# A Curriculum Analysis: Evaluating the 17 United Nations Sustainable Development Goals within the Nova Scotia Grade 10 Curriculum

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## Abstract

In recent years there has been attention around levels of education for sustainable development (ESD) in school curricula. Education for sustainable development has been a term used to describe curricula that involve the United Nations Sustainable Development Goals (SDGs). There have been a plethora of studies examining how the United Nations SDGs have been incorporated into school curricula; however, this type of study has not yet been performed in Nova Scotia. This study seeks to examine the extent to which United Nations SDGs are represented in the Nova Scotia grade 10 curriculum. This study was carried out using a qualitative content analysis. The results depicted that SDG representation among the grade 10 courses was disproportionate and that certain types of classes had higher representation than other classes. The results also show that certain SDGs are covered at higher frequencies than others. The discussion examines the discrepancies in SDG coverage that students are exposed to depending on what classes they choose to take. Additionally, the discussion investigates perceived barriers to implementing ESD into curricula. Lastly, there are suggestions for future studies and how the Nova Scotia high school curricula can better incorporate ESD into the various courses.

*Key words: Sustainable Development Goal, Nova Scotia, Education for Sustainable Development, Sustainable Development in School Curricula*

# 1.0 Introduction

## 1.1 The Problem

Around the world climate change is happening and global warming is intensifying. The worsening climate crisis is increasing the frequencies of floods, hurricanes, wildfires, droughts, and more. These events can also alter food availability and food security levels, increased levels of severe illness, clean water availability, housing security, and more (Sanson et al., 2019). Canada is also facing sustainability crises. A study by Schwartz and colleagues (2021) examines one of the many social sustainability crises happening currently in Canada. Schwartz and colleagues (2021) found that in several First Nations households there were 5 heavy metals that exceeded the Health Canada's Guidelines for Canadian Drinking Water Quality: lead, manganese, uranium, aluminum, and copper. Ingesting over the safe limit of these heavy metals can cause severe health detriments (Schwartz et al., 2021). Another study by Carpino, and colleagues (2018) examines the threats against environmental sustainability in Canada. This study investigated the impacts of global warming on the Canadian North. Carpino and colleagues concluded that global warming is having a substantial impact on the Canadian North and one of the biggest indicators of the impacts of global warming here in Canada is the rapid permafrost melt in the North. These are just a few of the sustainability crises happening here in Canada, and underline the need for society level awareness of sustainability challenges and informed communities who can create novel and effective solutions.

## 1.2 Importance of Education for Sustainable Development

Sustainability issues are complex and have proven to be difficult problems to solve. Experts have classified these issues as wicked problems (Lönngren et al., 2016, as cited in Block et al., 2018). Problems that are classified as wicked problems are categorized as being wicked

because they are often surrounded with a sense of uncertainty about how to solve the problem and because there are disagreements regarding the norms and values of the problem (Hugé et al. 2016, as cited in Block et al., 2018). "Sustainability education" is related to various associated terms, including education for sustainability (EfS), education for sustainable development (ESD), and environmental education (EE). ESD has been developed to promote the 17 sustainable development goals (SDGs) laid out by the United Nations (UN). In 2015, the UN designed 17 SDGs that act as indicators of sustainability and sustainable development. All 17 goals work to promote the three pillars of sustainability which are social sustainability, economic sustainability, and environmental sustainability (Dickens et al., 2020). The goals are in place to bring an end to issues such as hunger, poverty, climate change, decreasing biodiversity, and more (United Nations, n.d.).

UNESCO has made statements proclaiming the importance of learning about the 17 SDGs within ESD. UNESCO states that possessing ESD allows individuals to have the ability to contribute to the completion of the SDGs (UNESCO, 2017, as cited in Griffiths, 2021). Giving individuals this knowledge will not only help them better understand the SDGs, but it will also engage people as citizens that need to achieve these goals and complete a necessary transformation (UNESCO, 2017, as cited in Griffiths, 2021). ESD has been proclaimed as an education style that is different than just traditional environmental education. It has been said that ESD provides individuals with the ability to critically examine what professionals have to say and test their statements (Vare & Scott, 2007 as cited in Stössel, 2021). Providing ESD during education also provides students with an understanding of their position within the world and environment and allows them to question unsustainable living patterns (Fiselier et al., 2018; Vare & Scott, 2007 as cited in Stössel, 2021).

## 1.3 Education as a Fourth Pillar of Sustainability

There are three widely recognized pillars of sustainability: social sustainability, economic sustainability, and environmental sustainability (Diaz-Sarachaga et al., 2018). For some time, researchers have been stating that there has been a missing pillar of sustainable development and there has been a push to recognize the role of culture as the fourth pillar in sustainable development (Soini & Birkeland, 2014). However, other researchers have argued that education is the missing pillar of sustainability because education can aid individuals in having the proper knowledge to address sustainable development and sustainability problems (Albu-Alruz et al., 2018). In 2017, researchers Biasutti and Frate agreed, stating that education for sustainable development should be a fourth pillar and that ESD is necessary for sustainable development (Biasutti & Frate, 2017, as cited in Albu-Alruz et al., 2018).

## 1.4 Lack of ESD in education

A study by Fiesler and colleagues in 2018, states that many institutions are making a significant effort to incorporate ESD into their curriculums by signing declarations stating that they will further implement ESD into various courses. A host of institutions have also created sustainability classes or have been adjusting class curriculums to discuss sustainability. However, despite these efforts it has been argued by scholars that several institutions are failing to do so (Fiselier et al., 2018). Higher education institutions are educating young adults with the focus on economic competitiveness and capital accumulation which is otherwise known as academic capitalism. In some instances, higher education staff members have been asked to focus on economic and political systems which leads them not think about and question the current state of unsustainable economies (Fiselier et al., 2018). Additionally, even though some institutions have made the commitment to involve more sustainability into their education systems, many have still not (Fiselier et al., 2018). Not incorporating high levels of sustainability

and ESD into higher education systems is a result of many drivers such as policy and sector support. Due to a combination of these factors, higher education systems are producing young adults that are ready to go out into the world and live highly unsustainable lifestyles (Fiselier et al., 2018).

## 1.5 Importance of learning ESD and SDGs in Nova Scotia.

There are several reasons why it is important that the Nova Scotia high school curriculum is equipping students with the necessary education to be able to assess the 17 SDGs. Primarily, there has been an uptick in population numbers in Nova Scotia. In 2011, there were 921,727 people living within the province; however, a more recent census done in 2016 shows that there was a 2% increase in the population to 923,598 individuals (Statistics Canada, 2017). The population increase has also been noted within the province's regions and school districts. For example, the Halifax Regional Municipality (HRM) has been historically increasing in size and is the most populated municipality in all Nova Scotia. In a 2016 census, there were 403,130 people living in the HRM compared to 390,096 in 2011 (Province of Nova Scotia, 2019). Out of the large number of people living in the HRM, the Halifax Regional Centre for Education (HRCE) has also noted an increase in population numbers within schools. The HRCE shows that there were 53,127 students in the HRM during the 2020/2021 school year, which is up from 52,142 students during the 2019/2020 school year (Halifax Regional Centre for Education, 2020).

Nova Scotia has a duty to inform students about ESD, so they are able to assess the SDGs throughout their lives. This will provide students the education necessary to realize the importance of issues such as heavy metals in drinking water in First Nations communities and other issues such as melting permafrost. Additionally, it is also important that this knowledge is

provided since not all students go onto receive secondary educations where they may learn more about sustainability. It is crucial to provide ESD in Nova Scotia high schools because out of the students that do go on to attend post-secondary educational institutes, it is not guaranteed that the program they will pursue will provide them with a good understanding of sustainability and how to meet the SDGS in their personal and professional lives.

## 1.6 Research Gap

A study done by Yuan and colleagues (2021) identified that how the SDGs fit into high school curriculums has not been well-researched. The researchers also state that the majority of studies done to assess the exposure of the SDGs in curriculums have been done on universities. There are several possible reasons as to why this could be. One possible reason for neglecting primary and secondary schools in this type of research could be is that researchers desire to understand if the SDGs have been included in university curriculums. Historically, the position of universities in the realm of education has been crucial in how the development of society unfolds. Universities play an essential role in innovation and shaping society. Researchers have been trying to understand the role of universities in educating the different SDGs since they are vital to the development of society. However, researchers have also been assessing how universities have been implementing education on sustainable development (ESD) into curriculums, in response to the guidelines produced by the United Nations Sustainable Development Solutions Committee (USSDSN). The UNSDSN has produced guidelines to help universities develop a policy on how to include ESD. Lastly, there has been emphasis on research examining the SDGs in university curriculum because researchers want to understand if the integration of ESD can be improved (Pálsdóttir & Jóhannsdóttir, 2021).

## 1.7 Study Significance

      To date there have been no studies examining the presence of SDGs in the Nova Scotia high school curriculums. The aim of this study is to examine the extent to which all 17 UN Sustainable Development Goals are incorporated in the Nova Scotia grade 10 curriculum. In performing this study, the learning objectives of each grade 10 class will be examined.

# 2.0 Literature Review

## 2.1 History of Sustainability

      A study by Kuhlman and Farrington (2010) states that for centuries people have been concerned about the possibility of overexploiting earth's finite resources.  Several years ago, the Club of Rome stated that this concern could be a reality when they published a report predicting that humans were on track to use up natural resources necessary for survival within the time of a decade or two (Kuhlman & Farrington, 2010). This report launched widespread environmental concerns. In response to this report the United Nations World Commission on Environment and Development published the Brundtland Report which introduced the concept of sustainability (Kuhlman & Farrington, 2010). The report defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, n.d.o). The report divided the concept of sustainability into three pillars: society, environment, and economy (Diaz-Sarachaga et al., 2018). Ecological sustainability aims to ensure that species live within their carrying capacities while maintaining biodiversity. Social sustainability aims to uphold and promote a system of democracy that can effectively convey the ideals and peace that everyone wishes to live by. Economic sustainability aims to ensure that everyone's basic needs are met (Dale & Newman, 2005). Additionally, the report emphasized global sustainable development in order to ensure global well-being, good health, and justice and

peace for all (Renoldner, 2013). The Brundtland Report aimed to link the concepts of the environment and development (Diaz-Sarachaga et al., 2018).

Not long after the Brundtland Report was published, the United Nations (UN) created the Commission on Sustainable Development (CSD). The CSD was tasked with creating indicators



*Figure 1 - United Nations. (n.d.). The 17 Goals. https://sdgs.un.org/goals*

of sustainable development. In September of 2000, the CSD published 8 goals to indicate progress towards sustainable development named the Millennium Development Goals (MDGs). These goals were created for global use. Mainly the goals were produced for nations and actors to comprehend necessary actions for sustainable development and to measure their progress in doing so. The MDGs were published with the intent of completion within a 15-year timespan. In 2015, the UN updated the sustainable development indicators by publishing the 17 Sustainable Development Goals (SGDs) to be completed by 2030 (Diaz-Sarachaga et al., 2018). These goals can be seen in figure 1 below.

Under each goal there are additional targets; for example, under goal 3 good health and well-being there are several targets such as reducing global maternal mortality and "strengthening the prevention and treatment of substance abuse" (United Nations, n.d.d). These targets help organizations and government understand specifically what must happen to meet the larger goal. For example, target 3.9 under goal 3 is that by 2030, there must be a steep decline in deaths and illnesses that result from pollution of "air, water and soil pollution and contamination" (United Nations, n.d.d). Additionally, under each target there are indicators listed that organizations and governments can review to determine if they are on track to meet the target. For example, there are 3 indicators under target 3.9. One of the indicators that can be reviewed when determining if a stakeholder is on track to meet target 3.9 is the mortality rate from unintentional pollution. A stakeholder can look at if the rate has decreased, stayed the same, or increased when trying to meet the target. Each of the SDGs have their own targets and indicators to help stakeholders assess if they are becoming more sustainable (United Nations, n.d.c).

## 2.2 Commitment to Sustainability in Canada

In September of 2017, during a UN conference, Justin Trudeau, the Canadian Prime Minister expressed a clear commitment to implementing and meeting the SDGs in Canada. At the conference, Trudeau was quoted saying that "the SDGs are as meaningful in Canada as they are everywhere else in the world" (United Nations, n.d.a). Currently, the Government of Canada has a page within their website that displays all 17 of the SDGs. A website user can click on each goal and see each of the targets under each goal. Additionally, under each target is a chart showing each indicator with the most recent data displaying the progress on meeting the targets. There are other things provided in the chart as well such as the year of when the data was taken, sample size of people if applicable, and where the data was sourced from. However, for some

targets there is no data available, and next to the target it says, "exploring data sources"

(Government of Canada, 2021).

## 2.3 History of Curriculum Design

In order to contextualize this study, it is also essential to explore the question: What is

curriculum? A study done by Michael Young (2014) defines curriculum as a structure that limits

the engaged constituents. Typically, the constituents in the curriculum system can be seen as the

teachers and students who are defined by it, but it can also be the ones who design the

curriculum. A study by Huizinga and colleagues (2014) states that the ones who design

curriculum are often the teachers themselves. This came to be during the 1940s to the 1970s,

during this time period, experts tried to produce teacher proof curriculums. When put into

practice these curriculums failed. Following this, the importance of involving teachers in

curriculum building was recognized. Asking teachers to produce their own curriculums created a

sense of ownership among the teachers, but also at the same time led to some failures within the

new curriculums. Huizinga and colleagues (2014) also found that the teachers were not well

supported in the curriculum design process, and they were not provided the proper education to

design their own curriculums. Upon seeing this, teachers were invited to work together in

groups, also known as teacher design teams, while creating new curriculum to avoid such issues

of lack of skill and knowledge needed. This group collaboration allowed teachers to share

teaching methods and experiences. While the strategy of group collaboration for creating new

curriculum did fill some gaps related to knowledge and skill, other challenges arose. Each

teacher design teams involved teachers with different experience levels. Each team also faced the

challenge of not having the knowledge on how to design a curriculum. Lastly, the teachers also

faced practical issues such as not having enough time to create a high-quality curriculum.  These

issues combined led to gaps and reduced quality within the created curriculum (Huizinga et al.,

2014).

When it comes to designing curriculum, there are several factors that influence how and

why curriculum is produced. A study done Young (2014), explains that teachers try to design

curriculum in such a way that provides the curriculum with milestone learning objectives for

students to achieve; these milestones provide several students with the opportunity to learn

things that they would not typically learn about outside the classroom.  These milestones are also

in place to demonstrate what is possible to learn within the classroom setting. A study by

Boschman, and colleagues (2014) also examines what goes into curriculum design. Boschman,

and colleagues (2014) identify that when teacher design teams design curriculum, they have

three primary drivers. The first driver in designing new curriculum is the pre-existing knowledge

that the teachers come to the design session with. This is the knowledge accumulated from

previous curriculums and how they were designed and used. It is also the knowledge obtained

from past teaching experiences and observed from how students learn best. The second driver in

curriculum creation is external priorities such as mandated curriculums or provided textbooks.

These external priorities can sometimes feel limiting for the teachers, in terms of what the

teachers believe should be taught. The last driver that influences curriculum design is practical

concerns. These concerns often include concerns such as how much time is provided to teach a

curriculum, if there is adequate space to perform group activities, and how might the students

perceive the curriculum.  Overall, there are several factors that drive how a curriculum is

designed and that content that it includes.

## 2.4 Current Curriculum Design

The way that curriculum is designed can influence what students learn from class and

how effective the curriculum can be. It is important that when ESD curriculum is being designed,

that it is produced with knowledge on why sustainability is important in order to help students assess the SDGs within their lives. A study done by Krug and Shaw (2016) analyzes the importance of diverting from the traditional STEM education in schools and adding more importance to certain disciplines to give students STREAMS education. STEM is an acronym that in comprised of the words: science, technology, engineering, and mathematic; whereas STREAMS is an acronym that stands for science, technology, knowledge reintegration, engineering, arts and humanities, mathematics, and sustainability education. Krug and Shaw (2016) explain that STEM dominant curriculums first emerged during an unstable economy in the United States around 2006. During this time, there was also a high global demand for innovation in order to stabilize economies. The United States (U.S.) encouraged STEM education in primary schools to ensure that the next generation would continue to foster innovation and productivity, guaranteeing that the U.S. would continue to be a leader in research, innovation, and technological advancement (Krug & Shaw, 2016).

Not far behind, in 2007 Canada started to recognize the importance of STEM education. The Government of Canada published a report, *Science and Technology Strategy: Mobilizing Science and Technology to Canada's Advantage* (Krug & Shaw, 2016). This report stated that science and technology are both extremely important and used in almost all aspects of life. The report identified STEM as a crucial part of everyday life, but in Canada the need for STEM education was not called for until 2014 (Krug & Shaw, 2016). In 2014, a report was published by the David Dodge who is the Chair of the Expert Panel on STEM Skills for the Future stated that STEM skills in all levels of education is crucial to the prosperity of Canada as a country. As a result of the push for STEM education, Krug & Shaw (2016) did note that Canada and the United States have made significant progress in terms of innovation and economic competition.

However, in Canada, the push for STEM education has not led to more technological experts (Krug & Shaw, 2016).

## 2.5 Education for Sustainable Development

While the importance and drive for high levels of STEM education in primary schools has been recognized and argued as an essential part of the curriculum, the need for sustainability knowledge and education is slowly being acknowledged and implemented as well. Krug and Shaw (2016) argue that more priority should be given to providing STREAMS education meaning: science, technology, knowledge reintegration, engineering, arts and humanities, mathematics, and sustainability education. Krug and Shaw argue that sustainability education is should involve knowledge of social, political, economic, and environmental sustainability to effectively address complex issues that stem from innovation, progress, and global competition (Krug & Shaw, 2016). Taylor and colleagues (2015) state that other parts of the world have also identified the importance of involving sustainability education specifically into primary education curriculums. New Zealand and Australia have been successful in the integration of education for sustainability (Efs) into the country's curriculum. The curriculum in Australia proposes that sustainability is important in developing the skills necessary for sustainable living. EfS also provides students with an understanding of how actions that lead to more sustainable living should consider environmental, social, cultural, and economic systems and their interdependence (Taylor et al, 2015).

For there to be successful sustainable development as a society, it is essential that students in primary and secondary schools learn about the Sustainable Development Goals (SDGs) in addition to general knowledge about sustainability. This is true for several reasons. The United Nations Educational, Scientific and Cultural Organization (UNESCO) argued in 2015 that education has the power to contribute to future sustainable development (Yuan et al.,

2021). In addition, the need for sustainability education is also identified under one of the SDGs. SDG 4 advocates for quality education. Under SDG 4 target 7, the UN states that by 2030 is absolutely necessary that there is widespread education to provide skills that will ensure sustainable development (United Nations, n.d.e; Yuan et al., 2021)). To fulfill the demands, set out by SDG 4 an accurate education surrounding the different SDGs need to be provided (Yuan et al., 2021).

## 2.6 Grade 10 Curriculum in Nova Scotia

In Nova Scotia, high school education provided over the course of 3 years. To graduate high school in Nova Scotia, students are required to take a variety of classes. This includes 3 language credits one at each grade level, 1 fine arts class, 3 math classes one at each grade level, 2 science classes, 1 other class from the sciences or technology departments, 1 physical education class, 1 Canadian history class, and one global studies class (Nova Scotia Department of Labour and Advanced Education, 2021). The classes available to grade 10 students are: drama 10, music 10, visual arts 10, co-operative education 10, life/work transitions 10, core French 10, family studies 10, Gaelic 10, mathematics 10, mathematics at work 10, mathematics essentials 10, German 10, Spanish 10, learning strategies 10, English 10, English plus 10, physical education 10, science 10, skilled trades 10, geography 10, history 10, construction technology 10, and exploring technology 10 (Province of Nova Scotia, n.d.).

## 2.7 ESD in Curriculum

There are classes in the grade 10 Nova Scotia curriculum that have the potential to teach topics that fall under certain SDGs. Under SDG 4: quality education, there is a target, target 4.7 that states by 2030 learned must have the essential knowledge to be able to promote sustainable development (United Nations, n.d.c). Under the Government of Canada website for target 4.7 it

says "exploring data sources" meaning that there is no available data to be able to prove that students have been given adequate education to be able to promote sustainable development (Government of Canada, 2021). Thus, there is currently no widely available data and no studies to date examining how ESD has been worked into Canadian curriculum. In addition, there have been no studies examining how ESD has been incorporated into the grade 10 Nova Scotia curriculum.

## 2.8 Similar Studies

To date, there have been several similar studies that explore the integration of sustainability or the SDGs into curriculum. In 2016, there was a study performed by Jose on business schools in India to examine how sustainability issues and their solutions had been worked into the business curriculum. The study focused on business schools in India in particularly because it appears that Indian businesses have not been held accountable for their actions contributing to environmental stress and were not going out of their way to lessen their impact on the environment. The study aimed to investigate if business students were learning about these kinds of environmental stressors and if they are learning how to be a leader on corporate social sustainability. This study was performed in two different stages. In the first stage the researcher analyzed existing literature. In addition, the researcher reviewed the curriculum of business classes that appeared to teach about sustainability topics from an array of secondary sources. Next, in the second phase interviews with professors were held to discuss at what depth their classes incorporated sustainability topics (Jose, 2016).

Another study done at the University of Iceland examined the incorporation of the SDGs into the curriculum. The goal of the study was to examine the integration of knowledge pertaining to the different SDGs in the five different University of Iceland schools. Another goal

was to identify challenges in incorporating SDG information into the curriculum and to pinpoint areas and opportunities that could benefit from improving the curriculum. This study was performed using a curriculum analysis as well as evaluating the learning outcomes of each class. The research was broken down into four different phases. The first phase was done in preparation for research. In this phase an SDG curriculum analysis key was created along with a data spreadsheet in order to help code and record data. Additionally, in this phase a list of key words and phrases were developed for each SDG. Then the second phase: the pilot phase commenced. In this phase during the academic year 2019/2020 a group of master's students and project leaders met consistently throughout the year. Throughout the year the groups would pilot the study and share their findings during the meeting. This was done to ensure that the study didn't need any changing and that the study could yield quality and comparable data. The third phase of the study was collecting data. Finally, during the fourth phase results from the data were determined (Pálsdóttir & Jóhannsdóttir, 2021).

Additionally, there has been a similar study done that had several research objectives, one of which was to examine how Qatar has incorporated ESD into their curriculum. To be able to this question the researchers utilized a systematic quantitative literature review. In starting this process, key words and phrases were developed such as "Qatar Education System and ESD" and "UNESCO initiatives in Qatar." The researchers then searched these phrases and like phrases through many different search engines such as Google Scholar, Science Direct, and more. Running the key words through the many databases yielded many studies. The studies then had to be reviewed and cut down to only the relevant literature. The relevant studies and other literature were then further analyzed (Fekih Zguir et al., 2021).

# 3.0 Methods

## 3.1 Similar Study Methods

### 3.1.1 Study of Analyzing Sustainability Topics in Indian Business Schools Curriculums

Analyzing the presence of SDGs, the MDGs, or other environmental concepts within curriculum has been done several times by other researchers. For instance, one study done in Indian business schools analyzed the presence of sustainability issues and their solutions in class curriculums. When doing this the researcher analyzed existing documents and curriculum descriptions to evaluate if sustainability topics, issues, and solutions were mentioned. If the researcher had sufficient evidence to believe there was sustainability topics discussed in the class, they would then reach out to the professors of the class to discuss their class more in-depth. The researcher was not able to reach out to all institutions and professors of sustainability classes due to time constraints (Jose, 2016).

While this method or a similar variation of this method can provide a sufficient evaluation of whether sustainability topics are present in the curriculum, it was not chosen to be the method of this study. This was due to factors such as the expressed time constraint of the study period with a combination of other outside factors such as COVID-19 community spread and COVID-19 stresses on teachers. Teachers have experienced a major shift in day-to-day responsibilities during the pandemic (Reimers & Schleicher, 2020; as cited in Kim & Asbury, 2020). Some teachers have had to shift their curriculums online. Additionally, some teachers may have had to take on additional roles such as caring for family members or home schooling their own children (Kim & Asbury, 2020). It has been reported by Kim and Asbury (2020) that teachers have found these experiences to be stressful and overwhelming. In order to not add to the stressors and potential time implications teachers are now facing, the method of interviewing educators to examine the presence of the SDGs within education was not chosen.

### *3.1.2 Analyzing ESD in Curriculums throughout Qatar*

In Qatar a study was performed to analyze the presence of ESD in curriculums throughout Qatar by Fekih Zguir (2021). The researchers of this study determined that there was a lack of peer reviewed literature on this topic. Due to the lack of peer reviewed literature, the researchers mainly relied on articles and website pages that have been produced by government agencies. Additionally, the researchers looked at conference proceedings and forums about sustainability and ESD in the Middle East. Using the collected documents, the researchers performed a systematic quantitative literature review (Fekih Zguir et al., 2021). In a systematic literature review, there is a first search done that will yield many results, and from there the literature can be narrowed down the relevant literature for the study. After the literature is narrowed down, researchers try to make sense of what the literature says, and the ideas brought forward by the literature (Xiao & Watson, 2019). When selecting a method for this study, a systematic literature review was not chosen because that there is no existing literature about SDGs within the Nova Scotia grade 10 curriculum.

### 3.2 Analyzing SDGs in the University of Iceland Curriculum

Pálsdóttir and Jóhannsdóttir (2021) used a four-phase qualitative content analysis to examine the integration of the 17 SDGs within the University of Iceland courses. The first phase of Pálsdóttir and Jóhannsdóttir's (2021) content analysis was to design an SDG analysis curriculum key and a data recording sheet. Phase two was to pilot the SDG analysis curriculum key. Piloting a study can test the quality, comparability, reliability, and consistency of the data and the data collection method (Pálsdóttir & Jóhannsdóttir, 2021). The third phase of the four-step content analysis produced by Pálsdóttir and Jóhannsdóttir's (2021) study is launching the study and collecting the data. The last phase of the study was data dissemination.

## 3.3 Choosing a method

When examining previous methods used when examining SDG and ESD incorporation into school curriculums, using a qualitative content analysis most fit the needs of this study. This is because a qualitative content analysis can easily be done from home during a time of strict COVID-19 restrictions and uncertainties. Qualitative content analysis is based on available existing literature and does not involve interviewing candidates. Online, the Province of Nova Scotia's government website has all grade's curriculum descriptions and learning outcomes posted making these documents highly accessible. With these two factors combined using a qualitative content analysis to perform this study was the best option out of all previous methods used to examine SDGs within curriculum learning outcomes. This study uses a three-phase qualitative content analysis that is an altered version of the four-phase qualitative content analysis used by Pálsdóttir and Jóhannsdóttir's (2021) study.

## 3.4 Qualitative Content Analysis

Qualitative content analysis is a method of analyzing qualitative data. Erlingsson and Brysiewicz (2017) state that a qualitative content analysis is used to break down large amounts of text into clearly refined results. This is done by creating codes before going through the data (interviews or literature) or during the review process. Sometimes the codes can be grouped into categories (Erlingsson & Brysiewicz, 2017; Pálsdóttir & Jóhannsdóttir, 2021). Content analysis is a continuous process that requires researchers to dive into the literature and code and then take a step back and reflect whether codes are missing, or if a certain code should be moved into a different category. After this reflection period takes place, a researcher may go back to the literature and start coding again. Sometimes researchers will need to adjust their codes and categories several times during a content analysis. Once all the literature is assessed and the coding is done, a researcher can identify themes brought forward by the codes (Erlingsson &

Brysiewicz, 2017). Given the circumstances of COVID-19 and a lack of existing literature on

how the SDGs have been incorporated into the grade 10 curriculum in Nova Scotia, a content

analysis was the best option of conducting research to find out the extent to which the SDGs are

reflected in the curriculum. The method of this study was a modified version of the four-phase

content analysis that was used by Pálsdóttir and Jóhannsdóttir (2021) when examining the SDGs

in the University of Iceland curriculum.

### 3.4.1 Phase One

The SDG curriculum analysis key was divided by the different SDGs. Under each SDG I

created different key words, phrases, or codes that pertained to each SDG. Coding is the process

of analyzing data that has been collected from interviews (Deterding & Waters, 2021).

Typically, codes are words or short phrases that are assigned to select portions of visual or

textual data (Skjott Linneberg & Korsgaard, 2019). Phase one of this research project also

entailed creating an SDG analysis curriculum key with key words and codes pertaining to each

SDG which can seen in Appendix 1. I also created a data recording sheet created during phase

one. This data sheet was created in Excel with all of the grade 10 classes listed in the leftmost

column while all of the SDGs were listed in the first row at the top of the spreadsheet. The first

square 1A in the excel was left blank. Very little was altered from Pálsdóttir and Jóhannsdóttir's

(2021) study for phase one of this research project. One key difference in the method used for

this study is that new key words for this study were created because the key words used in the

other study were not listed.

### 3.4.2 Phase Two

In the data collection phase, each class was evaluated one at a time. During the evaluation

period, a course was assessed for one SDG at a time. Courses were scanned for the associated a

priori codes of each SDG. When scanning the curriculum and learning outcomes of each class a

posteriori codes were created as well. If the learning outcomes and course description had some of the key words or concepts related to the associated SDG, the SDG was given a 1. SDGs with a 1 for a certain class meant the class had covered the topic. However, if the SDG code word appeared in the class learning outcomes and description but the code word was clearly not in relation to the SDG topic it was not counted as a 1. For example, SDG 6: clean water and sanitation and SDG 14: life below water both have water as a code word. If the word water appeared in the learning outcomes and description but it was clearly alluding to life below water topics it was not counted as a 1 for SDG 6. Additionally, if two courses used the exact same learning outcome document the document was only graded for SDG integration once and each class that used that learning outcome document was given the same grade for each SDG.

If a class discussed a topic associated with an SDG such as road infrastructure and but did not discuss whether it is vital to increase or decrease current road infrastructure as stated in SDG 9, that was counted as a 1 because the students are learning about the topic of the SDG. This was counted as a 1 because the students are learning about the SDG topic background even though they are not learning how it is associated with a particular SDG. After each grade 10 class had been evaluated in relation to all SDGs, I wrote a personal interpretation of how well the class covered the SDG. This interpretation was done based on if the class had mentioned anything that matched up to the targets under each SDG. There were five different categories of coverage for an SDG. A class could either have no coverage of an SDG or poor, moderate, well, or extensive coverage of an SDG. If a class did cover the SDG poor coverage was the lowest level of coverage a class could have. On the other hand extensive coverage meant that the class covered several themes and targets related to the SDG and taught directly about the SDG in the class. Additionally, a class that covered several SDG targets of the SDG was considered to have taught

that particular SDG better compared to a class that only covered one SDG target of that

particular SDG. However, the interpretation of how well the class covered an SDG was not

confined to the targets. If a class frequently discussed topics relating to the SDG in-depth even if

the targets were not mentioned or alluded to the class was still considered to have moderate to

well coverage of the SDG. For example, if a class covered health topics such as cancer and

diabetes extremely in-depth but did not state the need to reduce deaths and ailments due to these

illnesses it was concluded that certain components of SDG 3: good health and well-being were

well covered.

### 3.4.3 Phase Three

The third phase of this study was data dissemination. The results of this study were

shared with the public in four different settings. On April 7th, 2022, the results of this study were

shared in a poster during a presentation in a gallery setting where anybody was invited to come

to the presentation in the Mona Campbell building on the Dalhousie University Studley campus.

In addition, this poster and the final thesis were uploaded to the Dalhousie College of

Sustainability website under ESS Student Work on April 21st, 2022.

# 4.0 Results

## 4.1 General Trends

When examining the Nova Scotia grade 10 curriculum the learning outcome guides at-a-glance and curriculum guides were examined. The longer learning guides were typically older than the learning outcome at-a-glance documents. Several of these documents had not been updates since the 1990s. However, the learning outcome at-a-glance documents were written much more recently with the majority of these documents published in 2015. Additionally, the longer learning outcome documents did not provide much further insight into what was covered during the select curriculum of that

| | Results |
|---|---|
| SDG 1 | 7 |
| SDG 2 | 2 |
| SDG 3 | 4 |
| SDG 4 | 0 |
| SDG 5 | 4 |
| SDG 6 | 0 |
| SDG 7 | 1 |
| SDG 8 | 7 |
| SDG 9 | 5 |
| SDG 10 | 3 |
| SDG 11 | 2 |
| SDG 12 | 2 |
| SDG 13 | 2 |
| SDG 14 | 2 |
| SDG 15 | 2 |
| SDG 16 | 1 |

*2 - Number of times that an SDG appeared among the Nova Scotia grade 10 courses.*

class. These documents listed the same learning outcomes and included suggested lesson plans for teachers. In both documents the learning outcome statements were very brief and vaguely written. For example, in the Gaelic 10 under culture, one of the learning outcomes is for students to be able to "examine the origins of the Gaels and events leading to their settlement in Nova Scotia" (Nova Scotia Department of Education and Early Childhood Development, 2015f). Many learning outcomes were written similar to this learning outcome. Additionally, many learning outcome statements were vague and could be interpreted as several different things. However, there were a few learning statements that were more specific and less vague.

The number of times in which the SDGs were represented in the Nova Scotia grade 10 curriculum is shown in figure 2 and 3. In each class, not once did the curriculum directly cover

*3 - Number of Times the SDGs Occurred Within the Curriculum*

any of the SDGs meaning that none of the classes taught material directly about the 17 UN

SDGs. Therefore, no classes had extensive coverage of any of the SDGs. However, the majority

of classes still covered topics that pertained to the SDGs. 15 out of all 25 courses offered at the

grade 10 level offered covered some level and range of the SDGs which is also 60% of the

courses offered. The most times an SDG was covered cumulatively between all classes was 7

times. The least number of times an SDG was covered cumulatively between all classes was 0

times. There were two SDGs that were introduced 7 times throughout the grade 10 curriculum.

These two SDGs were SDG 1: No Poverty and SDG 8: decent work and economic growth. Many

classes in the grade 10 Nova Scotia curriculum placed a big emphasis on career knowledge and

understanding salaries and wages related with select career paths. Many classes taught high

school students how to look into the availability and possibility of careers related to the subject

of the class. There were only 2 SDGs that was never discussed in the learning outcomes which

were SDG 4: Quality Education and SDG 6: Clean Water and Sanitation. The average amount of SDGs that were covered in each class in the grade 10 Nova Scotia curriculum was 1.8 SDGs per class. The mean number of SDGs covered per class was 2. The number of SDGs covered by class was disproportionate and some classes had much better SDG coverage than other classes.

All classes provided in the Nova Scotia grade 10 curriculum can be broken down into subject groupings. The academic subject groupings in Nova Scotia that contained grade 10 classes are Arts Education, Career Education, Core French, English Language Arts, Family Studies, Gaelic Language, Other Languages, Mathematics, Learning Strategies, Physical Education, Science, Skilled Trades, Social Studies, and Technology Education (Government of Nova Scotia, n.d.). On average humanities classes scored very low in SDG representation, while STEM and skill related classes covered a higher range of SDGs. There were two classes that each covered 6 SDGs which was most SDGs covered in class between all classes. These classes were History 10 and Life/Work Transitions 10. No class covered any SDGs extensively. There was also a wide range of classes that didn't have any SDG coverage. Often a class would touch upon a certain subject pertaining to an SDG especially in relation to a student's life but would not cover everything related to that particular SDG or view the SDG in a worldwide context.

## 4.2 SDG Representation by Class

The subject grouping of career education classes provided during the $10^{th}$ grade included Life/Work Transitions 10, Career Development 10, and Co-operative Education 10. These classes displayed a range of coverage of the different SDGs. Each of these classes well covered SDG 1: No Poverty and SDG 8: Decent Work and Economic Growth. All three classes each displayed a range of additional SDG coverage as well, each covering different SDGs. Life/Work Transitions 10 covered 6 different SDGs which were SDG 1: No Poverty, SDG 2: Zero Hunger,

SDG 3: Good Health and Well-Being, SDG 5: Gender Equality, SDG 8: Decent Work and Economic Growth, and SDG 10: Reduced Inequalities. One of the learning goals in Life/Work Transitions 10 stated that students would be able to "demonstrate an understanding of the ways that work choices and career patterns affect lifestyle" by the time the class was over (Nova Scotia Department of Education and Early Childhood Development, 2015i). Although this statement is very vague it alludes that students could be learning about the ways in which their career choices impact subjects such as income levels, food insecurity/security, and their personal health and well-being which relate to SDG 1: No Poverty, SDG 2: Zero Hunger, and SDG 3: Good Health and Well-Being. It can be inferred that Life/Work Transitions 10 touches upon these subjects and SDGs although there may not be extensive coverage of SDG 1: No Poverty, SDG 2: Zero Hunger, and SDG 3: Good Health and Well-Being. These SDGs have poor to moderate coverage in Life/Work Transitions 10 depending on what exactly the students are learning. Additionally, Life/Work Transitions does not address everything that the SDGs are in place for which is why the SDGs are not covered extensively in the class. For example, Life/Work Transitions 10 does not cover key elements of SDG 1: No Poverty like ending all poverty situations around the world (United Nations, n.d.b). Life/Work Transitions 10 does not address ending hunger for all around the world which is one of the prominent targets of SDG 2: Zero Hunger (United Nations, n.d.c). Lastly, Life/Work Transitions 10 does not educate on key elements of SDG 3: Good Health and Well-Being such as providing sexual health education for all or putting an end to HIV/AIDS which are two different targets under SDG 3: Good Health and Well-Being (United Nations, n.d.d).

Life/Work Transitions 10 well covers SDG 8: Decent Work and Economic Growth by allowing students to gain the knowledge of how to maintain a career portfolio and the class also

prepares students for making decisions regarding their work lives (Nova Scotia Department of Education and Early Childhood Development, 2015i). Life/Work Transitions 10 does not extensively cover SDG 8: Decent Work and Economic Growth because the class leaves out key elements of SDG 8: Decent Work and Economic Growth such as employment for all (United Nations, n.d.h). Life/Work Transitions 10 has moderate coverage of SDG 5: Gender Equality and SDG 10: Reduced Inequalities. While in Life/Work Transitions 10 students learn an understanding of how social drivers can influence a work environment. Students also learn about social problems within a workplace and how social needs influence the nature and structure of a workplace (Nova Scotia Department of Education and Early Childhood Development, 2015i). The learning outcomes related to how students learn about social needs and structures within a workplace were vague but allude that students could be learning about gender inequalities, racial inequalities, disability inequalities, and other inequalities within the workplace. Life/Work Transitions 10 only moderately covers both SDG 5: Gender Equality and SDG 10: Reduced Inequalities since it is unclear exactly what students are learning about. SDG 5: Gender Equality and SDG 10: Reduced Inequalities are not extensively covered in Life/Work Transitions 10 because the class only educates on certain concepts and targets related to the SDGs. For example, SDG 5: Gender Equality is also in place to end practices such as female genital mutilation which Life/Work Transitions 10 does not educate on (United Nations, n.d.f). In addition, Life/Work Transitions 10 does not address key targets of SDG 10: Reduced Inequalities such as eliminating inequalities between certain countries or fair migration rights (United Nations, n.d.j).

Career Development 10 covered SDG 1: No Poverty and SDG 8: Decent Work and Economic Growth. In Career Development 10 SDG 1: No Poverty is well covered. During

Career Development 10 there is a unit about financial literacy in which students learn how important financial literacy is in everyday life. Students also learn about personal spending habits, money management, and the financial options available to them for further education opportunities in Career Development 10. Career Development 10 also well covers SDG 8: Decent Work and Economic Growth by educating students on skills needed for the workplace, and what types of skills are applicable to different types of job fields (Nova Scotia Department of Education and Early Childhood Development, 2015a). Both of these SDGs are only well covered in Career Development 10 because there are gaps in the SDG coverage such as not educating on certain targets of both SDGs. For example, Career Development 10 does not teach on key concepts of SDG 1: No Poverty such as eradicating poverty for everyone (United Nations, n.d.b). Additionally, Career Development 10 does not touch upon key targets of SDG 8: Decent Work and Economic Growth such as policies for job creation (United Nations, n.d.h).

Co-operative Education 10 covered SDG 1: No Poverty, SDG 5: Gender Equality, SDG 8: Decent Work and Economic Growth, and SDG 10: Reduced Inequalities. Co-operative Education 10 allows students to explore certain career paths and the wages or salaries of the associated jobs (Nova Scotia Department of Education and Early Childhood Development, 2015c). This exploration of jobs and income levels relates to SDG 1: No Poverty and SDG 8: Decent Work and Economic Growth. Co-operative Education 10 covers both SDG 1: No Poverty and SDG 8: Decent Work and Economic Growth well. Co-operative Education 10 also has moderate coverage of SDG 5: Gender Equality and SDG 10: Reduced Inequalities depending on what exactly the students learn in class. In Co-operative Education 10 students learn about social situations within the workplace and types of legislation that has been enacted to protect workers within the workplace (Nova Scotia Department of Education and Early Childhood Development,

2015c). The learning outcomes of Co-operative Education 10 are unclear what social situations and legislation students are learning about; however, it can be inferred that students are being exposed to some level of SDG 5: Gender Equality and SDG 10: Reduced Inequalities.

The academic subject grouping Mathematics displayed overall poor SDG coverage. All three math classes offered in grade 10 including Mathematics 10, Mathematics Essentials 10, and Mathematics at Work 10 all only well covered SDG 1: No Poverty. Each of these classes taught a finance unit that related to SDG 1: No Poverty (Nova Scotia Department of Education and Early Childhood Development, 2015k; Nova Scotia Department of Education and Early Childhood Development, 2015l; Nova Scotia Department of Education and Early Childhood Development, 2015m). In each math class the finance unit had a slightly different unit curriculum. In Mathematics Essentials 10 Students learn to examine interest rates, salaries, tax rates, and best prices based on unit amounts (Nova Scotia Department of Education and Early Childhood Development, 2015m). In Mathematics at Work 10 there is a unit called numbers in which students learn about currency exchange, salaries, and wages (Nova Scotia Department of Education and Early Childhood Development, 2015l). In Mathematics 10 there is a financial mathematics unit in which students learn to investigate personal budgets. Students also learn to examine product prices, international exchange rates for purchasing products abroad, wages and salaries and what would be the net and gross pay of different jobs, and set budgets based on hypothetical needs. In this class students learn about budgets and financial decisions which would impact personal finances (Nova Scotia Department of Education and Early Childhood Development, 2015k). While each of these math classes educate on personal finance and other money related subjects and decisions, students do not learn about key aspects of SDG 1: No Poverty such as eradicating poverty for all (Nova Scotia Department of Education and Early

Childhood Development, 2015k; Nova Scotia Department of Education and Early Childhood Development, 2015l; Nova Scotia Department of Education and Early Childhood Development, 2015m; United Nations, n.d.b). This was why SDG 1: No Poverty was not covered extensively in any of the math classes.

Physical Education 10 displayed poor overall SDG coverage and the course only covered SDG 3: Good Health and Well-Being and SDG 8: Decent Work and Economic Growth. In Physical Education 10 students learn to examine the relationship between nutritional input and requirement for active living. Students also learn about levels of health and physical fitness that contribute to healthy living and what constitutes health-related physical fitness (Nova Scotia Department of Education and Early Childhood Development, 2015o). SDG 3: Good Health and Well-Being was well covered in Physical Education 10. Although, SDG 3: Good Health and Well-Being also pertains to subjects such as safe sexual health and health related to activities such as smoking which were most likely not covered in Physical Education 10 which is why the class did not cover the SDG extensively (United Nations, n.d.d). SDG 8: Decent Work and Economic Growth is covered in Physical Education 10 because students learn to investigate career opportunities related to exercise science. SDG 8: Decent Work and Economic Growth is poorly covered in Physical Education 10 because learning about career paths in class related exercise science was only shortly touched upon in the subject (Nova Scotia Department of Education and Early Childhood Development, 2015o). Additionally, SDG 8: Decent Work and Economic Growth also relates to subjects such as decent working conditions for all and economic growth when looking at GDP which Physical Education 10 does not cover (United Nations, n.d.h).

Science 10 covered SDG 3: Good Health and Well-Being, SDG 13: Climate Action, SDG 14: Life below Water, and SDG 15: Life on Land. In Science 10 students about SDG 3: Good Health and Well-Being by learning to "distinguish between biotic and abiotic factors, determining the impact on the consumers at all trophic levels due to bioaccumulation, variability, and diversity" (Nova Scotia Department of Education and Early Childhood Development, 2015p). This means that students could be learning about how the bioaccumulation of certain contaminants could affect human health. Depending on what is meant by impact in this statement, SDG 3: Good Health and Well-Being could not be covered at all or have poor to moderate at best. It is clear that in Science 10 students are not learning about all key components of SDG 3: Good Health and Well-Being such as safe sexual health leading to Science 10 not having extensive coverage of SDG 3: Good Health and Well-Being (Nova Scotia Department of Education and Early Childhood Development, 2015o; United Nations, n.d.d). In Science 10 students learn to "diagnose and report the ecosystem's response to short-term stress and long-term change" (Nova Scotia Department of Education and Early Childhood Development, 2015o). This statement suggests that students are possibly learning about climate change which means they are exposed to SDG 13: Climate Action. SDG 13: Climate Action is only moderately covered in Science 10 since this learning outcome was just one of the many things learned about under one of four units in Science 10. This means that whatever climate change knowledge that students may by learning about is most likely very brief. Additionally, SDG 13: Climate Action is not extensively covered in Science 10 because they are not learning about everything related to SDG 13: Climate Action such as urgent action to mitigate climate change effects (United Nations, n.d.l).

In Science 10 students learn about abiotic and biotic life in the environment and below water. Students also learn about how biodiversity impacts the sustainability of an ecosystem which pertains to SDG 14: Life below Water and SDG 15: Life on Land. SDG 14: Life below Water is moderately covered in Science 10 because students learn about this topic in just one of the four units covered in Science 10 (Nova Scotia Department of Education and Early Childhood Development, 2015p). This means that these subjects are touched upon most likely very briefly and probably not in extensive depth. Additionally, the class did not address key subjects of SDG 14: Life below Water and SDG 15: Life on Land which is why the class did not cover these SDGs extensively. For example, Science 10 did not address subjects such as reducing marine pollution which SDG 14: Life below Water aims to stop (United Nations, n.d.m). Additionally, Science 10 had moderate coverage SDG 15: Life on Land because the class left out key targets of SDG 15: Life on Land such as increased environmental restoration and prevention of invasive species (United Nations, n.d.n).

The academic subject grouping of Skilled Trades 10 overall demonstrated poor SDG coverage. Skilled Trades 10 covered SDG 1: No Poverty, SDG 8: Decent Work and Economic Growth, and SDG 9: Industry, Infrastructure, and Innovation. In Skilled Trades 10 students learn about job opportunities and economic opportunities associated with available careers in the skilled trades industry (Nova Scotia Department of Education and Early Childhood Development, 2015q). These learning outcomes are associated with SDG 1: No Poverty and SDG 8: Decent Work and Economic Growth. SDG 1: No Poverty and SDG 8: Decent Work and Economic Growth are moderately covered in Skilled Trades 10 since they were each only briefly touched upon. Although, there are gaps in what the students learn related to both SDGs since the class does miss fundamental concepts of each SDG such as no poverty and decent work for

everyone all around the world (United Nations, n.d.b; United Nations, n.d.h). SDG 9: Industry, Infrastructure, and Innovation is well covered in Skilled Trades 10 since the class is all about skilled trades relating to infrastructure. Students in Skilled Trades 10 learn extensively about power tools, measurements, and safety around power tools (Nova Scotia Department of Education and Early Childhood Development, 2015p).

Construction Technology 10 covered SDG 7: Affordable and Clean Energy and SDG 9: Industry, Infrastructure, and Innovation. In Construction 10 students learn about construction practices that maximize energy efficiency which relates to SDG 7: Affordable and Clean Energy (Nova Scotia Department of Education and Early Childhood Development, 2015b). SDG 7: Affordable and Clean Energy is poorly covered in Construction Technology 10 because the class does not address key concepts of SDG 7: Affordable and Clean Energy such as the importance of renewable energy (United Nations, n.d.). Additionally, energy efficiency was just one of the many subjects that the students learned about in Construction Technology 10. In Construction Technology 10 students gain an understanding of entrepreneurial skills and construction practices used in the construction industry which relates to SDG 9: Industry, Infrastructure, and Innovation (Nova Scotia Department of Education and Early Childhood Development, 2015b). Construction Technology 10 well covers SDG 9: Industry, Infrastructure, and Innovation since the class teaches many concepts related to SDG 9: Industry, Infrastructure, and Innovation. However, the class does contain knowledge gaps relating to SDG 9: Industry, Infrastructure, and Innovation because the class does not address subjects such as promoting inclusive and sustainable industrialization which is one of the many targets under SDG 9: Industry, Infrastructure, and Innovation (United Nations, n.d.i).

Humanities and Language classes displayed poor overall SDG coverage with moderate SDG coverage of the SDGs that the classes did cover. Gaelic 10 and History 10 were the only humanities and language courses that did cover a select few SDGs. Gaelic 10 covered SDG 5: Gender Equality, SDG 9: Industry, Infrastructure, and Innovation, and SDG 11: Sustainable Cities and Communities. Students in Gaelic 10 will be able to "describe the contribution of Gaels to societal growth in Nova Scotia" by the end of the class (Nova Scotia Department of Education and Early Childhood Development, 2015f). This statement is very vague but could infer that students are learning about SDG 9: Industry, Infrastructure, and Innovation and SDG 11: Sustainable Cities and Communities. In Gaelic 10 there could be no coverage of SDG 9: Industry, Infrastructure, and Innovation and SDG 11: Sustainable Cities and Communities depending on what students learn or poor to moderate coverage at best. There is not extensive coverage of SDG 9: Industry, Infrastructure, and Innovation in Gaelic 10 because the course does not educate on all aspects related to SDG 9: Industry, Infrastructure, and Innovation such as inclusive and sustainable industrialization (United Nations, n.d.i). In Gaelic 10 it also is likely that students are not learning about everything related to SDG 11: Sustainable Cities and Communities such as affordable housing (United Nations, n.d.k). Lastly, in Gaelic 10 students learn about gender roles in Gaelic society. When learning about gender roles in Gaelic society, students are learning about SDG 5: Gender Equality; however, SDG 5: Gender Equality is only poorly covered because this is just one of the many brief topics under the culture unit that students learn about (Nova Scotia Department of Education and Early Childhood Development, 2015f). Additionally, it is unlikely that students are learning all components of SDG 5: Gender Equality such as women's autonomy over their reproductive rights and sexual health (United Nations, n.d.f).

History 10 was the other class that covered the most SDGs between all classes. History 10 covered 6 SDGs which were SDG 9: Industry, Infrastructure, and Innovation, SDG 10: Reduced Inequalities, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production, and SDG 16: Peace, Justice, and Strong Institutions. In History 10 students gain an understanding of what ancient civilizations contributed to modern day society. In history 10 there is also a unit regarding revolutions in which students may have learned about how revolutions lead to industry and infrastructure (Nova Scotia Department of Education and Early Childhood Development, 2015h). Both of these subjects relate to SDG 9: Industry, Infrastructure, and Innovation and offer moderate to well coverage of the SDG depending on what the students actually learned about in class. However, History 10 does not offer extensive coverage of SDG 9: Industry, Infrastructure, and Innovation because the class does not cover particular targets of SDG 9: Industry, Infrastructure, and Innovation such as enhancing scientific research (United Nations, n.d.i). Students in History 10 also learn about how ancient civilizations, culture, and religions have impacted society and the impacts these factors have on today's society (Nova Scotia Department of Education and Early Childhood Development, 2015h). This statement is very vague but could infer that students are learning about SDG 5: Gender Equality and SDG 10: reduced inequalities by learning about how these structures influence inequality between gender and social classes. SDG 5: Gender Equality is poor to moderately covered depending on what students learn in class. However, when students learn about how historical structures have impacted today's society, they learn about this topic under one of many units in the class which likely does not leave much time for students to learn about this topic. Students in History 10 also learn about how political systems impacted class diversity. In addition, they learn about how revolutions have "cultural, racial, ethnic, and commercial

factors" (Nova Scotia Department of Education and Early Childhood Development, 2015h). SDG 10: reduced inequalities is moderately to well covered in History 10; however, students still are not receiving the full educational scope of SDG 10: reduced inequalities because they are not learning about the SDG in a present context such as the need to promote the social, economic, and political inclusion for all (United Nations, n.d.j).

In History 10, students have a unit about revolutions in which they learn about how revolutions have impacted societies. The learning outcome statements are extremely vague under this unit; however, in this unit the learning outcomes imply that students are learning a bit about how revolution has impacted today's cities and communities which relates to SDG 11: Sustainable Cities and Communities (Nova Scotia Department of Education and Early Childhood Development, 2015h). Depending on the impacts of revolutions that students learn about, SDG 11: Sustainable Cities and Communities might not be covered at all or have poor to moderate coverage. SDG 11: Sustainable Cities and Communities is not covered extensively because History 10 does not teach about all of the targets related to the SDG. In History 10 under the unit of revolution students learn about how revolution has impacted commercial factors (Nova Scotia Department of Education and Early Childhood Development, 2015h). This signifies that students are learning about how revolution impacted consumption which is related to SDG 12: Responsible Consumption and Production. History 10 has poor to moderate coverage of SDG 12: Responsible Consumption and Production since the class briefly touches upon the subject but does not teach about the SDG in the modern-day context. In History 10 students have a unit on political structures in which they examine governance and policy in ancient civilizations and how that has informed our political systems today. They also look at how these structures have led to peace and/or conflict within societies (Nova Scotia Department of Education and Early

Childhood Development, 2015h). History 10 well covers SDG 16: Peace, Justice, and Strong Institutions.

On the other hand, other humanities classes did not cover any SDGs in their course curriculums. These courses were English 10 and English Plus 10 French 10, German 10, Spanish 10, Drama 10, Music 10, Visual Art 10. Spanish 10 and German 10 were particularly hard to gauge for SDG representation because each class used the same learning outcomes at a glance document. The learning outcomes at a glance document was vague and written about general language requirements to allow the teaching staff to be flexible within their curriculum. However, this document did not pertain specific information to learning about Spanish or German or anything that was remotely specific to any of the SDGs (Nova Scotia Department of Education and Early Childhood Development, 2015n). Additionally, French 10 was a difficult class to analyze because French 10 – 12 just had one learning outcomes a glance document for all years and the document was written in French with no available English translation. There was no distinction about what was taught each year or if the students are taught relatively the same things every year with increasing intensity of the French language. There is a possibility that French 10 could cover some variety of SDGs; however, due to the generalization of the French high school curriculum the learning outcomes were very broad and did not pertain to any SDGs in specific (Nova Scotia Department of Education and Early Childhood Development, 2015j). Lastly, Learning Strategies 10 is not a humanities course, but the class did not cover any SDGs throughout the course.

The classes Family Studies 10 and Exploring Technology 10 were both classes in which the province has created a multitude of modules for schools to choose from to compose their classes. For Family Studies 10 there were 5 modules created that are each one-half credit and all

covered slightly different topics. The 5 different modules offered for Family Studies 10 are Food

for Healthy Living 10, Food Preparation/Service 10, Food Technology 10, International Foods,

and Textile Production 10. Each high school in Nova Scotia is allowed to select two half credits

and offer both as the full Family Studies 10 course. Each half credit course that was designed for

Family Studies 10 was based off of different curriculums with different learning outcomes that

each covered different SDGs. Several of the half credit courses created were very similar and

covered similar topics (Nova Scotia Department of Education and Early Childhood

Development, 2015e). As a result, no matter what combination of modules that the school chose

to offer, Family Studies 10 would cover SDG 2: Zero Hunger and SDG 3: Good Health and

Well-Being. Some of the modules covered different or additional SDGs than what previously

listed. Food for Healthy Living 10, Food Preparation/Service 10 and Food Technology 10 all had

well coverage of SDG 2: Zero Hunger, SDG 3: Good Health and Well-Being, and moderate

coverage of SDG 8: Decent Work and Economic Growth. These three half credit courses mainly

focused on safe food preparation, cooking techniques, and how to ensure appropriate nutrition

levels based on food choices (Nova Scotia Department of Education and Early Childhood

Development, 2015e). However, Food for Healthy Living 10, Food Preparation/Service 10 and

Food Technology 10 only moderately covered SDG 8: Decent Work and Economic Growth

since finding a job in food preparation was only discussed once in each class (Nova Scotia

Department of Education and Early Childhood Development, 2015e). International Foods 10

well covered SDG 2: Zero Hunger and SDG 3: Good Health and Well-Being. International

Foods 10 examined food practices among cultures and how to prepare safe and healthy foods of

other cuisines from around the world (Nova Scotia Department of Education and Early

Childhood Development, 2015e). Textile Production 10 covered SDG 8: Decent Work and

Economic Growth, SDG 9: Industry, Infrastructure, and Innovation, and SDG 12: Responsible Consumption and Production.

Textile Production 10 under Family Studies 10 had moderate coverage of SDG 8: Decent Work and Economic Growth since the class educated students on available jobs in the textile industry as well as how to find the jobs. In Textile Production 10 students also learn about the textile industry and how fabrics are made. During the class students design a textile project by themselves which relates to SDG 9: Industry, Infrastructure, and Innovation. Textile Production 10 has well coverage of SDG 9: Industry, Infrastructure, and Innovation because students learn a plethora of information about the textile industry. Lastly, Textile Production 10 has moderate coverage of SDG 12: Responsible Consumption and Production because the class educates students on recycling and buying used clothing (Nova Scotia Department of Education and Early Childhood Development, 2015e). All of the modules offered in Family Studies 10 presented gaps within the SDG education presented by not extensively covering any SDGs and leaving out key subjects and themes related to each SDG that the class touched upon.

The class Exploring Technology 10 was designed in a similar way to Family Studies 10. This class was designed so that it has one necessary module that schools must teach their students. The class also has 5 other modules from which each school system must pick three modules and teach all four modules as the complete Exploring Technology 10 class. The necessary of Exploring Technology 10 that schools must teach is Module 1: Introduction to Technology (Nova Scotia Department of Education and Early Childhood Development, 2015d). This one module moderately covered SDG 8: Decent Work and Economic Growth and SDG 9: Industry, Infrastructure, and Innovation. In Module 1: Introduction to Technology students learn to demonstrate an understanding of jobs in the technology field and how the influence of

technology influences the nature of the work world (Nova Scotia Department of Education and Early Childhood Development, 2015d). These learning outcomes relate to SDG 8: Decent Work and Economic Growth; however, the goal in not extensively covered because the class does not educate on decent work standards for all (United Nations, n.d.h). Students also learn about the cultural and economic influences of technology. They learn to evaluate and develop technological solutions to problems. Students also learn about the evolution of technology which relates to SDG 9: Industry, Infrastructure, and Innovation but still are not educated on fundamental themes of SDG 9 leading to only moderate coverage of the SDG (Nova Scotia Department of Education and Early Childhood Development, 2015d). Therefore, no matter what combination of modules that Nova Scotia high schools are choosing to teach their students they are all learning about SDG 8: Decent Work and Economic Growth and SDG 9: Industry, Infrastructure, and Innovation.

The other modules that schools were allowed to pick from varied in their SDG representation. Module 2: Green Energy covered SDG 7: Affordable and Clean Energy and SDG 9: Industry, Infrastructure, and Innovation. In Module 2 students learn to design and construct a renewable energy system as well as test one out (Nova Scotia Department of Education and Early Childhood Development, 2015d). These learning outcomes lead to well coverage of SDG 7: Affordable and Clean Energy and 9: Industry, Infrastructure, and Innovation. Students also learn about the consequences of technology in a global manufacturing system which relates to SDG 9: Industry, Infrastructure, and Innovation (Nova Scotia Department of Education and Early Childhood Development, 2015d). Module 3: Media Technology, Module 4: Control Technology, and Module 5: Engineering Technology all well cover SDG 9: Industry, Infrastructure, and Innovation. In these modules students learn about technology and how to

build different types of technology (Nova Scotia Department of Education and Early Childhood Development, 2015d). Lastly, Module 6: Exploring Trades and Technology moderately covered SDG 8: Decent Work and Economic Growth and well covered SDG 9: Industry, Infrastructure, and Innovation. In Module 6: Exploring Trades and Technology students learn how to practice skilled trades and look at jobs within the skilled trades field (Nova Scotia Department of Education and Early Childhood Development, 2015d). With each module under Exploring Technology 10 there are SDG coverage discrepancies because the modules do not teach on all subjects related to each SDG.

## 5.0 Discussion

### 5.1 Nova Scotia Graduation Requirements

In Nova Scotia to graduate with a high school diploma students need 18 credits minimum. High school in Nova Scotia runs for a duration of three years meaning that minimum students would need to take 6 credits a year to be on track to graduate at the three-year mark. However, it is encouraged by the Nova Scotia government that each high school in the province design schedules that allow students to take more than 6 credits a year so that they could potentially take 24 credits within three years (Nova Scotia Department of Education and Early Childhood Development, 2021). If a school has designed their year schedules in this manner, it would allow students to take up to 8 classes within a year. At the Nova Scotia grade 10 level there are 25 courses offered which is far more than any student could take in a year (Government of Nova Scotia, n.d.). Additionally, the Nova Scotia high school graduation requirements are extremely flexible which allow students to primarily design whatever they would like to take during their high school education. The only required course that all Nova Scotian students need to take at the grade 10 level is Science 10. All students need to take Science 10 to allow them to progress onto the higher-level science courses in the upper grades. After Science 10 students are

only required to take one more science course within their high school career. The other

requirements that Nova Scotian students need to abide by to graduate are 3 language arts one at

each level. A Nova Scotian student will also need to take one performing or visual arts class in

high school, but they are free to take this type of course at any grade level. A student will need to

take a math course one at each level. High school students within Nova Scotia also need to take

one physical education course in order to graduate but can take the course at any grade level.

Students are required to take one Canadian history class and can choose from a plethora of grade

11 Canadian history courses. Lastly, students also need to take one global studies course from

which an array of grade 12 global studies courses count for this requirement (Nova Scotia

Department of Education and Early Childhood Development, 2021).

## 5.2 Key Findings

As can be seen students have flexibility in what they choose to take and learn throughout

their courses. Also, because Science 10 is the only required course that all grade 10 Nova Scotian

students must take this ensures that all students are exposed to SDG 3: Good Health and Well-

Being, SDG 13: Climate Action, SDG 14: Life below Water, and SDG 15: Life on Land.

Additionally, because all students must take a math course in grade 10 all students are being

exposed to SDG 1: No Poverty. However, the extent to which students are exposed to this SDG

largely depends on which math class the student has selected Nova Scotia Department of

Education and Early Childhood Development, 2021). To reiterate it can only be guaranteed that

students are exposed to SDG 1: No Poverty, SDG 3: Good Health and Well-Being, SDG 13:

Climate Action, SDG 14: Life below Water, and SDG 15: Life on Land. Otherwise, because of

students' flexibility they are able to pick their own courses that offer a different range of SDG

exposures. Additionally, most other courses that students must take at the grade 10 level such as

performing or visual arts class, an English course, and most language course do not offer any

SDG exposure. However, Gaelic 10 was an outlier in SDG representation and the course actually covered many SDGs. Therefore, if students chose Gaelic 10 for their grade 10 language requirement they could be exposed to a higher range of SDGs, but if students did not choose this course to fulfill the language requirement they could be exposed to no additional SDGs while fulfilling their language requirement.

## 5.3 Similar Studies and Results

### 5.3.1 SDG Representation in the University of Toronto

To date, there have several studies done assessing how the SDGs have been implemented into curriculums. The majority of these studies have been done on universities (Pálsdóttir & Jóhannsdóttir, 2021). One of the many universities that has previously been examined in a study for its incorporation of the SDGs within the curriculum is the University of Toronto (UofT). In 2017, UofT designed the Presidential Advisory Committee on Environment, Climate Change, and Sustainability (CECCS). One of the many tasks this committee was faced with was examining the level of sustainability content within the undergraduate curriculum. The findings of this committee were that there were 2,022 courses that addressed sustainability or a topic that pertained to one or more of the SDGs. This number of courses is also the equivalent of 25% of all undergraduate courses offered on campus. They also found that there were certain SDGs that were introduced in the curriculum far more frequently than others. These SDGs were SDG 13: climate change; SDG: 16: peaceful and inclusive societies; and SDG 3: health and well-being. CECCS also discovered in their research that different SDGs had different exposure rates depending on the faculty, such as SDG 9: sustainable infrastructure and innovation, had been found to come up frequently in the Faculty of Applied Science and Engineering. From this study it can be seen that only a quarter of the courses offered at UofT teach about the SDGs. This could

result in students not being exposed to any of the SDGs during their education depending on the courses they choose to take (Brugmann et al., 2019).

### 5.3.2 University of Toronto Study Results Similarities

The study done on the University of Toronto yielded quite different results than this study. The University of Toronto overall had much lower SDG exposure in each class than the Nova Scotia grade curriculum did. Only 25% of UofT courses offered covered some range of SDGs while 60% of the courses offered at the Nova Scotia grade 10 level had some level of SDG coverage (Brugmann et al., 2019). One other result that was very different between studies was that the SDGs that were covered the most were not similar at all. At the grade 10 level in Nova Scotia the most covered SDGs were SDG 1: No Poverty, SDG 8: Decent Work and Economic Growth, and SDG 9: Industry, Innovation, and Infrastructure. At UofT the most covered SDGs were SDG 13: climate change; SDG: 16: peaceful and inclusive societies; and SDG 3: health and well-being (Brugmann et al., 2019). One similar finding between both studies was that students would be exposed to different SDG levels depending on what type of classes they chose to take.

### 5.3.3 SDG Representation in the University of Iceland

The results from Pálsdóttir's and Jóhannsdóttir's study (2021) examining the representation of the 17 SDGs within the University of Iceland's curriculum reveals that there were 4342 sings of SDGs in the curriculum within the 3239 classes offered at the university. The researchers also found that the number of SDG signs were the highest in the school of social sciences and the lowest in the school humanities. However, when calculating the average amount of SDG signs in each course, the school of education resulted in having the highest number of 2.5 SDG signs per course. Based on average SDG signs per course, the school of social sciences came in second place with having 2.3 SDG signs per course. Pálsdóttir's and Jóhannsdóttir's study (2021) also revealed that exposure to certain SDGs within the curriculum

was higher for some rather than others. SDG 4: quality education, was the SDG that came up the most in the curriculum and was found in 42% of all courses offered at the university. SDG 4 also happened to be SDG that was mentioned the most in the curriculum.  The second most exposed SDG was SDG 3: good health and well-being. SDG 3 was mentioned in 26% of total courses while in third place is SDG 10: reduced inequality, mentioned in 13% of total classes. The other 14 SDGs were found to be mentioned in less than 10% of total courses at the University of Iceland. Similar to the study done at UofT, Pálsdóttir and Jóhannsdóttir also discovered that the certain SDGs has higher exposure rates to certain faculties than others.  In the end of the study, the researchers stated that there was an expectation to see high amounts of SDG signs within the curriculum; however, the actual level of SDG signs for all faculties were lower than expected. At the end of study, the researchers also referenced similar studies done at different universities around the world. They noted that the findings of the different studies were similar to the results found in this study. The results of the other studies demonstrated that in some cases there was adequate representation of certain SDGs within all courses; however, other SDGs were completely missing in the curriculum.

### 5.3.4 University of Iceland Study Results Similarities

The results yielded by Pálsdóttir and Jóhannsdóttir were very similar to the results of this study.  In the study conducted by Pálsdóttir and Jóhannsdóttir (2021) it was discovered that students had a wide range of flexibility within their studies similar to the grade 10 Nova Scotia high school curriculum. At the University of Iceland students could have varying ranges of SDG exposures depending on which faculty a student was studying in. It appears that some University of Iceland students may have been exposed to higher levels of ESD than other students which is also similar to the Nova Scotia grade 10 curriculum. For example, students in Nova Scotia who wanted to take skill related classes would be more exposed to higher range of SDGs than

students who mainly chose to take a higher range of performing arts classes. Another similar

trend discovered by Pálsdóttir and Jóhannsdóttir (2021) was that SDG representation was the

lowest among humanities classes, which the results of this study also displayed. Lastly, the study

conducted on the University of Iceland discovered that on average there was 2.3 SDG signs per

course, whereas, in this study on average each class represented 1.8 SDGs per class.

### 5.3.5 SDG Representation in Beijing Number 35 High School

Another study that examined ESD implementation into the curriculum was done on the

International Department of Beijing Number 35 High School. Since the publication of the SDGs,

China has developed a policy framework to help achieve the various SDGs (Yu et al., 2020). To

examine the pre-existing knowledge of the SDGs held by high school students from the

International Department of Beijing Number 35 High School, Yuan and colleagues, (2021)

designed a survey to examine the knowledge regarding the SDGs. The findings of this study

show that the students had extensive knowledge of 8 different SDGs. However, the students did

not have a great understanding of the other 9 SDGs, mainly because these SDGs are not involved

as subject material within certain courses.

### 5.3.6 Beijing Number 35 High School Study Results Similarities

Similarly, to the study done on the Beijing Number 35 High School in Nova Scotia

students also most likely have extensive knowledge of particular SDGs over others purely due to

the number of SDGs exposed in course subject matter and the number of times in which the

SDGs appeared throughout the grade 10 classes. Another similarity that is present between both

studies is that certain SDGs were present in the courses with high frequencies while some SDGs

were not incorporated within the curriculum at all.

## 5.4 Unexpected Results

From this study it was unexpected that some SDGs would not be covered at all. The results of this study show that the SDGs were displayed through the curriculum disproportionately. The most an SDG was covered in the curriculum was 7 times and there were 2 SDGs that were included in the grade curriculum 7 different times. On the contrary, there were two SDGs that weren't covered at all in any grade 10 classes which were SDG 4: Quality Education and SDG 6: Clean Water and Sanitation. This is a shocking result especially since Prime Ministers Trudeau's exclamation to meet all SDGs within Canada and since there are such pressing drinking water advisories in several different First Nations communities within Canada (Government of Canada, 2022; United Nations, n.d.a). It could be difficult to meet the 17 goals if the future leaders are not learning about all SDGs before having the choice to further their education or not.

## 5.5 Discovered Barriers to Implementing ESD

To date, there have been a few studies done on ESD implementation in primary schools. These studies show that there have been several barriers in implementing ESD into course curriculums that could explain a lack of ESD in education (Kang, 2019). Researchers find that ESD integration in schools can only succeed if the teachers work to have more ESD in their curriculums (Stössel, 2021). Another barrier to teaching ESD is sustainable development itself. There has been widespread confusion about what sustainability is and how to define it (Kang, 2019). Due to this confusion, teacher remain unsure of what sustainability is and have trouble teaching the subject. Another barrier in being able to teach ESD, is that teachers often aren't provided the necessary content and pedagogical knowledge for teaching ESD (Kang, 2019). Teachers' personal beliefs can also act as a barrier in successfully teaching ESD. Teachers are often unaware that there is a need for ESD (Kang, 2019). In other instances, teachers are willing

to teach ESD but do not have the time to fit ESD within their curriculum. This results in teachers in seeing ESD as an additional thing that needs to be taught on top of what they already need to be teaching (Kang, 2019). In other instances, teachers who believe in ESD and are willing to make time to teach ESD but lack the resources necessary to promote this education. Teachers are not the only actor in preventing ESD in the classroom (Kang, 2019. Principals of the schools also have huge influences on the curriculum is aligned. Principals can have an effect on how long the classes run for and how the classes are oriented within the school day (Kang, 2019). They can also have a say in how the funding for curriculum is spent. Lastly, it is up to the principal to show support of ESD in the curriculum and allocate the resources to make ESD possible (Kang, 2019).

## 5.6 Limitations

In this study there a few different limitations of what has been presented within the dataset. One of the biggest limitations of the study was that SDG representation in the curriculum was inferred mainly based on what the curriculum outcome at a glance document said. This was because within the study period for the research there was not an appropriate amount of time to effectively interview teachers or ask to examine lesson plans to see exactly what SDGs are covered in each course and to what extent they are involved within the curriculum. The learning outcomes were extremely vague, and it was difficult to understand what exactly students were learning. In some instances, it could be inferred that a student is learning a little bit about a particular SDG from what has been stated in a vague learning outcome; however, depending on what the course actually covered a student may not be learning about that particular SDG at all. Language courses in particular were difficult to judge for SDG involvement because some language courses used the same curriculum outcome learning documents at a glance. Also, the learning outcome document at a glance for French was all in French and the document was the

same for grades 10 through 12. Additionally, it was complicated to understand to what extent a particular SDG was actually covered in the curriculum. In some cases, an SDG topic or theme was only discussed once in one single learning outcome statement from which it could be inferred that that particular SDG was not covered in-depth because it was just touched upon once among several different learning outcomes for the course. However, this could not be the case and the SDG could have moderate to well coverage.

## 5.7 Future Studies

Moving forward with examining SDGs within the Nova Scotia grade 10 curriculum if any future studies were done about the same topic, a researcher or research group should more comprehensively examine the grade 10 curriculum for SDG representation. It is suggested that this can be done through interviewing a representative sample of grade 10 teachers about what exactly is covered in each course. Researchers could also ask teachers for their yearlong lesson plans and units to examine exactly what is taught. These methods should give a more comprehensive outlook into what has been covered throughout the grade 10 curriculum. This type of study could also be performed for the entire Nova Scotia high school curriculum.

## 5.8 Recommendations

Several other studies and recommendations for how to better incorporate ESD into curriculum have been done at the university level. However, it has been found that most times that successful ESD implementation had been accredited to high determination levels. Other universities have made declarations about their commitment to ESD and about how they plan to teach this type of education. It has been recommended for successful ESD implementation that educational institutions make the SDGs part of all policy and practice of the educational institute (Pálsdóttir & Jóhannsdóttir, 2021). This will help ground the SDGs into the core values of the educational institute and help them be better taught to students. Additionally, it is recommended

by this study that other barriers to ESD implementation in Nova Scotia such as inadequate budget or SDG education levels within teaching staff are addressed and overcome. Lastly, it is recommended that the Nova Scotia government and school system adopt a transformative perspective to ESD implementation rather than a transmissive perspective. The main difference between these two types of perspectives is that transmissive is focuses mainly on improving existing education while transformative is focused on developing higher quality within education. Studies suggest that implementing ESD with a transformative perspective has been proven to be more successful than transmissive outlooks on the topic (Mogren & Gericke, 2017).

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# Appendices

## Appendix 1

| SDGs | Key Words |
|---|---|
| NoPoverty | Poverty* (*level; *eradication; *line; *in all its forms; *in all its dimensions; *eradication strategies; *reduction)<br>Social Protection Floors<br>Social Protection Levels<br>Income*(*Equality; *inequality)<br>Access<br>Access* (*to goods; *to basic services)<br>Land* (*Control; *Access)<br>Poor<br>Disaster* (*risk production strategy; *economic loss)<br>Means* (predictable*;  adequate*; fair*)<br>Access to adequate means<br>Pro-poor |
| Zero Hunger | Hunger<br>Hungry<br>Food* (*Insecurity; *Security; *safe; *nutritious; *sufficient)<br>Undernourishment<br>Food Insecurity Experience Scale<br>Malnutrition<br>Anemia<br>Increasing agriculture<br>agricultural productivity<br>Nutrition |
| Good Health and Well-Being | Well-being<br>Health* (*mental; *emotional; *reproductive *maternal; *child; *workers; *care; *coverage; *services; * insurance; *sexual; *financing; *workforce; *regulations)<br>Mortality* (*mortality; *mortality; *rate)<br>Death* (*child; *infant; *global; *rate)<br>Diseases* (*tropical; *communicable; *water-borne; *infectious; *non-communicable)<br>AIDS<br>Tuberculosis<br>Malaria<br>Asthma<br>Hepatitis<br>Illness<br>Cardiovascular disease<br>Cancer |

| SDGs | Key Words |
|---|---|
| | Diabetes<br>Chronic respiratory illness<br>Suicide<br>Substance abuse<br>Drug Prevention<br>Prevention<br>Treatment intervention<br>Drug abuse<br>Alcoholism<br>Alcohol abuse<br>Injury<br>Family planning<br>Birth rate<br>Children per woman<br>Medicine<br>Vaccines<br>Infection |
| Quality Education | Education* (*Affordable; *quality; *vocational; *tertiary;<br>*environmental; *for sustainable development; * for sustainability;<br>*facilities; *higher)<br>Learning<br>Literacy<br>Reading* (*proficiency)<br>School<br>Graduation<br>Mathematics<br>University<br>Skills* (*technical; *vocational)<br>Numeracy<br>Knowledge<br>Skills<br>Science<br>STEM<br>STREAMS<br>Technology<br>Engineering<br>Art<br>Arts<br>Music<br>Scholarships<br>Teacher<br>Teachers<br>Internet |

| SDGs | Key Words |
|---|---|
| | Books<br>Textbooks<br>Lectures<br>Classes |
| Gender Equality | Gender Equality<br>Non-binary<br>Girl<br>Girls* (*Violence against)<br>Boy<br>Man<br>Woman<br>Women* (*Violence against)<br>Male<br>Female<br>Sexual Violence<br>Discrimination<br>Exploitation<br>Human trafficking<br>Forced marriage<br>Female* (*genital mutilation; *genital cutting)<br>Share household responsibilities<br>Unpaid work<br>Equal opportunity<br>Rights* (*Women's; *Reproductive)<br>Health* (*Sexual; *Reproductive)<br>Sexual<br>Reproductive<br>Empowerment<br>Sexism<br>Misogyny<br>Misogynistic |
| Clean Water and Sanitation | Water* (*Potable; *drinking; *quality; *scarcity; *harvesting; *efficiency; *management of)<br>Sanitation<br>Hygiene<br>Open defecation<br>Wastewater* (*Untreated; *treated)<br>Water-use efficiency<br>Sustainable water use<br>Freshwater<br>Integrated water resource management<br>Water related ecosystems |

| SDGs | Key Words |
|------|-----------|
| | Mountains<br>Forests<br>Rivers<br>Wetlands<br>Aquifers<br>Lakes<br>Desalination |
| Affordable and Clean Energy | Energy* (*affordable; *clean energy; *reliable; *green; *renewable; *efficiency; *modern; *poverty; *tidal)<br>Fuel* (*Clean; *Fossil)<br>Cleaner fossil-fuel technology<br>Solar panel<br>Wind* (*farm; *turbine)<br>Hydrogen* (*green; *grey; *blue)<br>Electric car<br>Geothermal<br>Geo-exchange<br>Radiant heating<br>Hydropower<br>Bio* (*mass; *fuels; *diesel)<br>Gas* (*syn; *bio; *renewable; *synthetic; *natural)<br>Coal<br>Oil* (*crude) |
| Decent Work and Economic Growth | Economy<br>GDP<br>Wage* (*living; *hourly; *hour; *fair)<br>Salary<br>Employment (*productive; *increasing; *informal)<br>Work* (*fair; *decent; *paid; *unpaid; *sex)<br>Economic Growth* (*Sustained; *Inclusive; *sustainable)<br>Jobs (*full-time; *part-time; *creation; *immigrant)<br>Economic Productivity<br>Entrepreneurship<br>Creativity<br>Innovation<br>Enterprise growth<br>Slavery<br>Labor* (*paid; *forced; *unpaid; *rights)<br>Unemployment* (*rate)<br>Equal pay<br>Human trafficking<br>Child soldiers |

| SDGs | Key Words |
|---|---|
| | Working environment* (*safe; *secure)<br>Occupational injuries<br>Bank* (*access)<br>Finances<br>Financial* (*services for all)<br>Working* (*women; *woman; *child; *children; *immigrants) |
| Industry, Innovation, and Infrastructure | Industry* (*green; *clean)<br>Innovation<br>Infrastructure* (*resilient; *reliable; *quality; *sustainable; *regional; *transborder; *upgrade)<br>Industrialization* (*sustainable; *inclusive)<br>Access (*affordable; *equitable)<br>Affordable credit<br>Enterprises* (*small-scale industrial)<br>industries* (*retrofit)<br>Industrial processes* (*clean; *green)<br>Scientific research<br>Research* (*public; *private)<br>Development<br>Technology* (*information; *communications)<br>Internet* (*access) |
| Reduced Inequalities | Inequality<br>Inequalities<br>Racism<br>Equality* (*income; *racial; *gender)<br>Refugees* (*climate; *political)<br>Income growth<br>Inclusion* (*social; *economic; *political)<br>Voting rights<br>Equal opportunity<br>Discrimination<br>Harassment<br>Human rights<br>Social protection policies<br>Fair wage<br>Fiscal policy<br>Institutions* (*credible; *legitimate; *accountable; *effective)<br>Migration* (*safe; *regular; *responsible; *planned; *Policy; *policies)<br>refugees |

| SDGs | Key Words |
|---|---|
| Sustainable Cities and (Communities | Cities* (*resilient; *sustainable; *safe; *inclusive)<br>Communities* (*resilient; *sustainable; *safe; *inclusive)<br>Settlements* (*resilient; *sustainable; *safe; *inclusive; *informal)<br>Slums<br>Housing* (*affordable; *unsafe; *safe; *unaffordable; *green; *not enough; *adequate)<br>Basic services<br>Urban<br>Transport* (*safe; *sustainable; *accessible; *affordable; *public)<br>Heritage* (*cultural; *natural)<br>Space* (*green; *public)<br>Urbanization<br>Rural<br>per-urban |
| Responsible Consumption and Production | Corporate social responsibility<br>Production* (*sustainable; *responsible)<br>Consumption* (*sustainable; *responsible; *efficient)<br>Management* (*sustainable; *resource; *natural resource; *chemical; *waste; *environmental; *forest; *water)<br>Material* (*footprint; *consumption<br>Food* (*waste; *losses)<br>Compost<br>Composting<br>Waste* (*to energy; *generation)<br>Landfill<br>Hazardous waste<br>Recycle<br>Recycling<br>Reuse<br>Reusing<br>Reducing<br>Reduce |
| Climate Action | Climate* (*change; *action; *adaptation; *change measures; *change mitigation; *crises)<br>Fossil fuels<br>Coal<br>Oil* (*crude)<br>Natural gas<br>Greenhouse gas* (*emissions)<br>Carbon* (*footprint; *sink)<br>Natural disaster<br>Warming* (*ocean; *global) |

| SDGs | Key Words |
|---|---|
| | Greenhouse gasses<br>Temperature |
| Life Below Water | Sustainable ocean use<br>Life* (*marine; *ocean: *benthic; *ocean plant)<br>Coral reef<br>Fish* (*stocks; *industry)<br>Whale<br>Shark<br>Animals* (*marine; *ocean; *benthic)<br>Ocean* (*science; *research; *laws; *legislation; *acts; *proction; *protected areas; *Atlantic; *Pacific; *Indian; *Arctic; *restoration; *protection; *resilience; *research; *resources); *biodiversity<br>Sea* (*Baltic; *Mediterranean; *Red; *Black; *Caspian; *Aral; *Yellow; *Arabian; *of Okhotsk; *of Japan; *South China; *North; *Caribbean; *Bering; *restoration; *protection)<br>Water* (*fresh; *brackish)<br>Estuary* (*protection; *mitigation; *conservation)<br>Fishing* (*commercial; *small-scale; *unreported; *unregulated; *over; *destructive; *sustainable; *unsustainable; *illegal; *industry; *regulated)<br>Poaching<br>Dead zones<br>Eutrophication<br>Ph* (*rising)<br>Ocean conveyor belt<br>Aquatic<br>Acidification<br>Pollution* (*ocean; *marine; *plastic; *nutrient)<br>Microbeads<br>Marine* (*research; *legislation; *laws; *acts; *debris; *protected areas; *protection; *resilience; *invertebrates; *acidity; *acidification; *research; *resources; *biodiversity; *mammals)<br>Gulf* (*of Maine; *Persian)<br>Bay* (*of Fundy)<br>Coast<br>Ecosystem* (*coastal; *ocean; *marine; *estuary; *river; *lake; *stream)<br>River (*protection; *mitigation; *conservation; *animals; *life)<br>Lake (*protection; *mitigation; *conservation; *animals; *Life)<br>Stream (*protection; *mitigation; *conservation; *animals; *life)<br>Management* (*coastal; *ocean; *marine; *estuary; *river; *lake; *stream; *aquaculture; *fisheries)<br>Fisheries (*marine; *ocean; *subsidies negotiation) |

| SDGs | Key Words |
|---|---|
| | Aquaculture<br>Biodiversity (*coastal; *ocean; *marine; *estuary; *river; *lake; *stream)<br>Species at risk<br>Threatened<br>Endangered |
| Life on Land | Biodiversity* (*loss)<br>Mammals<br>Marsupials<br>Avian life<br>Ecosystem<br>Reptile<br>Amphibian<br>Rodents<br>Forest* (*Boreal; *Temperate; *Tropical; *Amazon)<br>Tundra (*arctic)<br>Desert<br>Rainforest* (*Amazon; *Congo)<br>Mountains<br>Valleys<br>Desertification<br>Melting* (*ice; *permafrost)<br>Indigenous* (*groups)<br>Land* (*degradation; *conservation)<br>Terrestrial<br>Extinction<br>Species at risk<br>Threatened<br>Invasive* (*species)<br>Grassland<br>Deforestation<br>Afforestation<br>Reforestation<br>Soil fertility<br>Aquifer<br>Degradation-neutral<br>Habitat* (*conservation; *loss; *protection; *restoration)<br>Poaching<br>Protected* (*area, *species)<br>Land trust<br>Zoos<br>Conservation* (*in-situ; *ex-situ) |

| SDGs | Key Words |
|------|-----------|
| Peace, Justice, and Strong Institutions | Peace<br>Peaceful<br>Justice<br>Institutions* (*strong; *peaceful; *effective; *accountable; *inclusive)<br>Societies* (*peaceful; *inclusive)<br>Trafficking<br>Labor* (*child;<br>Bribery<br>Rights* (*womens; *human; *voting)<br>Equality<br>Violence* (*sexual; *physical; *psychological)<br>Crime* (*organized)<br>Abuse<br>Exploitation<br>Homicide<br>Torture<br>Aggression (*physical; *psychological)<br>Law<br>Stealing<br>Combat<br>War<br>Fighting<br>Illicit financial flows<br>Corruption<br>Decision making* (*responsive; *inclusive; *participatory; *representative)<br>Legal identity<br>Access to information<br>freedom* (*of speech)<br>Media censorship |
| Partnerships for the Goals | Partnerships* (*multi-stakeholder; *civil; *public-private; public)<br>Connectivity<br>Resource mobilization<br>International support<br>Global partnership<br>Development assistance<br>Foreign direct investment<br>Debt* (*financing; *relief; *restructuring)<br>Investment promotion regimes; *distress)<br>Access to* (*science; *technology; *innovation<br>Knowledge sharing<br>Global technology facilitation |

| SDGs | Key Words |
|------|-----------|
|  | Trading system* (*universal; *rules-based; *non-discriminatory; *equitable; *multilateral)<br>Exports<br>Trade<br>Market* (*duty-free; *quota-free; *access)<br>Global macroeconomic sustainability<br>Policy coherence<br>Implement policy<br>Share* (*knowledge; *expertise; *technology; *financial resources)<br>Capacity-building support |