor Performance, stating three main factors: (1) writing and balancing equations and use of the correct mole ratio; (2) superficial rather than critical level of understanding of concepts; and (3) limited understanding of practical procedures. The second factor, superficial rather than critical level of understanding of concepts, highlighted the inability of students to provide the correct responses to questions asked:

Candidates seemed not to know how to select the necessary content to answer the questions from their knowledge base. Perhaps candidates need to be provided with more practice to respond to questions that require analysis and explanations so as to improve their critical thinking skills. (CSEC Report, 2016, p. 2-3)

The example above has underscored the point that the Caribbean Examination Council (CXC) acknowledged that depth of learning is lacking. It can be argued that this is inadvertently as a result of the syllabus, as students are experiencing difficulty responding appropriately to questions when they take their exit examinations. The CXC council made a recommendation of how to tackle the student’s superficial knowledge:

The recommendation made in previous reports is worth repeating here. Teachers should engage students in developing deep and enduring understanding of concepts by using strategies that help students to connect ideas and understand principles.

Classroom conversations on concepts should be encouraged and the correct use of terms during classroom conversations should be the norm. In addition, it is important that students be provided with visual images to represent concepts, for example, general formulae, dot-cross diagrams and arrangements of apparatus for experimental procedures. (CSEC Report, 2016, p. 3)

Another area of concern is underscored in the recommendation made by the Council. The CXC council encourages teachers to engage students in developing a deeper understanding; however, could it be that the syllabus document is failing to provide the necessary guidance and specificity of instruction to make this learning outcome possible? Teachers rely on the policy documents to provide direction on how to achieve the stated objectives. The findings of the report suggest that there is a lack of specificity and guidance in the syllabus document. This can be seen as a contributing factor to the weak alignment of depth of learning for students, consequently, resulting in the stated low performance on high school exit examinations, specifically CSEC Chemistry.

Contrastingly, the Ontario Science (2008) curriculum follows a more structured approach and uses language that requires deeper analysis of the material being studied. From the Natural Sciences curriculum documents, words such as assess, investigate, evaluate, propose, compare, explain, and predict are distinguishable. At the start of the each course, the first strand deals with scientific investigation skills and career exploration. This strand sets the stage for the following content and goals. Each science course is organized under initiating and planning, performing and recording, analyzing and interpreting, and communicating. From this, each upcoming topic is organized under relating science to technology, society, and the environment, developing skills of investigation and communication, and understanding basic concepts. This creates a systematic outline for information and facilitates the development of the strategies and skills that are conveyed in the specific expectations.

In the Chemistry course, the specific expectation from relating science to technology, society and the environment, for example, requires students to, “evaluate the benefits to society, and the impact on the environment, of specialized materials that have been created on the basis of scientific research into the structure of matter and chemical bonding. (e.g., bulletproof fabric, nanotechnologies, superconductors, instant adhesives” (Ontario Science,

2008, p. 110). Evident in this specific expectation is also the cross-application of the codes synthesizing and evaluating. Evidence of questioning/critical literacy can be seen in various specific expectations: for instance, “formulate relevant scientific questions about observed relationships, ideas, problems, or issues, make informed predictions, and/or formulate educated hypotheses to focus inquiries or research” in Biology; “solve problems related to equilibrium by performing calculations involving concentrations of reactants and products. (e.g.,  $K_{eq}$ ,  $K_{sp}$ ,  $K_a$ , pH, pOH,  $K_p$ ,  $K_b$ )” in Chemistry; and “solve problems related to motion, including projectile and relative motion, by adding and subtracting two-dimensional vector quantities, using vector diagrams, vector components, and algebraic methods” in Physics (Ontario Science, 2008, p. 76, 115, 198). Substantiated throughout the curriculum documents is a consistent relationship between the specific expectations and the standards expressed by Conley (2003), as it relates to depth of learning. The learning outcomes represented here demonstrate the depth of learning that students are expected to experience throughout the natural sciences curriculum document. Engberg and Wolniak (2010) state that, “one of the strongest human capital predictors of college enrollment is academic preparation” (p. 134). Subsequently, the quality of the courses undertaken at the secondary school level is of paramount importance, Conley (2007) postulates that depth of learning and curriculum alignment enables the smooth transition from secondary to university studies.

### **Summary**

Adequate preparation for university education proves to be a challenge for many young adults. The vast amount of literature reviewed in the earlier chapters suggests that there are various aspects involved in preparing students for success in university studies, as well as the importance of education to society and the individual. Researchers have maintained that there is a large gap between the standards and the preparation needed to be successful in university studies (Hoffman, 2003).

As a product of the Jamaican education system and a current international student, there was a personal impetus to undertake this particular research. After visiting various high schools in St. Catharines, Ontario, and learning of their extensive curriculum and secondary school exit standards, I was curious to understand how well both systems prepared students for university studies – and if not, where were the gaps that needed to be addressed.

Through the document analysis, a procedure in qualitative research, both syllabus and curriculum documents were analyzed to unearth these deficiencies. The codes designed to assess the official documents for the study helped to illuminate the areas that needed development, specifically in the Caribbean Secondary Education Certificate (CSEC) syllabi. The data suggest that while there are gaps in the level of preparedness for students regarding content knowledge and curriculum, core academic skills, and depth of learning, there is an overarching difference between both education systems that should be addressed.

The two-year Caribbean Secondary Education Certificate (CSEC) program for secondary school students in Jamaica culminates with students taking exit examinations to get the required passes to enter into university studies. Based on the structure of these examinations, high academic performance is a primary indicator for university readiness. Consequently, the factory model and standardized testing are aligned with the modernist, philosophical perspective of education (Serafani, 2002). The CSEC syllabi represent this factory model of assessment, which is predicated on three main concepts: (1) the school as factory, (2) the child as product, and (3) standardized testing as quality control (Serafani, 2002). Evident in the CSEC syllabi is the focus on solidifying students' understanding of the content knowledge that is mandatory for university education, which is thereafter, tested (Caribbean Examination Council, 2010). Based on the description and objectives of the courses, it can be argued that the CSEC syllabi require students to focus on broader content knowledge, without any level of differentiation in a subject area. The CSEC Mathematics

syllabus, for example, covers all the areas that are pertinent to high performance in the exit examinations and there is no student choice in the topics studied. Opposite to this syllabus structure is the Ontario curriculum outline, which exhibits high levels of choice and differentiation. The 56 subjects offered by the ministry present a, “shopping mall” experience for students, catering to a variety of needs and abilities by diversification in two ways; one, differentiated curriculum and two, the degree of difficulty (Davies & Guppy, 2014, p. 98). An example of this is seen in the Ontario graduation requirements state that students must complete three credits in Mathematics, completing one credit in Grade 11 or 12 (Ontario Ministry of Education, 2014). There are three University preparation courses in Grade 12 – Advanced Functions, Calculus and Vectors, and Mathematics of Data Management; therefore, students can choose to study one to two mathematics courses in Grade 12, providing that they have completed the pre-requisite in Grade 11. If students opt to do one math course in Grade 12, this limits the content knowledge of the student in the other areas of the mathematics curriculum and this lowers the level of preparation based on the content knowledge students must know to be successful in university studies.

### **Implications**

The findings of this research have several implications for theory, practice, and further research in the studies on university readiness of secondary school graduates. The implications of this study serve to inform all stakeholders, curriculum developers, and policy-makers in secondary and university education.

#### **Implications for Theory and Practice**

The overarching aims of the study were to address how well secondary school students were prepared to transition into university education and the academic skills needed to be successful in Jamaica and Ontario. This study tackled these questions by analyzing the curriculum outlines of Ontario and the syllabus documents of Jamaica, to which particular

attention was given to the content knowledge, core academic skills, and depth of learning expressed through the learning expectations of Mathematics, English, and the Natural Sciences. The theoretical foundation of this study was substantiated in the work of Conley from both “Understanding University Success” (2003) and “Redefining College Readiness” (2007). In the Knowledge and Skills for University Success (KSUS) standards, Conley (2003) states that the knowledge and skills standards identified here should be considered as a starting point for continuing dialogue on preparing secondary school graduates for university success. He states, “this dialogue will help shift the focus of discussion from course titles and grades, to knowledge and skills” (Conley, 2003, p. 10).

Accordingly, one major contribution of the present research is it provides indispensable empirical evidence on secondary education in Jamaica from a syllabus assessment standpoint. This represents only a starting point to the much-needed scholarly discourse in the Caribbean, specifically Jamaica, as it relates to secondary school and university education. The study highlighted several discrepancies in the CSEC curriculum, notably in the areas of content knowledge, core academic skills, and depth of learning.

Congruent with the findings of previous studies on university readiness, researchers have cited a lack of critical thinking and insufficient content knowledge as issues in preparing students for university education. From the analysis of the data on content knowledge, there were five subjects that showed 100% alignment with Conley’s (2003) knowledge and skills standards. Although the level of alignment is outstanding and suggests that the topics covered in these subjects are precisely what is needed for success in university education, the information emerging from the analysis of depth of learning regarding these subjects show that there is room for improvement. Additionally, Roderick, Nagaoka, and Coca (2009) have cited in their research that, “core academic skills are highly valued by colleges and are most often cited by college professors and students as the weakest areas of preparation in high

school” (p. 190). According to their research, “Conley argues that the largest differences in skill demands between high school and college classes are in these core academic skills—particularly in the amount and type of reading and writing required and the analytical and thinking skills emphasized” (Roderick, Nagaoka, & Coca, 2009, p. 190). Policy organizations, such as Achieve, a American-based educational administration, have purported that aligning the content of high school exit examinations with university expectations are an essential step in concentrating on secondary education and university readiness (Roderick, Nagaoka, & Coca, 2009). They have uncovered that students tend to need multiple chances to succeed in these exit exams and as a result, exam standards are lowered to cover only the materials to which students have been exposed (Roderick, Nagaoka, & Coca, 2009). With regards to proficiency in content knowledge, core academic skills, and depth of learning, one variable that may have contributed to this deficiency is their lack of development in the CSEC syllabi. Based on this finding, the Caribbean Examination Council (CXC) should accept the challenge of redeveloping these three areas of their syllabi to better align with Conley’s (2003) standards, as well as borrowing strategies from the curriculum documents of developed countries, as they strive to improve student-learning outcomes.

Another implication of the study corresponds with previous research that high stakes exit examinations do not adequately prepare students for university education. From the findings, it was uncovered that the CSEC syllabi focused on content knowledge and attaining success through the use of high stakes standardized testing. Although tailoring examinations for each subject area of interest is the preferred criterion, and student performance on exit examinations is another method for assessing university readiness (Bishop, 1998), the CSEC report from the Chemistry 2012 examination notes that student performance was poor in the area of depth of learning. This finding is reminiscent of the factory model assessment, as Serafani (2002) mentions: students pass through various stages of the curriculum, with

standardized tests becoming the means of measuring quality. According to Serafani (2002), “standardized testing and the factory model of education have had an enormous impact on the educational structure and practices” (p. 67). The factory model, Davies and Guppy (2014) argue, sacrifice the, “youth’s authentic development in favour of preparing them for post-secondary studies or the job market” (p. 97). Although analyzing the data entailed identifying and codifying objectives and expectations, previous research implies that with the use of high stakes standardized tests, the Jamaican secondary school graduates are at a significant disadvantage in developing the relevant knowledge and skills that are critical for university success.

Striving to accommodate students with varying abilities, the Ontario Ministry of Education has transformed its approach to education, and consequently, schools have become like, “shopping malls” (Davies & Guppy, 2014, p. 98). Differentiating courses by degree of difficulty has become the standard in order to retain students. Davies and Guppy (2014) argue that the Ontario education system exercises, “vertical differentiation” of math courses, creating specialty shops for varied capabilities (Davies & Guppy, 2014, p. 99). The Ontario curriculum, based on the findings, offers students a wide range of choice in specified subject areas, such as Mathematics, and then requires students to narrow their focus in order to gain a deeper knowledge of their topic of choice. Conversely, the CSEC syllabi extend students’ knowledge by covering a wide range of topics with less specificity on metacognitive skills. In the CSEC syllabi, there is neither vertical nor horizontal differentiation between subjects. The level of difficulty of a course is standard as they offer a general proficiency type of exam that students take regardless of their future plans.

Additionally, the transition from factory to shopping mall introduced courses into the curriculum that, “shifted many of their vocational orientation from manual, blue collar skills to those commonly linked with the service economy” (Davies & Guppy, 2014, p. 99). These

accommodations have had a negative impact on academic standards, according to researchers (Davies & Guppy, 2014). Overall both Jamaica and Ontario education systems stand on opposite ends of the spectrum in regards to its expectations. The CSEC syllabi desire to ready students through superficial expectations over a wide range of topics, while the Ontario curriculum outlines seek to prepare students through the specialization of courses, encouraging them to think critically.

Another implication emerging from this study is the development and construction of the syllabus and curriculum documents for both jurisdictions. The Ontario curriculum documents are, in part, developed through a consultative, iterative process, with numerous practitioners and educational leaders over a long period of time. After numerous revisions, the curriculum documents are presented as the instructional guides for secondary school courses. The CSEC syllabi, however, spans over a shorter period of time and is developed from a top down, hierarchical manner. Based on the existing syllabus documents, it can be argued that the process involved in the development of the syllabus documents is inept and insufficient in providing instruction and direction for educators at the secondary level. The CSEC curriculum developers are encouraged to review their curriculum development process as this plays an integral role in student success.

### **Implications for Further Research**

The findings of this study on university readiness and success have engendered implications for further research. Firstly, a deeper understanding of the additional factors that affect the level of preparedness for secondary school graduates would help in tackling the unpreparedness of secondary school students. This particular area of research might focus on student development in the classroom and the disparity between the curriculum and the pedagogy practiced in the classroom. A research into the teacher's role in preparing students

for exit examinations in Jamaica would shed useful light on the extent to which the curriculum provides sufficient instruction and direction in the classroom.

Secondly, additional research examining the development of Caribbean Secondary Education Certificate (CSEC) syllabus documents might also provide useful explanation of its construction. An assessment of the performance of students taking CSEC exit examinations and their performance in the first year of university studies might prove beneficial in determining whether or not students were adequately prepared. Further research in this area may result in a better understanding of the effects of the syllabi on university readiness and possibly create a sense of urgency for Caribbean Examination Council (CXC) to improve the standards and learning outcomes of students.

Thirdly, the topic of student perception is important to their level of preparedness for university success. The notion of students being prepared can also be dependent on individual study habits and their level of interest in university education. Looking at student perception will provide another interpretation of student preparedness for university education and success; this will facilitate a robust understanding of the topic in the discourse.

Statistical data of success is the fourth area that could be addressed for future study. Having statistical data in this area provides a solid reference point for further research as the information garnered from this presentation will allow educational leaders and other stakeholders to have a better understanding of the factors involved in high student performance at the secondary level. This research could be comparative study one, focusing on successful students leaving secondary education and taking a look at their performance in the first year of their university education experience. This would give a true representation of how well students are prepared for university.

Lastly, an assessment of the level of preparedness for students with learning disabilities in both jurisdictions may serve to uncover various factors inhibiting or promoting

their success in university studies. Currently, there is a large gap in research on students with learning disabilities in Jamaica, and an understanding of these factors might inform key stakeholders in creating better programs to facilitate their success and integration into society.

### **Limitations of the Study**

Although the research achieved its aims, there were some unavoidable limitations. The study only assessed the prescribed curricula and syllabi of Jamaica and Ontario. In assessing student preparedness for university education, there are other factors involved in providing a comprehensive assessment. In every education system lays the covert and overt expectations of students; the study, therefore, failed to assess the latent versus the manifest curriculum of both jurisdictions. The study was unable to provide an evaluation of the other educational institutions apart from university education and the idea of streaming, especially in the Ontario education system, as they provide students with the option of choosing the University preparation, college, or workplace pathways – all of which can lead to student success and effective integration into society.

Furthermore, the study did not assess the issue and importance of practice at the secondary level and the effect it has on university readiness and success. Time management was also unexplored as a measurement of core academic skills; however, it was difficult to extract this information from the syllabus and curriculum documents from both jurisdictions.

While these limitations exist, the researcher felt that the assessment of the curriculum to ascertain whether or not students were being prepared for university education and success was a good foundation for further research and discourse in the area. Understanding the extent to which the curriculum documents facilitated university readiness helped the researcher to see the advantages and deficits that exist in the curriculum outlines. The researcher felt that this study is advantageous for curriculum developers, educational leaders, and other stakeholders as they review and revise curriculum documents to promote high-

performance standards. Moving forward, the limitations highlighted from the research can be overcome by future research in this subject area.

### **Conclusion**

University readiness is the level of preparation required of a student to enroll in university studies and be successful (Conley, 2007). This training begins with the instruction, direction, and learning outcomes communicated in the curriculum documents of any education system. The research has pointed out that there is a vast difference between being university ready and secondary school competence. While the findings of the study suggest that the Ontario curriculum documents adequately prepare students for university success, the CSEC syllabi are lacking in all areas, specifically depth of learning in numerous subjects. Better preparation efforts should be employed to facilitate student transitions into university studies, as well as an improvement in the standards set by the Caribbean Examination Council (CXC) to better align secondary school education with university expectations. In so doing, this will tremendously increase the likelihood of students achieving university success.

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