

**EDUCATIONAL TECHNOLOGY: ASSESSING INSTRUCTIONAL USE IN THE
ELEMENTARY CLASSROOM**

by © Sana Jamil

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Abstract

The purpose of this study is to understand the process by which teachers integrate educational technology into their instructional practices in elementary classrooms in Newfoundland and Labrador. In Canada, several provinces have invested millions of dollars towards innovative teaching practices (Coles, 2018; Council of Ontario Directors of Education, 2017; Murgatroyd & Couture, 2010; Renić, 2020). Considering the local context, the Newfoundland and Labrador Government announced \$20 million for the purchase of laptops for all teachers and Chromebooks for students across the K-12 education system (Education and Early Childhood Development, 2020). An important supplement to the introduction of educational technology into classrooms is the professional development activities for teachers through which technology utilization can be facilitated. I analyzed how professional development and policy relate to the adoption and utilization of educational technology in elementary classrooms across Newfoundland and Labrador.

My study was situated in a qualitative constructivist paradigm and applied a single case study design. The critical theory of technology, proposed by Feenberg (1991), served as the philosophical lens for this research. The data collection process included an online teacher questionnaire, semi-structured interviews, classroom observations, and documentation review. An interpretive analysis was applied for gaining an in-depth understanding of educational technology use in classrooms. The main question focused on how educational technology is integrated into instructional practices in elementary classrooms. Findings revealed that educational technology was integrated into instructions to help facilitate the learning process. Two broad categories emerged from the data that reflected educational technology's use with instructions: (i) differentiating by offering choices and (ii) teaching with Google Workspace.

Teachers also identified several factors that affected the process of educational technology integration. Moreover, three professional development characteristics: collaboration, self-direction, and relevance motivated teachers towards using educational technology. This study also provides useful insights for policy and suggests a framework for the context of Newfoundland and Labrador in relation to educational technology integration in classrooms.

General Summary

Globally investments have been made in educational technology to provide students with enhanced learning opportunities. In Canada, millions of dollars have been spent towards innovative teaching practices. Within the local context, the provincial government of Newfoundland and Labrador announced \$20 million for technology to support digital learning in the K-12 education system. An important supplement to the introduction of educational technology into classrooms is the professional development activities for teachers through which technology utilization can be facilitated. The purpose of my study was to understand the process by which teachers integrate educational technology into their instructional practices in elementary classrooms in Newfoundland and Labrador. The study was conducted in Newfoundland and Labrador English School District (NLESD) K-6 schools. Research data were gathered in the following manner: (1) Documentation: policy documents related to educational technology and professional development were reviewed from across Canada. (2) Questionnaire: a questionnaire was circulated to all grade 6 teachers under the NLESD elementary school system. (3) In-service teacher interviews: ten teachers participated in an interview related to the main research questions. (4) Classroom observations: three classroom observations were conducted in the Avalon region. Findings revealed that educational technology was integrated into instructions to help facilitate the learning process. This study also provided useful insights for policy and suggested a framework for the context of Newfoundland and Labrador in relation to educational technology integration in classrooms.

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Dedication

I dedicate this dissertation to my family –

Arif, Hadi, and Rayan.

*They have been a source of strength, support, patience,
and motivation for me throughout this entire experience.*

I am truly blessed to have you all in my life.

I would also like to dedicate my work

to all teachers

who serve as an inspiration by

working hard to brighten the future of others.

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Chapter 1: Introduction

Investments in educational technology such as SMART Boards, Chromebooks, and educational software are being made in the K-12 education system with a primary focus on enhancing student learning (Council of Ontario Directors of Education, 2017; Education and Early Childhood Development, 2020). Regardless, merely providing the resources does not necessarily result in meaningful educational technology integration in classrooms. Educational technology integration is much more than simply using a device to complete a task (Cauley et al., 2009; Guzey & Roehrig, 2009). Educational technology facilitates learning through different mediums that provide student-centric learning opportunities, engage learners, and allow for differentiation and learning preferences (Ertmer et al., 2012; Hsu, 2010; Ritzhaupt et al., 2012; Ottenbreit-Leftwich et al., 2010). Teachers are expected to integrate these devices and software tools with the curriculum (Eady & Lockyer, 2013; Mueller et al., 2008). Generally, school districts provide professional development opportunities for teachers to learn and integrate educational technology within their instructional practices. However, teachers have reported several factors, including a shortfall in teacher preparation and lack of support in using available educational technology (Kusano et al., 2013; Potter & Rockinson-Szapkiw, 2012).

In Canada, some provincial education policy and regulations require schools to develop plans based on provincial priorities (Alberta Teachers' Association, 2005). The Newfoundland and Labrador Government recently provided \$20 million in support of digital learning in the K-12 education system (Education and Early Childhood Development, 2020). The Newfoundland and Labrador English School District (NLESD), the sole English school district in Newfoundland and Labrador, is responsible for equipping teachers with the skill-set in order to support digital learning in K-12 classrooms. This study was conducted to understand the

processes by which teachers integrate educational technology into their instructional practices in elementary classrooms in Newfoundland and Labrador. Within the qualitative methodology research approach, a single case study design was applied. The critical theory of technology, proposed by Feenberg (1991), served as the philosophical lens for this research. It helped in exploring teachers' perspectives towards technology in general and educational technology in particular. Results of this study provide useful insights and recommendations that can be considered when planning strategies to implement policies, designing professional development activities, and adopting educational technologies.

The next section provides a brief background of educational technology, followed by a statement of the problem, rationale, context, significance of the study, and definition of key terms.

1.1 Background

Educational technologies have evolved over time, from the invention of pictographs before 3000 B.C. to the predecessor of 3D printers. Some early examples of educational technology include: textbooks, blackboards, and abacuses. Though these developments are still popularly used across educational institutions, some have undergone tremendous transformations. For example: textbooks can easily be accessed on digital devices, blackboards have mostly been replaced with whiteboards and SMART Boards, and modern-day calculators and computers have originated from an abacus (Ifrah et al., 2000).

During the 1980s, the number of computers in western schools increased tenfold (Schofield, 1995). Faster and more robust computers were available in almost every school in the United States (Wenglinsky, 2006). Advanced tools provided additional interactive elements and swift feedback. More recently, large investments are being made by governments to provide

classrooms with up-to-date technological devices and software (Alenezi, 2019; Dede et al., 2005; OECD, 2015). However, teachers require relevant professional development that supports the provision of these latest resources. Technology can only be beneficial in the classroom if teachers know how and when to use it (Hollebrands, 2020). Sandholtz and Reilly (2004) note that often more time is spent on teaching the technology, and little on what is meaningful to teachers. The authors further argued that “a more productive approach is to begin with teachers’ strengths—thinking about curriculum and instruction—rather than putting them in the uncomfortable and unfamiliar role of technicians” (Sandholtz & Reilly, 2004, p. 507). Similarly, Winter et al. (2021) assert that “teachers’ levels of technological skills and capacity to adapt both the quality and quantity of curriculum are essential for success” (p. 236).

A review of the literature revealed that most empirical studies (Abrami et al., 2013; Domingo et al., 2016; Haßler et al., 2016; Warschauer et al., 2004) focussed on the effects on K-6 learning through educational technologies and only a few (Giordano, 2007; Inan & Lowther, 2010; Khambari et al., 2020; Kopcha, 2012) provided an overview of the processes adopted to integrate educational technology for instructional practices. Thus, this study focussed on understanding the processes by which teachers integrate educational technology into their instructional practices in elementary classrooms in Newfoundland and Labrador, Canada. The results of the exploratory study included recommendations for best practices when designing professional development, adopting educational technologies, and planning strategies to implement policies. This study provided teachers, administrators, and district personnel useful insights, which may result in better utilization of educational technology. This in turn, may lead to meaningful classroom activities that may enhance student learning outcomes.

1.2 Statement of the Problem

Investments in technological devices for K-12 classrooms continue to be the norm, despite mixed research findings on the value of these devices in the classroom. While some research studies suggest that these technological devices have a positive impact on learning (Gupta & Kour, 2016; Quinn, 2016; Zheng et al., 2013), other studies have expressed disagreement about their effect on student performance (Cuban, 2001; Ditzler et al., 2016; OECD, 2015). In Canada, several provinces have invested millions of dollars towards innovative teaching practices. For instance, in Ontario the Ministry of Education made a multi-faceted investment of \$150 million, out of which 80% was designated for acquiring digital technology and learning tools such as tablets, laptops, software, and 3D scanners and printers, and 20% was dedicated to professional development opportunities for educators (Council of Ontario Directors of Education, 2017). Similarly, Alberta has invested \$1.5 billion in technology since the 1980s, with \$600 million spent just on building the Alberta SuperNet, a broadband network connecting public institutions across the province (Murgatroyd & Couture, 2010). More recently, the Newfoundland and Labrador Government announced \$20 million for the purchase of laptops for all teachers and Chromebooks for students across the K-12 education system (Education and Early Childhood Development, 2020).

An important supplement to the introduction of educational technology into classrooms is the professional development activities for teachers through which technology utilization can be facilitated. Despite considerable investments in technology, it is questionable whether teachers are receiving the professional development support that they need to successfully implement technology into their classrooms. It is important to determine if these investments are producing the desired outcomes and justify the spending. Furthermore, it would be insightful to learn about

existing policies (if any) that facilitate the purchase of educational technology for NLESD and what policy or procedures are followed to introduce educational technology for instructional use in classrooms. Therefore, the purpose of my study was to understand the processes by which teachers integrate educational technology into their instructional practices in elementary classrooms in Newfoundland and Labrador, Canada.

1.3 Rationale for the Study

With ten years of teaching experience in various international elementary schools, I was interested in exploring elementary teachers' perceptions with regards to the meaningful integration of educational technology. Since I had worked as an educator internationally, I had my own perspective of educational technology and professional development support. I coordinated the Accelerated Reader program, a reading assessment software, for multiple grade levels without being provided professional development in this area. I also integrated technology across the grade 6 Social Studies curriculum and regularly utilized Google Classroom to teach specifically during weather-related school closure days. Hence, I was naturally inclined to explore teachers' perspectives and provide teachers an opportunity to voice their beliefs regarding the instructional use of educational technology.

Domingo and Gargante (2016) note that teachers' perceptions can have a great influence on their teaching practices. Hence, if teachers do not comprehend the usefulness of educational technology then there may be a serious problem that requires attention. Previously, the Newfoundland and Labrador Government had allocated \$1 million to acquire educational technology in the hopes of teachers utilizing more technology while teaching (Coles, 2018). However, it is unknown if teachers did incorporate educational technology in their day-to-day

teaching. Furthermore, it is unclear if policies are in place for consulting teachers before and after investing in educational technology.

Education policies are often formed following a top-down approach (OECD, 2017), where policymakers make decisions that are forwarded to schools for implementation in classrooms. Therefore, school leaders and teachers act as policy implementers at the ground level (Dede et al., 2005). They need to have a skillset to implement and be fluent in adopting a policy within the given context. Consequently, time, resources, and design are needed for professional development to be successful and to yield improved learning outcomes using educational technology (Wang et al., 2014).

Globally, professional development is often delivered in a lecture format with one-way instruction and without involving hands-on practical value for teachers. Not only is delivery of professional development problematic, Darling-Hammond et al. (2017) observe that “implementing effective professional development well also requires responsiveness to the needs of educators and learners and to the contexts in which teaching and learning will take place” (p. iv). Historically, considering the K-12 educational context, Cuban (1986) notes that the introduction of film, radio, and television in classrooms for learning purposes could not survive for long. For example, Cuban (1986) conducted a study at an elementary school in the U.S. to monitor the use of television in classrooms. Direct observations involving eight teachers, surveys, and in-depth reviews of six case studies were conducted to collect data. His findings suggested that the introduction of television in elementary schools was not successful because of several technical issues, such as the lack of infrastructure support, the synchronization of schedules, the training required for teachers, and having no connection to the curriculum (Cuban, 1986). The current situation of educational technology use in classrooms is not very different

from that of Cuban's findings. There seems to be a lack of connection between curriculum and technology use, teachers usually do not have the time to be comfortable in using technology due to inadequate professional development opportunities (Al-Alwani, 2005; Kopcha, 2010; Schrum, 1995). Continuous upgrades in innovation and information technology has added further stress on already overwhelmed teachers, resulting in expedited cycle times. Fundamentally, it means that by the time a policy may facilitate integration of educational technology into classrooms, another latest technology is awaiting consideration.

With ongoing resources being dispensed it is essential to study if the distribution of technological devices results in improved instructional practices that enhance student learning. When it comes to the impact on learning through educational technology, there have been a variety of perspectives offered regarding the relationship between educational technology and pedagogy, which have fueled scholarly debates (Dede et al., 2005). One classic debate, highly cited in the literature, includes a series of articles by Richard Clark (1983, 1994) and Robert Kozma (1991, 1994) (note: the term *media* will be used interchangeably for educational technologies and medium). Clark (1983) asserted that "media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (p. 445). Clark insisted that any method could be designed into different forms of media presentations. He argued that it is the methods of teaching that are important and not the media being used for teaching.

On the other hand, Kozma (1994) believed that media and methods could not be separated. He emphasized that capabilities of media can be utilized to their full advantage to generate new ways of learning through appropriately designing and addressing the needs of diverse learners. Kozma provides a more balanced and pragmatic approach when compared to

Clark's more rigid claim. However, irrespective of the perspective, both require teachers to be well acquainted in using the media provided to them, which reflects the importance of professional development for integrating educational technology in classrooms. Therefore, in order to use the media for educational purposes, methods need to be designed to help teachers be the facilitators of educational change in classrooms. For this, not only is it necessary for school districts to evaluate the spending on educational technology but also policies for professional development require evaluation.

1.4 Context of the Study

This study was conducted in Newfoundland and Labrador, Canada. Newfoundland and Labrador is the easternmost province of Canada; situated in the country's Atlantic region. Memorial University of Newfoundland and Labrador (MUNL) is the only research-based university in the province. Though there has been ground breaking research conducted that has helped to drive new developments in teaching and learning, there has been limited research on the instructional use of educational technology in K-12 schools. Thus far, only a few studies have investigated the adoption and the use of educational technology at schools in Newfoundland and Labrador (Galway et al., 2020; Khanlari, 2016, and Seifert et al., 2013). Furthermore, there are no studies conducted to analyze how professional development and policy relate to the adoption and utilization of educational technology in classrooms across Newfoundland and Labrador. Moreover, although the Newfoundland and Labrador Government has been working towards acquiring educational technology for the past few years, the Department of Education, the Newfoundland and Labrador English School District (NLESD) and the Newfoundland and Labrador Teachers' Association (NLTA) have not conducted

independent research to explore instructional use of educational technology in elementary classrooms. Therefore, this research is much needed and timely.

This study investigated the instructional use of educational technology while aligning it with professional development and policy to understand the support available to teachers. The NLESD K-12 system includes primary (grades K-3), elementary (grades 4-6), junior high (grades 7-9), and high school (grades 10-12). The K-12 curriculum is organized by outcomes based on The Atlantic Canada Framework for Essential Graduation Learning in Schools (Government of Newfoundland and Labrador, 2021). The framework identifies seven Essential Graduation Learnings: Aesthetic Expression, Citizenship, Communication, Personal Development, Problem Solving, Spiritual and Moral Development, and Technological Competence. In order to demonstrate technological competence, K-12 students should be able to “use a variety of technologies, demonstrate an understanding of technological applications, and apply appropriate technologies for solving problems” (Government of Newfoundland and Labrador, 2021). In elementary schools, teachers of grade 6 are more likely to adopt educational technology to support smooth transition into the junior high school system. Therefore, I gathered data from grade 6 teachers within the NLESD. Data were collected from a questionnaire, interviews, and classroom observations.

1.5 Significance of the Study

As stated earlier, the Newfoundland and Labrador Government continues to invest in providing educational technology to K-12 schools even though there is insufficient research to support the outcomes of these investments in this region. It is unknown if teachers have been involved in providing input on the worth of these investments with regard to its utilization in the classrooms. Also, it is inexplicit if students are benefitting from these resources for whom

essentially the investments are being considered. To date, no research has been done by the Faculty of Education at MUNL, Department of Education, the NLESD and the NLTA that involved teachers' perspectives of educational technology and considered understanding the process of educational technology implementation.

Therefore, this research contributes in the following manner: empowers the voices of people that have not been heard in Newfoundland and Labrador – elementary school teachers; provides policymakers evidence and data for their consideration moving forward; informs parents and the school community at large about how the investments in educational technology are being utilized at a classroom level; benefits students as corresponding learning activities will be aligned with meaningful teacher professional development leading to improved learning outcomes; lastly, this research contributes to the existing body of scholarly knowledge and adds to the theoretical position of educational technology in K-12 schools.

Furthermore, there are at least two potential benefits for participants. First, teacher participants may gain new insights to their personal pedagogies and methodologies related to student engagement and collaboration through the integration of educational technologies. Second, teacher participants may gain knowledge of the broader spectrum of the educational technologies and the potential support networks that are already in place to help them move forward in this area. My study has created a baseline of knowledge that can potentially impact future policies and practices related to educational technology. This study encourages evidence-based decision making when creating policies and planning professional development activities for teachers within the local context.

1.6 Definition of Key Terms

There are a broad range of available definitions in the literature that define educational technology, policy, and professional development. Consequently, it is fundamental to state the definitions that are adopted to understand this study. The concise definitions of the main terms of the study are provided in alphabetical order as follows:

Deliverology: “Deliverology is the establishment of a delivery unit—a small group of dedicated individuals focused exclusively on achieving impact and improving outcomes” (Barber et al., 2011).

Educational Technology: The Association for Educational Communications and Technology (2018) states, “educational technology is the study and ethical application of theory, research, and best practices to advance knowledge[,] as well as mediate and improve learning and performance through the strategic design, management and implementation of learning and instructional processes and resources” (AECT, 2018).

Policy: A policy “usually proposes a vision to achieve, sets goals to meet, and may even spell out the means to reach them” (OECD, 2017, p. 21). A typical policy may therefore include specific components, such as a vision, analysis, planning, implementation, and evaluation.

Processes: The steps taken to support the integration of educational technology.

Professional Development: Richter et al. (2011) define professional development as an “uptake of formal and informal learning opportunities that deepen and extend teachers’ professional competence, including knowledge, beliefs, motivation, and self-regulatory skills” (p. 116).

Technology: Burgelman et al. (1996) define technology as the theoretical and practical knowledge, skills, and artifacts that can be used to develop products and services including their production and delivery systems (Burgelman et al., 1996).

The Critical Theory of Technology: According to Feenberg (1991) the critical theory of technology offers both critical and empirical perspectives that help in making sense of technological changes taking place around us.

1.7 Conclusion

This chapter provided an overview of purpose, context, rationale, and significance of the study. The remainder of this dissertation is organized as follows: *Chapter 2: Literature Review*, provides a theoretical foundation and detailed literature review on the main areas; *Chapter 3: Methodology*, discusses the nature of the study and provides a rationale for the appropriateness of method and a detailed explanation of the data collection process; *Chapter 4: Analysis and Findings*, discusses the summary of themes and sub-themes found within the data; and *Chapter 5: Discussion*, discusses the findings within the context of existing research and local conditions.

Chapter 2: Literature Review

Technology is ubiquitous: it has grown at a rapid pace, particularly in the past few decades, and has impacted almost every facet of our daily lives (Bullman, 2021; Escueta et al., 2017; Feenberg, 2017; Jones & Jo, 2004; Selwyn, 2017). Different types of technologies in various fields are responsible for the smooth functioning of societies, such as the Internet in the field of information and communication, satellite-based navigation systems in transportation, and 3D design technology in construction. While the purpose of technology is often to make our lives more efficient, it also creates opportunities for abuse in the form of social, ethical, or environmental harm. The Internet, for instance, is perhaps one of the best-known information and communication technologies, and has resulted in improved communications, accessible services, and a provision of outstanding online learning opportunities (Aslan & Reigeluth, 2011; Ely, 1995). A large number of software applications developed for K-12 classrooms are attributed to information and communication technologies.

However, with the growing use of the Internet in K-12 schools, targeted students have become the victims of severe cyberbullying incidents, some of them resulting in loss of life (Moore & Ellsworth, 2014). As a result of this abuse of technology, schools are now more involved in tackling issues related to cyberbullying, privacy invasion, academic dishonesty, and unethical behaviors (Davies & West, 2014). Technology is introduced into classrooms worldwide as a means to help teachers educate and to help students learn—this integration of technology and education is both beneficial and problematic.

In K-12 education, there has been an increased interest in providing technological tools in classrooms to support the teaching and learning process (Cuban, 2001; Davies & West, 2014; Ely, 1995; OECD, 2015; Selwyn, 2017). Large investments are being made to provide

classrooms with up-to-date technological devices and software (Alenezi, 2019; Dede et al., 2005; OECD, 2015; NSDC, 2001; See et al., 2021). These investments in technological devices continue to be the norm, despite mixed research findings on the use of these devices in the classroom: while some research studies suggest that these technological devices have a positive impact on learning (Gupta & Kour, 2016; Fink, 2015; Quinn, 2016), other studies have expressed disagreement about its effect on student achievement (Cuban, 2001; Ditzler et al., 2016; OECD, 2015).

This chapter is divided into three main areas: (1) Educational Technology, which first explores the various definitions of technology, then explores the definitions of one of its subgroups, educational technology, next perspectives related to technological and social determinism are analyzed, and finally how well educational technology is being integrated into classroom settings is assessed; (2) Professional Development, which discusses effective elements of professional development and explores the relationship between professional development and educational technology; and (3) Policy and Practice, which defines and provides a brief overview of education policy implementation and discusses three different types of policy implementation frameworks in relation to the use of educational technology: analytical, normative, and action-oriented frameworks.

2.1 Educational Technology

To properly assess the term educational technology, it is necessary to first understand the meaning of its origin, *technology*, which is derived from the ancient Greek word *technē*, signifying art or craft (Selwyn, 2017). *Technē* originated from the desire of humanity to explore and create new tools and functions by repurposing things found in nature, as the Greeks understood the world “in terms of the fundamental fact that humanity is a laboring animal

constantly at work transforming nature” (Feenberg, p. 1, 2009). *Technē* lays emphasis on the purpose and meaning of the nature of things in an environment: for example, the repurposing of logs of wood to make furniture, paper, and pencil, as well as fuel for cooking. One issue with a term this broad is that it has resulted in various multifaceted meanings of technology, rendering the term messy, complex, and difficult to define and understand (Hughes, 2005).

In the literature, many definitions have been proposed that attempt to simplify the term technology. According to Winner (1977), technology can be viewed as the application of knowledge to a variety of organizational processes. Winner’s definition is too broad and can also be related to the organizational processes involved in the schools of today, such as administrative and professional development activities, as well as technology use in classrooms. Alternatively, Burgelman et al. (1996) assert that technology is the theoretical and practical knowledge, skills, and artifacts that can be used to develop products and services, including their production and delivery systems. This definition regards both research and applied knowledge as equally important for designing tools that can be further developed into products and services. When observed in the K-12 educational context, equal importance needs to be given for providing a strong theoretical basis for technology’s anticipated application and desired outcomes.

2.1.1 Defining Educational Technology

Researchers have found it difficult to settle on one specific definition for educational technology: as Luppicini (2005) notes, educational technology is an applied and decision-oriented field developing from multiple sources, making it challenging to define, and demanding a broad and multifaceted approach. Several researchers have attempted to define educational technology in the past by applying different perspectives. Armsey and Dahl (1973) define educational technology using simple terms, describing it as “things of learning” (p. 21). Likewise, some

teachers also consider educational technology as a learning tool (Kerr, 1991). Things of learning in today's context can be both physical objects that are tangible, such as computers and whiteboards, as well as things that are intangible, such as software or digital media. In the context of K-12 education, it is teachers who facilitate the learning process. Merely providing things of learning to students, such as books, may not result in desired outcomes unless a teacher uses books in a manner that simplifies the discussed concepts and encourages higher-order thinking skills, like reasoning and comprehension. Therefore, it may be apt to note that things of learning cannot directly contribute to learning without other vital elements. Thus, Armsey and Dahl's definition of educational technology as things of learning is vague.

Ely (1995) proposes another definition that considers educational technology as “the systematic design and use of hardware and software to achieve specific objectives” (p. 5). This definition is much more inclusive than Armsey and Dahl's definition because it includes software, which can be applied to contemporary K-12 classrooms where various reading software are often used for improving the comprehension skills of students. Furthermore, this definition covers the vagueness of Armsey and Dahl's definition by suggesting that an objective must first be specified in order to systematically design the use of educational technology to achieve a desired goal. For instance, according to Ely's definition, the website YouTube can be considered an educational technology because it is indeed a systematic design and use of hardware (data storage servers) and software to provide an online video-sharing platform. YouTube is commonly utilized by teachers to explain concepts related to the curriculum in classrooms as well for their own learning (e.g. videos from the online educational organization Khan Academy). Although YouTube may be used for advancing learning at an introductory level, it may need specific guidelines when catering towards a particular objective. For example, using YouTube for learning purposes may

require guidelines for content to align with its appropriate grade level and school curriculums.

While Ely's definition is narrower in scope than Armsey and Dahl's, it still has certain limitations: for example, Ely's definition of educational technology fails to address certain aspects that would be considered crucial in today's educational climate, such as the ethical use of technology and research involving the systematic design of technology.

An organization that has remained at the forefront in the field of educational technology since 1923 is the Association for Educational Communications and Technology (AECT) (Hlynka & Jacobsen, 2009). Over the years, the AECT has proposed several definitions of educational technology that have provided a strong foundation to the evolving field. One definition, proposed by AECT Task Force on Definition and Terminology (1977), defines educational technology as "a complex and integrated process, involving people, procedures, ideas, devices, and organization for analyzing problems and devising, implementing, evaluating, and managing solutions to those problems, involved in all aspects of human learning" (p. 19). The definition of educational technology has continuously been subject to revision based on the developments in technology, ethical standards, and shift in social norms. The latest unpublished definition of AECT (2018) states that "educational technology is the study and ethical application of theory, research, and best practices to advance knowledge[,] as well as mediate and improve learning and performance through the strategic design, management and implementation of learning and instructional processes and resources" (AECT, 2018). This definition offers a visionary perspective that supports educational technology based on elements of research, application of theory, and best practices. Also, the inclusion of the term ethical highlights the social role of educational technology in societies, and its emphasis is on educational technology acting not only as a tool, but also as a mediator for improving learning, further reinforcing its role. The AECT's definition

provides a good base to this study as the emphasis is on educational technology acting as a mediator for best practices that leads to improved learning and performance. This study explored how teachers are utilizing educational technology in their instructional practices and how teachers are supported for the use of educational technology in classrooms. Thus, this definition aligned well with my research and was adopted for this study.

The AECT's most recent definition may intrigue readers to examine some of the less successful integrations of past technologies in the classroom (e.g., film, radio, television) that lacked the understanding of the very essence of educational technology. A brief overview is provided below on the evolution of educational technology and its associated failures.

2.1.2 The Evolution of Educational Technologies

According to scholars, many early technologies that ended up in K-12 classrooms were less effective in influencing teaching and learning, including the following four technologies: (i) films, believed to take less instructional time (Cuban, 1986); (ii) radios, considered to be the “textbooks of the air” (Cuban, 1986, p. 19); (iii) language labs, a technological breakthrough for learning English (Gupta & Kour, 2016); and (iv) television, believed to have brought revolution during the 1950s and 1960s. While most of these technologies no longer exist in today's classrooms, a few of them have been modified to suit their users. It is apparent that educational technology has been a part of K-12 classrooms for several decades, nonetheless researchers have labeled educational technology as a ‘double-edged sword’ (Postman, 1992) and advised caution for its use (Cuban, 2001; Selwyn, 2017; Yu, 2020). Researchers continue to reiterate that possessing or being knowledgeable about technologies is not enough to use them effectively in educational settings (Aslan & Reigeluth, 2011), which has attracted more studies on developments in educational technologies and their link to learning (Alenezi, 2019; Ditzler et al.,

2016; Haßler et al., 2016; Rizk, 2020; Samsonova, 2021).

When it comes to the impact on learning through educational technology, there have been a variety of perspectives offered regarding the relationship between educational technology and pedagogy, which have fueled scholarly debates (Dede et al., 2005). One classic debate, highly cited in the literature, includes a series of articles by Richard Clark (e.g., 1983, 1994) and Robert Kozma (e.g., 1991, 1994) (note: the term *media* will be used interchangeably for educational technologies and medium). Clark (1983) asserted that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (p. 445). In 1994, Clark further explained that methods influence learning and that instructional methods had been mixed up with media. Therefore, he insisted that any method could be designed into different forms of media presentations. For instance, the multiplication tables in mathematics could be taught using various methods, such as using numbers (i.e. $2 \times 3 = 6$) or drawings (i.e. $\text{☺☺} \times \text{☺☺☺} = \text{☺☺☺☺☺☺}$), yet both influence learning. Clark argued that methods of teaching are important and not the media being used for teaching. He believed that different media are also created based on the methods. Hundreds of learning materials are available online, resulting from methods, eventually making the methods imperative: hence, Clark insisted that media should not be the central focus of learning.

On the other hand, Kozma (1994) believed that media and methods could not be separated. He emphasized that capabilities of media can be utilized to their full advantage to generate new ways of learning through appropriately designing and addressing the needs of diverse learners. Kozma provides a more balanced and pragmatic approach when compared to Clark's more rigid claim. Furthermore, Kozma's argument aligns well with the AECT's definition

of educational technology, which highlights the role of educational technology as more than just a means for delivering instructions.

Both Kozma and Clark raise important points that compel us to understand the role of media (a.k.a. educational technology) in the learning process. Conversely, several scholars have maintained a deterministic point of view towards technology and student learning (Friesen, 2008; Hofmann, 2006; Leonardi, 2008; Selwyn, 2017), espousing that media not only influences learning, but is also responsible for transforming society.

2.1.3 Technological Determinism

The technological determinism theory perceives technology as the driving force behind society's transformation (Oliver, 2011). According to Winner (1977), the central argument of technological determinism is that "changes in technology are the single most important basis of change in society" (p. 65). Technological determinism argues that technology is believed to be already available, and it is only a matter of when it will be discovered and by whom (Christiansen, 2014). Considering the technology of the Internet and the social change it has aided, this assumption of technological determinism makes sense: the availability of the Internet has resulted in many websites, such as YouTube and Facebook, that have created opportunities for people to build and manage their own channels. These channels are subscribed and followed by millions of online users, resulting in an online society impacting the social behavior of people. In the case of the Internet, technology can be said to have been the driving force behind social change.

Another example of technological determinism that aims to solve the social issue of education in developing countries is the One Laptop Per Child (OLPC) program, created by Nicholas Negroponte, the founder of Massachusetts Institute of Technology's (MIT) Media Lab.

Warschauer and Ames (2010) provide insight on the overexaggerated OLPC program and note that millions of dollars were invested in designing low-cost laptops named *XO*, specifically for children's use to empower them to learn on their own. Some of the countries that availed of the OLPC program included the United States, Uruguay, Rwanda, Paraguay, Peru, the Republic of Haiti and the small Pacific Island nation of Niue. The article highlights that Negroponte believed that the OLPC implementation model should not waste time and money in considering changing curricula and assessments, providing teacher training, and conducting formal evaluations or pilot programs, as those would slow down vitally needed reform. Warschauer and Ames (2010) reviewed studies conducted in Haiti, Uruguay, the United States and Paraguay to analyze the effect on student performance outcomes in reading, writing, language, science or math from participating in the OLPC program. Studies did not report any measurable increase in student performance outcomes. Therefore, “regrettably, there is no magic laptop that can solve the educational problems of the world's poor” (Warschauer & Ames, 2010, p. 46).

Approaches that do not consider teacher training and evaluation as vital elements are destined to fail and result in a waste of precious resources, such as the case of the OLPC program (Warschauer & Ames, 2010). It has been noted in the research that most 1:1 device programs expect that technology will improve student outcomes automatically, instead of preparing teachers to integrate the technology in ways that promote cooperation, learning differentiation and problem-based learning (Weston & Bain, 2010). Additionally, Ely (1995) asserts that misconceptions suggesting that “almost any problem can be solved with a technological solution” commonly exists in our societies, emphasizing that “in education, this assumption is dangerous and in terms of technology, it can be disastrous” (p. 12). Ely explains that, in education, human interactions are important elements in order to solve problems that require time so that schools

can make sensible and appropriate applications of technology. This suggests that technology may not be the answer to problems in education.

Negroponte's perspective can be linked to communications theorist and media scholar Marshall McLuhan, who declared that "the medium is the message" (McLuhan, 1964, p. 7). Viewing technology from McLuhan's lens would mean that technology is presented in various ways, like the availability of laptops and desktop computers in K-12 schools, irrespective of the need technology is portrayed as a necessity and is sought to be gradually accepted in the society. Accordingly, technological devices, such as laptops, iPads, and computers, promise a positive difference on student learning, while embedding their necessity.

However, many studies have shown that these technologies have little or no effect on learning (Cuban, 1986; Cuban, 2001; Ditzler et al., 2016; OECD, 2015; Vigdor et al., 2014). A qualitative study by Ditzler et al. (2016) conducted observations and interviews to understand the perceptions of students and teachers on the use of iPads. The sample included twenty-three students and three teachers from a middle school in the United States. The findings demonstrated a number of concerns on the use of iPads in classrooms, such as creating distractions towards learning, having limited applications for classroom use, reducing student engagement, creating issues involving Internet connections, and increasing the need for teacher training. Vigdor et al. (2014) further narrowed down the effect of using devices for reading and mathematics, concluding that technological devices have no significant differences on student performance.

Conversely, there are studies that have reported positive effects of technological devices on student learning, specifically for students requiring special needs (Maskey et al., 2014). However, there are several other non-technological factors (teachers, resources, administration, parent support, etc.) that are associated with this positive effect (Rizk, 2020). Hence, it may not be

justifiable to promote only technological devices as responsible for this effect. The positive effect on learning can be ascribed to an alternative perspective lens.

2.1.4 Social Determinism

The opposite school of thought to technological determinism is *social determinism*, which suggests that human actions build, implement, and use technology and cause social change (Janssen, 2014). Pinch and Bijker (1984) endorse the social deterministic approach and provide the popular example of bicycles, which came into existence based on the needs of various social groups of society. According to social determinism, the needs of society is what forms the basis for technologies to be successful (Oliver, 2011). Segways (a two-wheeled motorized personal vehicle), for instance, have been unpopular due to its design resulting in life-threatening injuries (Vincent et al., 2009). When considering the K-12 educational context, Cuban (1986) notes that the introduction of film, radio, and television in classrooms for learning purposes could not survive for long. For example, Cuban (1986) conducted a study at an elementary school in the U.S. to monitor the use of television in classrooms. Direct observations involving eight teachers, surveys, and in-depth reviews of six case studies were conducted to collect data. His findings suggested that the introduction of television in elementary schools was not successful because of several technical issues, such as the lack of infrastructure support, the synchronization of schedules, the training required for teachers, and having no connection to the curriculum (Cuban, 1986). However, another important element that cannot be ignored is that the implementation did not consider teacher involvement or their feedback, which increased the chances of television's failure. Therefore, technologies that are designed and imposed without recognizing human needs will result in less effective utilization.

Pinch and Bijker (1984) developed the Social Construction of Technology (SCOT)

model, which suggests that new technology emerges from interactions with different social groups. According to Pinch and Bijker (1984), there are two primary components of SCOT: (a) interpretive flexibility, where different social groups associate different meanings with artifacts, and (b) relevant social groups, where “all members of a certain social group share the same set of meanings, attached to a specific artifact” (p. 414). Interpretative flexibility is defined as the utilization of technology for purposes other than what it was originally designed for (Pinch & Bijker, 1984). Historically, most technologies that fall under the category of educational technology, such as radio, television, computers, laptops, and projectors, were not initially developed to aid in classroom learning. Many software applications currently used for educational purposes, such as 3D designing, printing, and social media applications such as Twitter and Facebook, were not designed and developed for educational purposes.

Twitter, a social networking site, was developed for communication purposes, but now finds use as an instructional tool that can facilitate student learning. For instance, Marich (2016) discussed the positive impact of blogging using Twitter on the teacher and her students’ learning. The author, who was also a professional development provider, documented the eight-week journey of a second-grade teacher whom she mentored. The teacher initially created an account for herself and monitored the work of other teachers online for a month. The author noted that the teacher’s main concern was related to student cybersafety, therefore, she made sure safety protocols were established before introducing Twitter to her class. These protocols included: using three-digit numbers (Marich, personal communication, June 2020), not tagging any pictures with names, using a classroom account, and following only selected classes. Students’ tweets were focused on the *what* and *why* of learning: students were able to fix grammar, punctuation, and capitalization before getting approval from the teacher to publish. Twitter-use encouraged

students to learn digital citizenship skills related to cybersafety, online relationships, and communication. As the teacher explored more about Twitter, she used @Skypeclassroom to organize virtual field trips, author visits, and conversations with TED speakers, among others. Furthermore, students tweeted questions and responded to the tweets of other students from around the globe. The teacher felt motivated to use best practices strategically while constantly reflecting on her teaching practices, making her a better teacher.

However, considering the notion of cyberbullying: it can be agreed that society shapes technology in both good and bad ways. For example, the Internet was originally invented for use by the military for communication purposes (Leiner et al., 2009), but today, there are more than a billion users of the Internet across the globe, having been adopted by schools for better communication, collaboration, and online resources. Hence, applications such as Moodle and Google Workspace, and informal applications like Facebook and Twitter, have been adopted by schools to enhance the experience of students (Arzu, 2014; Marich, 2016).

Nonetheless, unintended consequences and unanticipated possibilities are common, and the final utilization of technology cannot be controlled by the designers and promoters of technology. For instance, due to an increase in cyberbullying incidents, institutions have taken action against Internet surveillance and now have policies in place to protect students from being targeted (Moore & Ellsworth, 2014). Issues such as copyright infringement, distribution rights, and cyberbullying have been commonly associated with technology. It is also possible to predict that if new technology is introduced in an organization, it can engender various cultural practices (Leonardi, 2008).

Consequently, society has the potential to cause mass social change: Twitter hashtags such as #BlackLivesMatter and #ClimateChange have been used to create awareness about

important issues. These movements put pressure on governments across the globe to reconsider their policies. However, there can be competing interests and power formations that underlie the use of technology when it comes to education (Selwyn, 2007). Some criticisms of the social determinism perspective are that it has given rise to large corporations, resulting in commercialized education (Kanuka, 2008) and deliberately overlooking the needs of certain social groups (Cook, 2007).

2.1.5 Impact of Educational Technologies at a Classroom Level

Winter (2021) notes that “schools are expected to use technology to enhance the education of their students” (Winter et al., 2021, p. 242). Education administrators continue to allocate budgets for technological upgrades in anticipation of profound changes in student learning (T. Hunt, personal communication, November, 2019). Along the same lines, Fullan (2016) asserts that “billions are spent to buy technology with limited thought to how it will be used” (p. 45). The belief in technology, that it will create profound change, has been repeatedly evident, specifically in the U.S, where the U.S. government considered technological devices as a solution for improving declining scores on standardized tests (Tyack & Cuban, 1995). Hence, the use of technology in K-12 schools was presumed to be a sign of success, and further accelerated the process of putting educational technology into schools (Ely, 1995; Tyack & Cuban, 1995). Although, when expected results were not achieved, teachers and schools were blamed by officials for not effectively using educational technology (Selwyn, 2017). Conversely, recent empirical studies that analyzed the potential of educational technology use in the classroom highlight various reasons that are fundamental for implementing educational technologies. Two relevant studies of educational technology, Rizk (2020) and OECD (2015), that assessed technology use are discussed in the following paragraphs.

A study conducted by Rizk (2020) across ten school boards in Ontario, Canada explored technology use and integration in elementary classrooms. The primary purpose of this research was to discover if technology alone can facilitate longevity in student engagement. The author conducted 38 in-depth interviews, 10 focus group interviews, and 27 classroom observations with teachers who utilized various educational technologies. Rizk's findings suggested that technology alone may not be sufficient enough to facilitate longevity in student engagement. The author highlighted four key considerations that are fundamental for implementing long-term engagement with technologies, which were: (i) teacher pedagogy, (ii) teacher training, (iii) collaborative learning environments, and (iv) greater access of digital tools across schools (Rizk, 2020).

A report presented in collaboration with the Organization for Economic Cooperation and Development (OECD) and Programme for International Student Assessment (PISA) provided an internationally comparative analysis of the digital skills acquired by K-12 students. Data collected from more than thirty countries showed that schools were way behind compared to what technology was hailed to promise (OECD, 2015). Results from this analysis conveyed limited improvement in student achievement, even though OECD countries invested heavily in technology to be part of the school learning environment. Consequently, results also revealed that technology has not been successful in bridging the division of skills between advantaged and disadvantaged students. OECD stresses the need for rigorous teacher-student interactions without using technology as a distraction. In conclusion, the report asserts that "technology can amplify great teaching, but great technology cannot replace poor teaching" (p. 4). This inference highlights the importance of the role of teachers and schools in identifying and addressing the needs of learners. Hence, better policies and procedures are required that support pedagogies that can effectively use educational technologies. Fullan and Langworthy (2014) echoed the belief that

good pedagogy, along with technology, “unleashes deep learning” (p. 33). Teachers can focus on helping students learn while using educational technology to collaborate.

While technological determinism ignores pedagogical and social factors, social determinism turns a blind eye to the political and economic factors that may influence social needs. However, both perspectives support technology and acknowledge its existence. Therefore, it is believed that technological and social deterministic perspectives have potentially made K-12 education commercialized: Google can be considered one such example. Schools continue to invest in providing students with Google Chromebooks (Quinn, 2016), and giant corporations (like Google) have developed cloud-based applications (e.g. Google Classroom) for use in K-12 schools, and further designed Chromebooks that perfectly incorporate Google’s cloud-based free applications (Quinn, 2016), even though student privacy continues to be a concern (El-Khattabi, 2017). Moreover, there has been limited research on teacher’s use and experience of Google Workspace applications (Sahin et al., 2016). Therefore, the role of schools, policymakers, and researchers is vital in providing insights so that schools can make informative decisions and act in the best interest of students.

Schools must also further weigh the costs against the benefits of adopting technologies in classrooms (Luschei, 2014). A review of the literature (Alenezi, 2019; Carr, 2012; Cuban, 1986; Ditzler et al., 2016; Domingo et al., 2016; Galway et al., 2020; Samsonova, 2021) revealed that not many studies provide an overview of the process through which technological devices are being added in classrooms. Most empirical studies are a step ahead and study the implementation of educational technologies and its effects on learning. At this stage, though results provide great insights from these studies, they usually do not hold much meaning for schools that have already

made hefty investments. The next section proposes an alternative perspective that focuses on the rationale behind the use of educational technology in K-12 systems.

2.1.6 The Critical Theory of Technology

There is a need to apply an analytical perspective on the use of technology in education (Bruce, 1997; Feenberg, 1991; Friesen, 2008; Okan, 2007; Schmid, 2006; Selwyn, 2017). Both technological deterministic and social deterministic perspectives are too broad in terms of adopting educational technologies in classrooms: a new approach is needed that questions the rational and that thoroughly analyzes educational technology. One philosophical lens that emphasizes critical analysis of technology before its adoption is the *critical theory of technology*. According to Feenberg (1991), the critical theory of technology offers both critical and empirical perspectives that help in making sense of technological changes taking place around us. Feenberg acknowledged the merits of both technological and social deterministic perspectives and suggested that the critical theory of technology can be helpful in utilizing technology through a conscious and collective reform. Rowe (2011) explains that the critical theory of technology recognizes “that technology is always already embedded in social practice....it is how technology is used and administered within complex realms that determine its potential” (Rowe, 2011, p. 15). Rowe further notes that this potential is realized through a complex intermingling of human and non-human factors within localities that are influenced by a range of social, economic and political interests and values (Rowe, 2011). The intermingling of both human and non-human factors can be understood in the context of K-12 schools where stakeholders and education policies influence the implementation of educational technology. Hence, the philosophical perspective of the critical theory of technology calls for the critical evaluation of technological

offerings before adopting them, and further supports the democratization of technology (Feenberg, 1991).

Feenberg (2001) provides an example of the computer, which he observes is “the least likely candidate for a determinist philosophy of technology” (p. 86). He explains that computers can easily be viewed from the social dimension of their development. After being used mainly for calculation and storage purposes, the computers were steered by ordinary people to serve social goals. Feenberg alludes that the computer is still not a finished product and is continuously evolving based on social influences and demands. He asserts that the future direction of educational technology use should include actors from various levels such as teachers and students as they can “bring a number of considerations to the table, including the desire to create tools that support human interactions” (p. 87). In what follows, are examples of two studies that explored the use of interactive whiteboards through the lens of the critical theory of technology.

Rowe (2011) conducted ethnographic case studies in two public elementary schools in Ontario, Canada. She questioned the SMART whiteboard technology use in classrooms and applied the critical theory of technology and actor-network theory as the theoretical and methodological framework for her research. Rowe argued that SMART whiteboard technology is not simply a neutral tool that enhances practice, nor the essence of a 21st century education model. Data were collected through promotional materials that included the SMART brand video *The Magical Classroom*, SMART executive statements, press releases and online publications, and by conducting two principal interviews, three teacher interviews, and in-person observations. Findings indicated that “SMART technology embodies the heterogeneous values of its designers, producers, administrators and users as well as the political economy whose policies and infrastructure created the conditions for a transformative process” (Rowe, 2011, p. 14). In other

words, the methodological framework that was applied critically examined SMART whiteboard technology and helped in understanding the contextual inter-relationships of technologies and social communities.

Schmid (2006) conducted a qualitative study at the University of Lancaster, the United Kingdom, that considered the benefits of using critical theory of technology as a conceptual framework. Schmid analyzed the use of interactive whiteboard technology in a language classroom. Data were collected through classroom observations, teacher's field notes, video recording of classes, an online discussion forum, classroom discussions, semi-structured interviews with students, and pre- and post-course student questionnaires. The whiteboard technology was not examined as an all-powerful machine or just a tool for teaching/learning. In fact, Schmid approached the whiteboard technology by considering the social and pedagogical issues that influenced the adoption and transformation of its use. She asserted that "in order to understand the impact of a new technology on the pedagogical process it is necessary to understand the circumstances in which it is implemented and how it has been interpreted by the participants of this process" (p. 51). Several elements such as technology design, teacher's and student's pedagogical beliefs and values were analyzed in the context of interactive whiteboard technology. Therefore, the perspective of the critical theory of technology helped in providing a holistic understanding of the process of technology integration.

The philosophical perspective of the critical theory of technology can be well understood in relation to the current challenges faced by K-12 schools as a result of the COVID-19 pandemic; the lockdown has impacted more than 1 billion learners due to the closure of national schools worldwide (UNESCO, 2020). With regards to technological determinism, considering the pandemic situation, it may be apt to note that K-12 schools resorted to an increased use of

educational technology, such as video conferencing (Li & Lalani, 2020). Teachers were compelled to utilize educational technology due to social change caused by COVID-19. This social change can partially be attributed to social determinism because the needs of society now have driven people to not only use technology, but to also focus on technological upgrades, such as security and privacy. Hence, the present-day situation has now forced schools to critically analyze technology that facilitates remote learning. The manner in which schools utilize educational technology for remote teaching and learning in the near future, including professional development offerings, may create notable change, prompting modification to their delivery structure. The role of teacher professional development in using educational technology for instructional purposes is discussed in the next section.

2.2 Professional Development

Professional development is provided to teachers in anticipation of effective teaching that will result in learning benefits for all students (Khambari et al., 2020; Sims & Fletcher-Wood, 2021). The continuous introduction of new technologies and the creation of knowledge demand a change in teaching practices, requiring ongoing professional development. Professional development is considered vital in keeping up with changes in the curriculum, student performance standards, and technological advances (Lawless & Pellegrino, 2007). It is essential for school districts to follow a needs-based plan for designing effective professional development that results in better teaching and learning outcomes because teachers are overwhelmed by their daily teaching loads and administrative tasks (Mizel, 2010). By being continuously involved in well-planned professional development, teachers can be effective and efficient in their work, and generate a sense of purpose, satisfaction, and professionalism that can help their students perform better (Garcia & Weiss, 2019).

This section includes the following: an overview of professional development, which briefly defines and provides an overarching view of professional development; elements of effective professional development, which briefly discusses effective elements of professional development; and the relationship between professional development and educational technology, which discusses the need for effective professional development.

2.2.1 An Overview of Professional Development

Professional development has gained considerable attention in the literature for several decades (Darling-Hammond et al., 2017; Fullan, 1982; Webster-Wright, 2009). Darling-Hammond et al. (2017) define professional development “as structured professional learning that results in changes in teacher practices and improvements in student learning outcomes” (p. V). Similarly, Campbell et al. (2016) assert that “professional development is defined as a broad umbrella encompassing a range of professional learning” (p. 12). Clearly, these definitions show that professional learning is embedded in professional development. Richter et al. (2011) define *professional development* as an “uptake of formal and informal learning opportunities that deepen and extend teachers’ professional competence, including knowledge, beliefs, motivation, and self-regulatory skills” (p. 116). This definition provides a comprehensive understanding of professional development and thus was adopted for this study. The term professional development is often considered a synonym for staff development, in-service, training, professional learning, or continuing education (Mizell, 2010; Bullman, 2021).

Professional development may be misunderstood as only a formal learning experience that comprises workshops, conferences, courses, and online webinars. But in fact, professional development is an umbrella term that also includes mentoring, co-teaching, observations, formal and informal discussions with colleagues, and self-reflection, among others. Hence, professional

development for teachers is ongoing and embedded within their daily routines (Desimone, 2009). The Department of Education and Early Childhood Development (2021) notes that “teacher professional learning in Newfoundland and Labrador has moved from a ‘one-size-fits-all’ model, to one where teacher learning is guided by three principles which state that professional learning occurs in collaborative, reflective communities; is guided by student and teacher learning needs; and is designed to foster change in practice.” The ongoing nature of professional development was evident when the Newfoundland and Labrador English School District (NLESD) provided an update on teacher readiness for utilizing Google Chromebooks for instructional purposes. The NLESD stated that professional development was offered for virtual learning prior to the start of the academic year in 2020 (CBC, 2021). Later in the fall, around 2000 teachers indicated that they required additional professional development. Therefore, to address this need, the district organized release time for these teachers and offered additional professional development. The NLESD further noted that if teachers still required more professional development then they should identify their professional learning needs and reach out to their schools. Though the NLESD reinforced continuous teacher professional development, it remained unclear how professional development was designed and what type of professional development was being offered and by whom.

According to Garcia and Weiss (2019), the most common and least effective types of professional development activities in the United States continue to be workshops, conferences, and training sessions. However, in Canada teachers value “the importance of access to workshops and conferences” (Campbell et al., 2016, p. 64). There have been extensive studies regarding the types of professional development that result in enhanced teacher practices and student outcomes (Akiba & Liang, 2016; Avalos, 2011; Fishman et al., 2013; Kopcha, 2012;

Shaha & Ellsworth, 2013). In the past few years, the various types of professional development have extended even further, including web-based mentoring, online courses, webinars, and e-conferences. Therefore, with the increased use of online professional development platforms, choices have become more complex, requiring empirical research to assist in decision making and sound investments (Fishman et al., 2013).

As noted, there is an abundance of literature that verifies which types of professional development are successful in having an impact on teaching practices and student outcomes. Two relevant studies, Fishman et al. (2013) and Akiba and Liang (2016), are presented that discuss various types of professional development. Fishman et al. (2013) conducted a randomized experiment of secondary school teachers in the United States to study the adoption of a new science curriculum by developing and comparing two professional development conditions: a week-long face-to-face workshop with 24 teachers and an asynchronous online workshop with 25 teachers. Their methods included surveys, videotaped observations, and assessments, and their findings suggested that both online and face-to-face professional development results in positive outcomes for teaching practices and student learning. In conclusion, the authors emphasized that, irrespective of the medium of delivery, effective professional development requires thoughtful planning and implementation. In this study, both online and face-to-face professional development were contextual, and embedded in subject matter. The online professional development platform was self-paced and provided teachers the ability to reflect on prior practice, while the face-to-face professional development provided greater collegiality and collaboration among teachers. Furthermore, ongoing feedback from the facilitators in both online and face-to-face professional development sessions provided a sense of direction to teachers.

In a study by Akiba and Liang (2016), six different types of professional development associated with student achievement growth were analyzed. This longitudinal study collected data from the Teachers' Opportunity to Learn (TOTL) survey in Missouri, U.S., to analyze six different types of professional development: professional development programs, teacher collaboration, university/college courses, professional conferences, informal communication, and individual learning activities. The survey collected data from 467 middle school mathematics teachers in 91 schools, and the findings suggested that professional development activities that promoted teacher-centered collaboration and research-based learning resulted in improved student achievement. These activities also included conferences where practice-based research findings involved in-depth discussions. Hence, recent studies are shifting towards recommending activities for effective professional development.

Conversely, there is a lack of empirical research on teacher professional development across Canada; however, school districts in several provinces are engaged in developing evidence-based professional development frameworks and policies that are developed based on studies conducted in the U.S. (Campbell, 2017). For example, Alberta has developed a professional development planning framework based on research and analysis of teachers' needs and students' learning (Alberta Teachers' Association, 2005). A framework helps in planning professional development priorities, processes, and content (Campbell, 2017). Many provinces in Canada (Alberta, British Columbia, Ontario, and Prince Edward Island) have a common understanding that effective professional development must be collaborative, sustainable, and resourced (Collins et al., 2017).

For this study, Alberta is considered as an inspiring example. Alberta is one of the highest-performing provinces in Canada (Svendsen, 2020). "Leaders at all levels have become

central to the development of the teaching profession” in Alberta (Svendsen, 2020, p. 122). Moreover, according to the OECD (2019), Alberta is the only province in Canada to participate in the Teaching and Learning International Survey (TALIS), a worldwide survey about teachers, teaching, and learning environments, which signifies Alberta’s commitment towards teacher professional development.

A committee of Alberta’s education partners developed a comprehensive professional development guide (Alberta Teachers' Association, 2005). This guide also includes a cyclic professional development planning framework that can be adopted by school districts. Though this framework is more than a decade old, it can still be applicable to professional development planning. Alberta’s professional development planning cycle can be used for both single- or multi-year professional development activities. A professional development planning committee follows the steps identified in the framework. The steps involved are: (1) conducting environmental scan and participant needs assessment, (2) developing professional development program goals, (3) identifying possible professional development strategies, (4) finalizing action plan and measures, (5) implementing action plan, (6) revising action plan as required, and (7) undertaking summative evaluation (Alberta Teachers' Association, 2005). The plan begins by identifying contextual needs and professional development priorities. This helps in determining the changes required for success and developing manageable goals. After the preliminary work is completed, professional development programs that are focused, comprehensive, and ongoing are developed. A detailed action plan that includes a guide for implementation and evaluation is then finalized and sent for approval from stakeholders. Implementation is then done by critically monitoring the process and revising based on emerging needs. Additionally, each step lists a set of questions to be considered while planning by the committee.

A framework, such as this, may be helpful in planning professional development activities for NLESD. Throughout the planning and implementation process there is an emphasis on effective professional development. The guide states that, “for professional development to be effective it must be systemically planned, systemic, supported and sustained” (Alberta Teachers' Association, 2005, p. 3). It is imperative to understand the perspectives presented in the literature regarding the elements of effective professional development. The next section briefly discusses the elements of effective professional development.

2.2.2 Elements of Effective Professional Development

In the literature, there is a general consensus for the need of professional development (Darling-Hammond, 1998; Fullan, 1982; Hill, 2009; Mizell, 2010; Sims & Fletcher-Wood, 2021; Webster-Wright, 2009). Professional development continues to be a priority of school districts, even in cases where professional development has an insignificant effect on teachers' practices (Darling-Hammond et al., 2017), as it is believed to improve student attainment (Sims & Fletcher-Wood, 2021). Researchers now seem to have reached an understanding on the core evidence-based elements of effective professional development that can lead to improved teaching practices and deeper student learning (Darling-Hammond et al., 2017; Desimone, 2009; Sims & Fletcher-Wood, 2021).

A report by Darling-Hammond et al. (2017), that reviewed 35 methodologically rigorous studies, has identified seven elements of effective professional development, which are: (i) *Content focused*, a type of professional development that can provide teachers an opportunity to test new curriculums, study students' work, or enhance their content knowledge; (ii) *Active learning*, which acknowledges teachers' experiences, such as how they learn and what they learn; (iii) *Collaboration*, an important part of well-structured professional development, which

encourages an environment of trust and cooperation; (iv) *Models and modelling*, which helps provide teachers with a vision for best practices, and promotes teacher support and learning through demo lessons, lesson plans, observations of peers, and curriculum materials; (v) *Coaching and expert support*, which can help to improve teaching practices and in appropriately applying new curriculum or tools; (vi) *Feedback and reflection*, an ongoing process that allows teachers to think and make changes in practice; and (vii) *Sustained duration*, where quality professional development requires time and must be enacted for a sustained duration.

These elements of effective professional development have influenced the design of professional development and policy in the UK (Department of Education, 2016), the EU (European Commission, 2021), and the US (Combs & Silverman, 2016). The UK has developed the Standard for Teachers' Professional Development based on the best evidence available on effective professional development. In the US, the Every Student Succeeds Act required professional development to be sustained, collaborative and practice-based (Combs & Silverman, 2016). The Digital Education Action Plan (2021-2027) of the European Commission supported ongoing professional development that is tailored to the needs of teachers and is content focussed (European Commission, 2021). Consequently, well-designed professional development based on the identified elements can enhance teacher practices, as well as practices related to the effective use of educational technologies in classrooms.

2.2.3 The Relationship Between Professional Development and Educational Technology

According to the AECT (2018), educational technology acts as a *mediator* for enhancing learning, which can only be possible if teachers make use of educational technology in a manner that results in improving learning outcomes. Consequently, it is apt to assume that professional development is a mediator for teachers to learn about educational technology. The following

research studies, Kopcha (2012) and Aurini et al. (2017), highlight the relationship between professional development, teachers, educational technology, and student learning outcomes.

A longitudinal case study conducted by Kopcha (2012) in the U.S., examined, over two years, the effect of sustained and situated professional development on elementary teachers' perceptions of technology use. Perceptions of the barriers to technology integration and instructional practices from 18 teachers were analyzed. As part of the professional development activities in the first year, Kopcha, who was also the mentor of the teachers, dedicated 30 hours per week to conducting workshops, one-on-one follow-ups, and lesson designs. These activities were selected based on six effective professional development principles recommended by Garet et al. (2001). The six selected principles were: a focus on teacher knowledge, reform-types of activities, situating activities in teacher needs, opportunities for active learning, an extensive duration, and collective participation. During the second year, Kopcha's mentoring transitioned to a teacher-led community of practice. He used multiple data collection methods that included surveys, focused interviews, and observations. The collected data were analyzed and triangulation was achieved, and the findings suggested that sustained professional development was more beneficial than one-day workshops, and that mentorship in the first year was more effective than the teacher-led community of practice in the second year. Furthermore, mentorship changed teachers' perceptions on integrating technology in classrooms. The continuous support of the mentor improved teachers' skills and changed their beliefs about using technology for learning (Kopcha, 2012).

An action research study conducted by Aurini et. al (2017) examined the use of robotics in nine school boards in Ontario. The study provided an overview of how robotics is being used to support student learning. Data were collected through interviews, focus groups, video-recorded

classroom observations, and surveys. Though the findings indicated that teachers were using robotics to teach in a variety of creative ways, challenges such as lack of professional development support and resources, and insufficient curriculum and assessment integration remained at large. In order to support the use of robotics in instruction, the study provided a list of considerations in which prioritizing professional development and supporting teachers in their efforts to learn was paramount along with providing teachers with ample space and time to meaningfully engage in teaching and learning using robotics (Aurini et. al, 2017).

Consequently, professional development merits serious empirical research on the relationship between educational technology and professional development. Aslan and Reigeluth (2011) affirm, “unless teachers get enough training, they may use instructional [educational] technology tools ineffectively or they may decline to use them since it would take too much time to get familiar with them” (p. 11). Hence, policies need to be designed in a manner that includes teachers early in the process so they can direct their own professional development.

2.3 Policy and Practice

In education, it is well-known that the implementation of new policies is “incredibly hard” particularly across institutions (Mclaughlin, 1987, p. 172). There is a considerable emphasis in the literature regarding education policy implementation as being part of policy frameworks (Bell & Stevenson, 2015; Mclaughlin, 1987; Nakamura & Smallwood, 1980; Suggett, 2011). Different policy frameworks have been presented by researchers to help in the successful implementation of policies. Considering the context of education, Fullan (2015) asserts that successful implementation of policy is possible when teachers, school administrators, and other stakeholders in education understand the policy. Not only is an understanding of policy important but also identifying the need through a strategic manner is essential. Fullan provides the example

of school districts buying new technological devices by considering it as a need, only to learn later that these devices have little impact. Cuban (1986) infers the same towards the use of films, radio, educational television, and computers. There exists a paradox between technology use in classrooms and the teaching and learning process. Therefore, it is necessary to understand how policy influences teachers' integration of educational technology in their classrooms.

Education policies are often formed following a top-down approach, where policymakers from the head of a governing body make decisions that ripple downwards throughout those affected by policy changes and are forwarded to schools for implementation in classrooms. As a result, experts have become particularly invested in developing the capacity to implement policies with school leaders and teachers (Hopfenbeck et al., 2015; OECD, 2017; Wurzburg, 2010) because they act as policy implementers at the ground level (Dede et al., 2005; Fullan, 2016). School leaders and teachers need to have a skillset to implement and be fluent in adopting a policy within a given context. Moreover, the school principal is believed to be empowered to ensure the effective use of educational technology in instructional practices (Machado & Chung, 2015; Sergiovanni, 2009).

It is important to note that even after investing in policy implementers at the ground level, policies can fail to produce their desired outcome due to various reasons. According to Darling-Hammond (1990), failure to understand the local policy context, lack of dialogue and education, and not considering the process of teaching, which includes teachers' prior learning, beliefs, and attitudes, are factors that can result in unsuccessful education policy implementation. A study conducted in Norway by Hopfenbeck et al. (2015) obtained the same results, even after 25 years, signifying the importance of these factors. Hopfenbeck et al. (2015) investigated a government-initiated four-phase policy implementation program on Assessment for Learning

(AFL). Data collected from 145 primary schools and 80 secondary schools, included semi-structured interviews with stakeholders, comparison of test scores, and textual analysis of relevant documents. The results indicated the need for trust, dialogue, and higher levels of teacher involvement in the policy implementation process.

Conversely, a proactive approach was adopted by the school districts in Maine, the United States that resulted in better outcomes for both teachers and students. Murphy et al.'s (2020) study addresses the “increasingly common and important policy contexts—the one to one technology initiative” (Murphy et al., 2020, p. 1). The authors noted that, as per the statewide policy for addressing equitable access in Maine, every student in middle school was provided a laptop to take home. Murphy et al. (2020) conducted a randomized controlled trial study to assess a web-based platform known as ASSISTments that was used as an intervention for two years to help grade 7 students solve mathematics homework problems and assist teachers by providing data to track student progress. Data collected from 43 public schools, 87 teachers, and 2769 grade 7 students, included interviews, observations, surveys, and instructional logs. Ongoing professional development was provided to teachers by a coach who offered both introductory and advanced level training and technical assistance throughout the school year.

The online mathematics homework intervention produced not only a positive impact on students' mathematics achievement but also prepared teachers to use the feedback in an instructionally meaningful manner (Murphy et al., 2020). It is apparent from this study that the policy of providing 1:1 devices to students needs to be supplemented with software that meet the needs of both the teachers and students. Therefore, understanding the local policy context – in this case, access to personal laptops for students, homework policy, and support for teacher preparation, resulted in successful policy implementation.

While policy implementation can be influenced due to internal factors that are directly involved in its development and execution, there can also be certain external factors that either support opposing policies or enforce policy implementation. This includes the department or ministry of education, faculties of education, unions, and other agencies that may have a role in the implementation process. For instance, in some countries, such as Canada, teachers are supported by teacher unions which can oppose a particular policy. Whereas in other countries, such as Saudi Arabia, school leaders and teachers are expected to implement education policies as laid out by the Ministry of Education without complaint or disagreement (Al-Saadat & Al-Braik, 2004). Therefore, understanding education policy implementation frameworks can be helpful in identifying appropriate implementation processes and influencing elements within a given context, which also includes educational technology policy and implementation.

Several education policy implementation frameworks are proposed in the literature (Bell & Stevenson, 2015; Nakamura & Smallwood, 1980; Suggett, 2011) and this section considers three different types of frameworks: analytical, normative, and action-oriented. In order to identify and understand the policy implementation framework (if any) adopted by the NLESD for educational technology and professional development, it is fundamental to review the different policy implementation frameworks addressed in the literature. The following three sections are discussed: an overview of education policy implementation, which defines and provides a brief overview of education policy implementation; the three types of frameworks, which elaborates on education policy implementation while briefly reviewing an analytical, a normative, and an action-oriented framework; and comparing education policy frameworks, which briefly compares the three different types of frameworks and presents their relation to one another.

2.3.1 An Overview of Education Policy Implementation

Policies exist in the form of written documents that are produced after a series of processes to address a specific issue. A policy “usually proposes a vision to achieve, sets goals to meet, and may even spell out the means to reach them” (OECD, 2017, p. 21). A typical policy may therefore include specific components, such as a vision, analysis, planning, implementation, and evaluation. In the field of education, policies address issues related to equity, curriculum and learning outcomes, evaluation and assessment mechanisms, school and learning environments, and funding, among others (OECD, 2015).

Education policies have the potential to be formulated and implemented at a national, provincial, or school district level, depending on the nature of the policy (OECD, 2017). Hence, policies can be formulated “at a number of different levels” (Bell & Stevenson, 2006, p. 18). This dissertation discusses the potential of policy implementation at the provincial, district, school, and classroom levels for educational technology and teacher professional development. Furthermore, it highlights the inter-relationships among the different levels. OECD (2017) provides an example, stating that “if a new curriculum requires the use of high technology equipment which schools cannot afford, the policy may fail to be implemented unless some budget is available at the national or local level” (p. 6). Similarly, if the budget is in place and educational technology is made available but teachers are not provided with professional development opportunities, then the desired outcome will not be achieved.

Education policies shape the environment in which school leaders and teachers work. While Cerna (2013) considers policy implementation as “a multidimensional process” (p. 22), O’Toole (2002) describes implementation as a “puzzle” (p. 265). In simpler terms, implementing an education policy can be understood as putting an idea into practice while following a rigorous

and iterative process. Additionally, implementation is considered as a complex, evolving process involving many stakeholders (Darling-Hammond, 1990; OECD, 2017). Many comprehensive definitions of education policy implementation are present in the literature. For instance, Bell and Stevenson (2015) consider education policy implementation a complex process involving a thorough understanding that translates into a restructuring of the policy. They also highlight the importance of stakeholder participation and include analyzing similar practices in place as an integrated component of developing a policy. Haddad and Demsky (1995), however, note that education policy implementation involves concrete planning with a clear outline focusing on details of what, when, and how. It can be understood that, though policy implementation is a complex process, concrete planning will lead to a robust implementation of education policy. Consequently, there exists an inherent agreement that educational policy implementation is a complex process, requiring time and planning.

A concise definition of education policy implementation is offered by Honig (2006), who defines the term “as the product of the interaction among particular policies, people, and places” (p. 4). Considering Honig’s definition in the context of K-12 schools, education policy implementation can be observed as a guide for the day-to-day functioning of schools: following a prescribed curriculum is an example of interaction between policies, stakeholders (people), and schools (places). Consequently, it can be said that the reactions of people at the ground level shapes the implementation process, and even the policy itself, because they are the frontline implementers (Lipsky, 2010). Though people at the ground level directly impact the implementation process itself, the decisions come from a higher level. Therefore, a better system, or framework, is needed in order to successfully implement education policies. There are different types of frameworks proposed in the literature discussing the implementation process (Barber et

al. 2011; Bell & Stevenson, 2015; Nakamura & Smallwood, 1980; Suggett, 2011). While some frameworks focus comprehensively from policy development to implementation, others address certain aspects of policy, such as implementation, or act as guidelines for policy formulation.

2.3.2 Types of Frameworks

The framework acts as a roadmap, provides policy a direction and ensures alignment across different systems (Government of Alberta, 2013). Furthermore, the framework guides policy processes towards achieving the vision. For the purpose of this paper, one analytical, one normative, and one action-oriented policy implementation frameworks are explored and their relationship to one another is presented in the section that follows.

Analytical Frameworks

Analytical frameworks are structured in a systematic manner which helps in logical thinking. These frameworks provide coherence and set the stage for policy development while considering multidirectional interactions and major domains that may influence policy formulation and implementation. Therefore, an analytic framework essentially provides required knowledge for policy implementation that forms the basis for developing a policy (Note, 2012). An analytical framework, 'From policy development to enactment' proposed by Bell and Stevenson (2015) explains the multidirectional interactions between the development and enactment stages. Their framework is directed towards education policy implementation and includes four steps: social-political environment; governance and strategic direction; organizational principles; and operational practices and procedures. Bell and Stevenson note that, although the top-down framework reflects the predominant system of the manner in which policy is perceived, there is complete probability that policy can be influenced or challenged from the bottom.

Normative frameworks

Normative frameworks prescribe a path forward by educating policymakers regarding conditions that would lead to success (OECD, 2017). Cerna (2013) asserts that there is “no ‘one-size-fits-all’ policy” (p. 17) to guide the implementation process. Therefore, normative frameworks provide advice while considering the local context, so the probability to achieve the policy goal will be increased. Suggett (2011) provides a four-part matrix, ‘Classifying implementation challenges,’ to consider conditions for designing implementation strategy. He suggests that an analysis of pre-conditions such as the purpose, context, outcomes, evidence, and organisational capability be conducted for successful implementation.

Suggett’s framework evaluates two dimensions that contribute towards developing a policy based on the degree of goal conflict and uncertainty of actions. The different combinations of uncertainty and goal conflict address different types of problems which need policies. For instance, a policy on cyberbullying may come under low uncertainty and low goal conflict. This would reflect administrative excellence; that means there will be clarity in the goals and ease of implementation without any challenges. And a policy on cyberbullying may be straightforward to implement as all stakeholders will support the policy. Whereas low uncertainty and high goal conflict would reflect strong political direction and power comes into play to deal with expected conflict. For example, the use of Google Workspace applications such as Google Classroom in elementary schools has raised issues of privacy, yet school districts continue to use Google applications (Lindh & Nolin, 2016).

Action-oriented framework

Action-oriented framework offers steps to consider and highlight the prescribed path forward on what needs to be done (OECD, 2017). As the contextual factors vary greatly, an action-oriented framework can provide effective implementation practices for policymakers.

According to OECD (2017) there is one robust action-oriented framework in the literature, ‘Deliverology’ developed by Barber et al. (2011). Deliverology emerged in 2001 during Tony Blair’s tenure as Prime Minister (PM) of the United Kingdom and has extended to other countries since then. This framework was used for delivering on the promises that the PM's political party made during the electoral campaign. The promise related to education policy was to raise standards of school performance, that is indicated by Standard Assessment Testing (Ball et al., 2012).

The Prime Minister’s Delivery Unit (PMDU) headed by Michael Barber was established to concentrate on specific targets (Barber et al., 2011). Deliverology incorporates three main components: the formation of the delivery unit, data collection for setting targets and trajectories, and the establishment of routines. The delivery unit includes a group of dedicated individuals who are focused exclusively on improving outcomes and achieving goals. Barber et al. (2011) note that “targets should be both ambitious and realistic” (p. 35) and the Deliverology framework aligns well with both these characteristics. The delivery unit ensures that clear priorities are set with certain measurable targets. Trajectories act as a tool by providing an evidence-based projection that helps in identifying and communicating the gap (Barber et al., 2011). The process of implementing a policy is closely connected with regular data collection, monitoring, and analysis. The implementation plan remains flexible so changes can be made at each step based on the lessons learnt. The implementation team and decision makers establish appropriate routines for assessing performance and maintaining momentum. Additionally, Barber et al. (2011) emphasize on the need for senior leaders to build relationships and clear lines of communication in order to have the greatest effect on implementation.

2.3.3 Comparing Education Policy Frameworks

In this section, the three frameworks are compared: one analytical framework by– (1) Bell and Stevenson; one normative framework by– (2) Suggestt; and one action-oriented framework– (3) Deliverology. The Table 1 highlights how these frameworks relate to each other based on relation between their characteristics and uniqueness. The relationships are elaborated with regards to their purpose, structure, stages, environments, and key actors. For example, the relationship between Deliverology framework (DF) and Bell and Stevenson’s framework (BF) is discussed as the difference in structure; DF is cyclic, and BF is linear.

Table 1

Comparison of Frameworks

Framework	Relationship to Framework	Relationship to Framework
	<i>Relationship with SF</i>	<i>Relationship with DF</i>
Bell & Stevenson - BF (2015)	BF is an analytical framework and SF is a normative framework. The environmental interactions seem to be linear in BF but clearly distinguishes two stages. SF does not involve stages of policy development nor implementation but addresses issues that influence them by studying the uncertainty and goal conflict.	DF is cyclic and BF is a linear approach in terms of the structure of the policy. DF overlaps more with the second stage of policy enactment presented by BF. The focus is emphasized on the implementation aspects while the need had already been identified and analyzed to pursue further towards implementation.
		<i>Relationship with DF</i>
Suggestt - SF (2011)	-----	SF provides a basis to identify the need, its magnitude and the level of goal conflict associated with it. The outcome can be considered as the foundation for utilizing DF, where it can be analyzed, and necessary steps can be taken towards implementation.

2.3.4 Proposed Study Framework

Considering the current scenario, the action-oriented framework– Deliverology aligns better in the Newfoundland and Labrador context than other frameworks discussed earlier and therefore would be most applicable. The flexible characteristics and accountability aspect of the Deliverology framework not only cater to the needs of the current pandemic situation but also beyond the pandemic. The prolonged uncertainty demands proactive policy making and rapid execution which works well with the Deliverology framework. The situation of the COVID-19 pandemic has forced schools to act swiftly yet maintain flexibility and develop achievable goals. Schools across Canada have shifted to virtual learning, compelling teachers to deliver curriculum content online. School districts have taken measures to ensure teachers and students have devices to teach and learn using virtual platforms (Education and Early Childhood Development, 2020). At the same time, school districts have been actively collecting data, monitoring, and analysing teachers’ professional development needs even more than before (CBC, 2021). The Deliverology framework can be considered as an ideal framework in this situation where continuous assessment is required to maintain the momentum. This framework therefore can also be helpful in understanding how elementary teachers integrate educational technology in instructional practices. By continuously assessing and involving teachers in feedback loops, resources can be redirected to meet the needs of teachers.

While it is common in the K-12 education system to set goals for providing educational technology and professional development, Barber et al. (2011) assert that public-sector organizations, like the education sector, rarely develop and use trajectories in part because they can be difficult to establish. However, using trajectories to monitor progress can result in saving a lot of time and resources. For instance, if the NLESD had reached out to teachers to gauge their

professional development needs, in the beginning of the academic year, prior to providing professional development then teachers may have not required additional professional development. Furthermore, if school districts commit to an ambitious roadmap it will help in realizing the full potential of teachers, resulting in better student learning outcomes. As stated earlier, the Deliverology framework includes crucial steps– establishing a delivery unit, setting targets and trajectories, and maintaining routines. These steps can help in making sound judgements with regards to investing in educational technology and providing professional development to teachers. Moreover, the delivery unit can apply the AECT’s definition of educational technology as a base to move forward in making decisions about policy and professional development.

Deliverology is appreciated for its focus on key outcomes and time-bound goals. Although Gewirtz et al. (2019) consider that Deliverology adopts a top-down approach, the framework applies the cyclic approach to implementation, making it simple to understand and follow. However, some of the downfalls associated with Deliverology are that it tends to focus only on administrative performances, creates pressure, and has the potential to make the working environment toxic (Gewirtz et al., 2019; Richards et al., 2018). For instance, teachers often felt pressured while complying with practices such as following rigid lesson plans (Coffield, 2012; Gewirtz et al., 2019). Also, skepticism on the political party’s vision by school leaders and teachers may make the acceptance difficult as they may not share the same vision. Conversely, Deliverology offers flexibility to modify the policy even when it is at an implementation stage.

It can be understood that the type of framework to be adopted will depend on the need as well as the potential influence from multiple factors such as the cultural, social, economic, political, geographic, and demographic (Cerna, 2013). Furthermore, it is important to have an in-

depth understanding of the context as “the right approach might depend upon the issue” (Hill & Hupe, 2002, p. 56). Hence, understanding the resolution of need which includes a crucial component of policy implementation is fundamental, and selection of the appropriate framework is critical.

It is also important to realize that a framework that worked well in a given setting may not produce similar results when implemented elsewhere. For example, if the Deliverology framework, when adopted for educational technology implementation, worked well for some schools in the United Kingdom, it may not necessarily be adaptive to the schools in the USA. Therefore, understanding the context is paramount. Consequently, Brighthouse et al. (2018) note that in the field of education, policymakers should be cautious of making decisions only based on data, emphasizing further that “good education decision making is informed by good evidence” that is “driven by good values” (p. 39). Therefore, it is important to consult those who are responsible to implement education policies on a day-to-day basis.

2.4 Conclusion

This chapter discussed the three main areas of this research: educational technology, professional development, and policy and practice. It is evident that all three areas are closely knit and should not be considered independent of each other when assessing educational technology implementation in schools. The section on educational technology explored various definitions and discussed the evolution of technology and educational technology in particular. The AECT’s definition for educational technology would be an ideal starting point for schools looking to include educational technology through the philosophical lens of the critical theory of technology. This definition offers a rational approach that connects educational technology based on elements of research, application of theory, and best practices. Therefore, an amalgamation of

the critical theory of technology and the AECT's definition may result in limiting the unsuccessful integration of educational technology use in K-12 classrooms. Involving teachers early in the process will not only provide an opportunity for the critical evaluation of technological offerings before adopting them but also establish accountability for the subsequent use of educational technology.

The section on professional development provided an overview of teacher professional development and discussed effective elements of the same. The relationship between professional development and educational technology was presented. A well-designed professional development plan, based on effective elements, will act as a bridge to enhance teacher practices and result in improved educational technology usage, whereas if professional development continues to be delivered in a manner that neglects the way teachers learn, then teachers will remain at lower levels of effectiveness than they otherwise could be. Therefore, it is important to involve teachers in identifying their professional development needs so they are motivated to participate in professional development activities.

The section on policy and practice discussed the definitions and descriptions of education policy implementation as perceived by researchers. Three types of frameworks: one analytical framework by– (1) Bell and Stevenson; one normative framework by– (2) Suggett; and one action-oriented framework– (3) Deliverology were briefly discussed. The relation between these three different types of frameworks was also presented. It is believed that the action-oriented framework– Deliverology would be most applicable in the Newfoundland and Labrador context as it primarily focuses on establishing a delivery unit that can overlook the implementation process by ensuring that clear priorities are set.

The main focus of this study was to explore how elementary teachers integrate educational technology in instructional practices. This chapter acted as a base for understanding the role of professional development and policy in relation to educational technology. The next chapter provides a detailed discussion on the research design and the process followed for collecting data in this study.

Chapter 3: Methodology

The purpose of my study was to understand the processes by which teachers integrate educational technology into their instructional practices in elementary classrooms within the context of Newfoundland and Labrador, Canada. Prior to my research, there had been a few studies that investigated the adoption and the use of educational technology in Newfoundland and Labrador schools, but there were no empirical investigations that explored the integration of educational technology along with professional development and policy. I analyzed how professional development and policy relate to the adoption and utilization of educational technology in classrooms across Newfoundland and Labrador. The following research question guided my study: How is educational technology integrated into instructional practices in elementary classrooms? From this question, a well-designed research plan that aligned with an appropriate research tradition and methodology was implemented.

This chapter elaborates on the design and the methodological approaches adopted for my study and is divided into the following sections: the nature of the study, which provides an overview on research paradigm choice; overview of the appropriateness of design, which provides an overview of the methodology adopted; case-study design, which discusses in detail the design of my study; data collection methods, which provides a detailed description of the methods of data collection; data analysis, which describes the procedures adopted for analysis; and integrity of the study, which establishes the credibility for my study.

3.1 Nature of the Study

Paradigms are central to any research process. They are beliefs that have developed over a period and continue to dominate an individuals' thought processes. McGregor and Murnane (2010) describe a paradigm as a set of assumptions, concepts, values, and practices that

constitutes a way of viewing reality. Researchers also describe a paradigm as a theoretical framework that influences the way research choices are made (Bogdan & Biklen, 1998; Mertens, 2005). Mackenzie and Knipe (2006) acknowledge that it is necessary to select the right choice of paradigm in any research as this lays the foundation for selecting the following choices of appropriate methodology, methods, literature or research design. Therefore, it is necessary to understand the underlying paradigms of research so that methodologies and methods can lead to effective and efficient research choices and priorities. Positivism, post-positivism, critical (feminism and race), constructivism (interpretivist), and participatory (postmodern) are among the predominant types of research paradigms addressed in the literature. Each paradigm has its own ontological, epistemological, and methodological stance (Lincoln et al., 2011). My study was situated in a qualitative constructivist/interpretivist paradigm.

In order to solidify this stance, I will briefly discuss the difference between constructivist and positivist paradigms by using the work of Merriam and Tisdell (2016) as a foundation. Constructivist researchers believe reality is socially constructed and, therefore, multiple realities can exist simultaneously. Conversely, from a positivist ontology perspective, reality is something to measure, control, and stabilize. Similarly, a constructivist epistemological perspective suggests that the construction of knowledge makes the researcher part of the enquiry process. Knowledge is a blend of the researchers' personal experiences with the knowledge gained through the research inquiry. Hence, the researcher will have influence on the knowledge produced. In contrast, a positivist epistemological perspective considers knowledge as rigid and scientific. A constructivist researcher would want to discover, explore, understand, and describe a given phenomenon, whereas a positivist researcher would want to predict (hypothesize), experiment, test a hypothesis, or generate a theory (Merriam & Tisdell, 2016).

With regard to educational technology, the choice of paradigm may be dependent on the focus of the study. When studying the technology utilization component, perhaps the positivist paradigm is better as it primarily uses scientific methods and deals with quantitative data. However, when dealing with the perceptions of participants around the use of educational technology, it is appropriate to follow the constructivist paradigm, as constructivist research generally depends on the participants' views of the situation (Creswell, 2003).

My study adopted the constructivist paradigm as it relied on participants' views and collected data that was purely qualitative in nature. The researcher is an essential part of the research process in a constructivist paradigm, with their personal experiences also influencing the research (Wahyuni, 2012). Moreover, constructivism aligned well with my epistemological belief that "knowledge is constructed rather than discovered" (Stake, 1995, p. 99). Looking through a constructivist lens, it can be assumed that individuals come with "their own varied backgrounds, assumptions and experiences [and] contribute to the on-going construction of reality existing in their broader social context through social interaction" (Wahyuni, 2012, p. 71). Constructivism supports collaboration between the researcher and participants (Crabtree & Miller, 1999), which results in participants being able to express their views on reality. Hence, my research was value-bound and subjective in nature. As I defined my approach, the need to identify an appropriate methodology became clear. The next section discusses the methodology selected for my study.

3.2 Overview of the Appropriateness of Design

Creswell (2008) defines research as a process of steps that collect and analyze information to expand our understanding of a topic or issue. Similarly, as part of this process, methodology is a strategy that guides a set of procedures (Creswell, 2009; Denzin & Lincoln,

2000). There are three main research methodologies or approaches: Qualitative, Quantitative, and Mixed Method. Quantitative research focuses on attaining objectivity, control, and precise measurement (Leavy, 2017). Qualitative research, according to Bloomberg and Volpe (2018), is “a broad approach to the study of social phenomena” (p. 30). Whereas mixed method research is a combination of both quantitative and qualitative approaches to research. Bloomberg and Volpe (2012) note that qualitative research provides a greater understanding of the studied phenomena by underscoring the significance of exploration, discovery, and description. Qualitative research places the researcher within the context of the participants. Denzin and Lincoln (2011) state, taking a qualitative stance “...means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them” (p. 3). Qualitative research was the appropriate research method for my study as I sought to understand the process of educational technology integration in K-12 classrooms. This included exploring teachers’ perceptions of educational technology, professional development, and policy. In the next paragraph, a brief historical overview of qualitative research is provided.

Qualitative research became renowned in the mid-twentieth century with the publication of Barney Glaser and Anselm Strauss’s 1967 book *The Discovery of Grounded Theory: Strategies for Qualitative Research* (Merriam & Tisdell, 2016). Their book made significant contributions as it focussed on building a theory rather than testing a theory. According to Merriam and Tisdell (2016), it was during the late 1970s and early 1980s that a growing number of publications contributed to the understanding of qualitative research. For example, in 1978, Egon Guba published a monograph titled *Toward a Methodology of Naturalistic Inquiry in Educational Evaluation*, which recognized that “a study was *naturalistic* if it took place in a real-world setting rather than a laboratory” (Merriam & Tisdell, 2016, p. 7). The investigator did not

pre-determine the findings and was involved in the research process only as an observer of the natural phenomenon. Thus, the researcher is a naturalistic interpreter in qualitative research (Denzin & Lincoln, 2011).

I applied a case study design to my qualitative methodology approach. The case study design is a popular approach that has an extensive, “distinguished history across many disciplines” (Creswell & Poth, 2018, p. 97). Merriam (1998) asserts that “the epistemology that should orient qualitative case study is constructivism” since “the key philosophical assumption upon which all types of qualitative research are based is the view that reality is constructed by individuals interacting with their social worlds” (Merriam, 1998, p. 6). Other scholars have echoed this sentiment, emphasizing that qualitative case study falls within the constructivist paradigm (Stake, 1995; 2000; 2006; Yin, 2003). Hence, qualitative case study design aligned well with the epistemological views and paradigm selected for my study, and the purpose aligned with Merriam and Tisdell’s constructivist epistemology. They note that “qualitative researchers assume that reality is socially constructed; that is, there is no single, observable reality...there are multiple realities, or interpretations, of a single event” (2016, p. 9). Additionally, novice researchers should use Merriam’s text as it provides clear descriptions and guidelines with regards to qualitative case study (Yazan, 2012, p. 147).

In determining whether a case study was appropriate for my research, this method was further compared to the most common types of qualitative research designs. According to Creswell (2005), in social and health sciences the most common types of qualitative research include grounded theory, phenomenology, and ethnography. Grounded theory focuses on developing a theory based on experiences of individuals (Creswell, 2005); my study did not intend to develop a new theory. Phenomenology investigates a specific phenomenon experienced

by a group of people or individuals (Creswell, 1998); the purpose of my study was to understand the integration process of educational technology within a larger context, not specific phenomena. Ethnographic research requires prolonged observations to understand cultures (Creswell, 2007); the lack of cultural study and prolonged observations for data collection meant this was also not appropriate. It is important to note that an overlap among the types of qualitative research approaches is also common (Creswell & Poth, 2018; Merriam & Tisdell, 2016). For instance, ethnographic research may include case study by focusing on a particular cultural dimension. A qualitative case study was best suited for my research because I sought to understand the process through which grade 6 teachers in the Newfoundland and Labrador English School District (NLESD) integrated educational technology into classroom instructions. My research exists within a well-defined bounded system and provided a thick description using multiple data collection methods. According to Baxter and Jack (2008) a case study approach “facilitates exploration of a phenomenon within its context using a variety of data sources” (p. 544). Exploring the process and understanding the teachers’ perceptions was an essential part of my research. Next, I provide a detailed discussion of case study design.

3.3 Case-Study Design

According to Yazan (2015) “research methodologists do not have a consensus on the design and implementation of case study, which makes it a contested terrain and hampers its full evolution” (p. 134). Several attempts to clarify what case study means have occurred, however, Gerring (2004) points out that these attempts only created more of a mess, resulting in a “definitional morass” (p. 342). Yet, the case study methodology has survived as a methodological limbo and continues to produce a pantheon of classic research work (Gerring, 2004, p. 341). Hence, there exists a clear paradox as case studies continue to be widely practiced

and still given low regard (Flyvbjerg, 2011). Consequently, a coherent understanding of case study methodology was necessary to align the focus of my research with its purpose and research design.

3.3.1 Historical Overview

For decades case studies have been a part of empirical knowledge building (Flyvbjerg, 2011). Case study received attention in the 1960s and 1970s as a research method that focussed on the detailed description of a phenomenon within quantitative research methodology (Merriam & Tisdell, 2016). Around the same time there emerged a need to evaluate and understand the experience of curriculum innovation in educational research (Simons, 2009). According to Simons (2009), “alternatives were needed that included participant perspectives, were responsive to audience needs, attentive to the process and dynamics of implementation and interpretation of events in their socio-political contexts” (p. 12). Later in the 1980s, many research scholars including Stake (1988), Yin (1984), and Merriam (1988) viewed case study as a methodology (Merriam & Tisdell, 2016), as it embodied features that provide an in-depth understanding of a phenomenon.

At that time, positivist tradition was the dominant research paradigm; therefore, researchers needed solid justification to support case study as an alternative (Simons, 2009). Quasi-experimental and survey methods dominated the research process, but these methods were inadequate in understanding the complexities within an educational context. Hence, there was a need to address how and why questions (Simons, 2009). According to Baxter and Jack (2008) qualitative case studies provided a variety of lenses allowing for “multiple facets of the phenomenon to be revealed and understood” (p. 544). Case study research therefore included several methods of data collection, including naturalistic observations and interviews that

involved participants in the process. Bloomberg and Volpe (2012) explain that “the research explores the bounded system over time through in-depth data collection methods, involving multiple data sources” (p. 31). With time, case study methodology was applied in different disciplines such as nursing (Treacy & Hyde, 1999), health care (Dowell et al., 1995), social work (Shaw & Gould, 2001), and medicine (Greenhalgh, 1999). These research studies have contributed to the huge collection of methodological literature on qualitative inquiry (Simons, 2009).

3.3.2 Defining Case Study

Understanding what constitutes a case study is paramount before starting the research process. There are numerous definitions of case study in the literature. Simons (2009) note that “case study has different meanings for different people and in different disciplines” (p. 17). Multiple meanings can often create confusion, merging disciplines and findings to a point where we lose the real meaning of a case study (Ragin, 1992). I focussed on the definitions of case study from leading proponents in qualitative research. Miles et al. (2014) define a case “as a phenomenon of some sort occurring in a bounded context” (p. 28). Similar to this understanding of a case, Stake (1995) ascribes that “case study is the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances” (p. xi). For Stake, case study is more of a choice of what will be studied (Creswell & Poth, 2018). In the same vein, Thomas (2015) also argues that “your case study is defined not so much by the methods that you are using to the study, but the edges you put around the case” (p. 21). On the other hand, Simons (2009) defines case study based on the purpose of case study which is an “... in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, programme or system in a ‘real life’ context” (p. 15). This definition

is similar to Merriam and Tisdell (2016), who define a case study as an “in-depth description and analysis of a bounded system” (p. 37). Though Merriam and Tisdell offer this definition of case study, they suggest that Creswell’s definition is more detailed and can help in providing a better understanding of case study research. For Creswell, “case study research is a qualitative approach in which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audio-visual material, and documents and reports), and reports a case description and case-based themes” (Creswell, 2013, p. 97). Creswell’s definition of case study provides a holistic view of what constitutes a case study.

These definitions consider having boundaries as an essential element of case studies. Therefore, as a starting point, the researcher needs to articulate the methodological choice for the research. Yazan (2015) rightly notes that pioneering researchers “have their own epistemic commitments which impact their perspectives on case study methodology and the principles and the steps they recommend the emerging researchers to adhere to while exploiting case study method in their research endeavors” (p. 136). Therefore, to establish a case study framework for my study, I used Merriam and Tisdell’s (2016) definition of case study to guide my research. Though Merriam and Tisdell provided a simple definition, they focussed on the essence of case study research, which is in-depth inquiry of a bounded system. Furthermore, the defining characteristics of a case is paramount in case study research (Merriam & Tisdell, 2016). They asserted the researcher needs to put a fence around what will be studied, because if the case is not “intrinsically bounded, it is not a case” (p. 39). To assess the boundedness of a case, Merriam and Tisdell explain that there must be a limit to the number of participants in interviews and observations conducted for the case study. Therefore, the unit of analysis is central in

determining the boundaries of a case study. For my study, the unit of analysis (the case) were grade 6 teachers. These included homeroom, subject, and substitute grade 6 teachers. Boundaries included elementary schools and a selected grade level under the jurisdiction of the Newfoundland and Labrador English School District (NLESD). Further, the context is vital in a case study. As observed by Yin (2014), a case study is suited to situations in which the phenomenon's variables are inseparable from their context. Therefore, a case study design helped in bounding what was studied. Several natural boundaries of space and time defined my research as a case study, including the NLESD being the sole English school district in the province of Newfoundland and Labrador, elementary teachers, and the grade level. After determining the unit of analysis/the case and boundaries of my study, an in-depth understanding of case study design was needed.

3.3.3 Case Study Design

As a novice researcher, understanding the research process and making decisions when conducting a study can be an overwhelming experience. As Yazan (2015) points out, the multiple procedures available for case studies makes it even more challenging. However, case study continues to be “one of the most frequently used qualitative research methodologies” (Yazan, 2015, p. 134). There are several reasons listed by Yin (2003) for when to use a qualitative case study methodology and suggested considerations: (a) the focus of the study is to answer “how” and “why” questions; (b) you cannot manipulate the behaviour of those involved in the study; (c) you want to cover contextual conditions because you believe they are relevant to the phenomenon under study; or (d) the boundaries are not clear between the phenomenon and context. The considerations mentioned by Yin (2003) had a good overlap with my research as it looked into how teachers integrated educational technology in their instructional practices. I did

not intend to manipulate the behaviour of the teachers and solely intended to collect any relevant information for analysis within the given context. Baxter and Jack (2008) mention several other components identified by researchers that would aid in designing and implementing a case study, namely (a) propositions; (b) the application of a conceptual framework; (c) development of the research questions; (d) the logic linking data to propositions; and (e) the criteria for interpreting findings. These components are generic in nature and most case studies follow similar structure and are designed to obtain critical insights from the data collected. Several seminal research scholars (see Merriam & Tisdell, 2016; Stake 1995; and Yin, 2002) have also offered a guide for selecting the most appropriate tools when following a case study design. For my research, the procedures suggested by Merriam and Tisdell (2016) were applied, as their constructivist epistemology and qualitative perspectives supplemented my research study.

3.3.4 Case Study Type

Baxter and Jack (2008) explain that “in addition to identifying the case, researchers must consider if it is prudent to conduct a single case study or if a better understanding of the phenomenon will be gained through conducting a multiple case study” (p 549). The focus is on one individual or process in holistic single case studies; however, multiple subunits can be part of a single case study as long as they are bound by the same context. Therefore, the main difference between single and multiple case studies is the context. As I studied the integration of educational technology by different teachers in different elementary schools within the NLESD, I considered them subunits of the holistic single case. Consequently, I validated the use of the case study methodology for my research.

In the literature, many different types of case studies are discussed. For instance, Yin (2003) categorizes case studies as explanatory, exploratory, or descriptive. Stake (1995)

identifies case studies as intrinsic, instrumental, or collective. For Bassey (1999), case studies included theory-seeking and theory-testing, storytelling and picture drawing, and evaluative types. Merriam (1988) distinguishes case studies as descriptive, interpretative, and evaluative. Irrespective of the type selected, the purpose of the study should be the guiding factor (Baxter & Jack, 2008). I framed my study as an intrinsic case study, as the purpose was to understand the process by which grade 6 teachers integrated educational technology into their instructional practices. As a former grade 6 teacher, I had an inclination towards this subject and I was interested in studying how professional development and policy and practice informed the use of educational technology. Therefore, I chose to perform an intrinsic case study.

Intrinsic case studies are conducted when the researcher is interested in a topic. Baxter and Jack (2008) explain that this style of case study means that the researcher is interested in a subject and is aware that the results will have little transferability. Stake (1995) uses the term *intrinsic* to indicate that the “researchers who have a genuine interest in the case should use this approach when the intent is to better understand the case” (as cited in Baxter & Jack, 2008, p. 548). I had the desire to learn from the case rather than extending a theory or generalizing the case findings. Grandy (2010) defines intrinsic case study as the study of a case (e.g., person, specific group, occupation, department, organization) where the case itself is of primary interest in the exploration. Hence, the exploration is linked with the researchers’ desire to learn about the uniqueness of the case rather than to build theory. The next section provides the research questions that formed the cornerstones of my study, followed by a discussion of the proposed population sample and data collection methods of the research.

3.3.5 Research Questions

Researchers keenly study the developments in educational technologies and the impact these technologies have on learning (Caffarella, 1999; Klein, 1997; Latchem, 2006; Masood, 2004; Ross et al., 2010). This interest has continued to increase ever since desktop computers, access to the Internet, and other hand-held devices expanded their use into classrooms. My research focussed on the instructional use of educational technology by elementary school teachers. Since there was limited research in this area within the context of NL, and I had an active interest in learning about educational technology use, I framed my research questions accordingly. The following main question and sub-questions guided the inquiry: **How do grade 6 teachers integrate educational technology into their instructional practices?**

- How do grade 6 teachers perceive the role of educational technology in their teaching?
- What are the components and characteristics of professional development related to educational technology that motivate or demotivate teachers towards using educational technology?
- How does provincial policy influence teachers' integration of educational technology in their classrooms?

3.3.6 Population and Sampling

This study was conducted across the province of Newfoundland and Labrador, Canada. According to Patton (2008), in qualitative research there are a wide range of sampling strategies available. In my research, a purposeful sampling strategy was applied to develop an in-depth understanding of the case (Patton, 2015). In qualitative research, the purposeful sampling concept is commonly used to understand the central phenomenon in the study (Creswell & Poth, 2018). Purposeful sampling is applied when the researcher “wants to discover, understand, and

gain insight” (Merriam & Tisdell, 2016, p. 97). Furthermore, in case study methodology there are two levels of sampling and selection: at the case level and within case level (Merriam, 1998). For my study, I applied both levels of sampling. The initial recruitment letter that included the questionnaire link was sent to all K-6 school principals, who then forwarded the information to all grade 6 teachers in their school. Next, based on their responses in a separate section of the questionnaire, teachers were invited to participate in the interview and observation portion of the study.

Due to a lack of sufficient responses to the questionnaire, an alternate recruitment method was also considered. The recruitment options were expanded by requesting the TESIC (Technology Education Special Interest Council) to distribute my questionnaire invitation to their membership. TESIC is a special interest council of the Newfoundland and Labrador Teachers' Association (NLTA). The NLTA was created in 1890 as a volunteer organization and has no power relationship in relation to its members. The NLTA has played a significant role in the development of education in NL and includes special interest councils that are professional learning communities dedicated to life-long learning and the ongoing professional growth of the membership. Their mandate includes offering a range of professional development programs, including conferences, focus groups, teleconferences, and e-learning initiatives (NLTA, 2021). Similarly, TESIC of the NLTA is a professional learning community that supports the growth of NL’s technology education teachers. Since my research focused on teachers' use of educational technology and professional development, it was appropriate to request TESIC to circulate my research recruitment letter to their members. I contacted the communication officer of the TESIC to circulate the recruitment letter within their membership via email list and on their social media channels. It is important to note that, there may be potential bias associated with the

questionnaire responses as grade 6 teachers who are members of the TESIC could be passionate about the use of educational technology.

For the 2020-2021 academic year, there were a total of 91 K-6 schools under the NLESD. Within the K-6 schools' context, my study focussed on grade 6 as the sample grade level. According to the Newfoundland and Labrador curriculum outcomes, K-12 students are expected to demonstrate technological competence (Government of Newfoundland and Labrador, 2020). Grade 6 teachers may adopt educational technology to support smooth transitions into the junior high school system and could utilize educational technology on a more frequent basis as compared to other grade levels in elementary school.

Miles et al. (2014) note that “qualitative researchers usually work with small samples of people, nested in their context and studied in-depth” (p. 31). The sample for my study included grade 6 teachers and the sample size included 104 questionnaire responses, ten interview participants, and three classroom observation participants. These teachers were identified from an initial online questionnaire that was sent to all grade 6 teachers under the NLESD and TESIC. The questionnaire assessed teachers' self-efficacy regarding skills for integrating technology into classroom teaching. Thirteen teachers expressed their willingness to participate in interviews. Individual emails were sent out to all thirteen teachers to obtain their consent and to schedule a time for the interview. Eleven teachers responded to the email; however, later one teacher withdrew her participation due to lack of time and another teacher did not respond to requests for scheduling the interview. Therefore, a total of ten teachers were interviewed from across the province. The classrooms of three teachers that were interviewed were the sites of the observations conducted. Sufficient data were collected until there was no new information shared and the study reached the saturation point.

3.4 Data Collection Methods

To achieve a deeper understanding of participants' perspectives, qualitative research includes a variety of resources (Baxter & Jack, 2008; Bloomberg & Volpe, 2012; Creswell, 2005). Multiple data collection methods are an important part of case study research, a strategy that supplements data credibility (Patton, 1990; Yin, 2003). Baxter and Jack (2008) explain that "each data source is one piece of the "puzzle," with each piece contributing to the researcher's understanding of the whole phenomenon" (p. 554). Each piece of the puzzle, when added together, leads to an in-depth understanding of the case and validates the findings. Data collection may include, but is not limited to, interviews, direct observation, participant-observation, documentation, archival records, and physical artifacts (Baxter & Jack, 2008; Bloomberg & Volpe, 2012). However, the majority of qualitative methodologies consider interview, observation, and documents as the cornerstones of data collection (Bloomberg & Volpe, 2012; Creswell, 2012; Merriam & Tisdell, 2016). All three data collection methods were used in my study. An in-depth analysis was conducted by collecting data through a questionnaire, interviews, observations, and documentation.

The study was conducted at the NLESD K-6 schools within the region of Newfoundland and Labrador, Canada. Research data were gathered in the following manner during and after the project: (1) Documentation: policy documents related to educational technology and professional development were reviewed from across Canada. (2) Questionnaire: a questionnaire was circulated to all grade 6 teachers under the NLESD elementary school system. (3) In-service teacher interviews: ten teachers participated in an interview related to the main research questions. (4) Classroom observations: request for classroom observations was sent to three

teachers who also participated in interviews. What follows is a brief discussion of each data collection method used in my study:

3.4.1 Documentation

Documentation was the first step towards my data collection process and began prior to circulating the questionnaire and conducting interviews and observations (Merriam & Tisdell, 2016). Merriam and Tisdell (2016) explain that “one of the greatest advantages of using documentary material is its stability... [as] data are objective sources of data as compared to other forms” (p. 182). I reviewed policy documents pertaining to educational technology and teacher’s professional development from Newfoundland and Labrador and different provinces in Canada in order to understand the context of my research. This review of documents also included most recently published government reports, school district policies, teacher associations’ research documents, reports from international organisations and other relevant materials. These documents further helped me uncover meaning, develop understanding, and discover insights relevant to my research.

3.4.2 Questionnaire

After obtaining ethics clearance from both my institution and the school district, the first step was to distribute the recruitment letter for the questionnaire. As per the ethics committee guidelines, I had to contact school principals under the NLESD to distribute my research questionnaire to grade 6 teachers. In order to do so, I used the NLESD’s online public directory to identify K-6 schools. These schools were filtered according to regions identified on the website: Avalon, Central, Western, and Labrador and then according to the school level. Next, I retrieved the K-6 school principals’ names and email addresses and used a spreadsheet to record them. Individual emails were sent to 91 K-6 school principals, consisting of the research

approval letter from the NLESD and the questionnaire link. A total of three emails were sent to each principal in Spring 2021: the first email was sent on April 15, the second on April 28, and a final reminder on May18. I maintained a record of the emails sent using a spreadsheet.

An online questionnaire was developed with both open and close-ended questions for collecting primary data from grade 6 teachers across the NLESD. Questionnaires are considered a form of interview and are an acceptable method of data collection in a qualitative study (Creswell, 2012). A section of the questionnaire that focussed on belief, access, time, and professional development with regards to educational technology was adapted and modified with permission from Kopcha (2012). A sample of the questionnaire can be found in Appendix A. The questionnaire was developed using *Qualtrics*, the research software recommended by the university. The questionnaire received 87 responses after being circulated three times. As mentioned earlier, since the response numbers were lower than expected, TESIC was approached and asked to distribute the questionnaire through their membership mailing list and social media channels. This resulted in an additional 14 responses, adding up to a total of 104 responses to the questionnaire. Data was downloaded from *Qualtrics* into an Excel sheet and the responses were color coded to identify the completion rate. The completion rate breakdown were as follows: 40 responses with 100%, one with 97%, one with 69%, three with 61%, three with 56%, four with 47%, one with 42%, three with 36%, five with 22%, four with 19%, 23 with six%, 15 with three%, and one with 0% completion.

Since no questions were attempted under the completion rate of 6, 3, and 1, the responses collected with a completion rate of less than or equal to 6% were discarded. As per the ethics requirement, participants could skip questions, or attempt as many questions as they like. Therefore, all responses with more than 6% completion rate were used for data analysis

purposes. Out of the total of 104 responses, 63 responses were considered for analysis after discarding 41 that did not include any data.

Teachers for the interview were invited based on their responses in a separate section of the questionnaire that included the following screening questions:

- (i) I am a grade 6 teacher.
- (ii) I have at least 2 years of teaching experience in grade 6.
- (iii) I have never integrated educational technology in my teaching.
- (iv) I somewhat integrate educational technology in my teaching.
- (v) I regularly integrate educational technology in my teaching.
- (vi) I would like to learn more about educational technology and develop my skills in this area.

The responses to the main questionnaire remained anonymous. The contact details provided in the separate section of the questionnaire, where teachers completed the screening questions to participate in an interview/observation, were added to a password protected file on my computer. This file was only accessible to the researcher. No personal information was disclosed during or after the research was completed. Irrespective of region, any grade 6 NLESD teacher could express their willingness to participate in an interview. However, for observations, grade 6 teachers in the region of Avalon East were selected due to geographical proximity. Hence, the questionnaire helped in conducting preliminary analysis and identifying potential participants for the interview.

3.4.3 In-Service Teacher Interviews

Semi-structured interviews were conducted with grade 6 teachers. Semi-structured interviews are “a mix of more or less structured questions” (Merriam & Tisdell, 2016, p. 110). I

had ten years of teaching experience in elementary school, therefore I used semi-structured interviews to help guide the conversation. This type of interview is helpful when the researcher is familiar with an issue that is being explored and can respond to the emerging worldviews of the participants (Merriam & Tisdell, 2016). Bloomberg and Volpe (2012) note that “designing the right interview questions is critical” (p.108) and hence interview questions need to be linked directly with the research questions. While following the guidance of Bloomberg and Volpe (2012), I brainstormed four or five questions that were tied to my research questions. Next, I thought of possible responses for my interview questions and shortlisted those which would be more helpful in answering my research questions. I maintained an interview guide which included specific questions about educational technology, professional development, and policy and some open-ended questions that were followed up with probes (Merriam & Tisdell, 2016). A sample of the interview guide can be found in Appendix B.

Additionally, Merriam and Tisdell (2016) note that “asking good questions is key to getting meaningful data” and the researcher should “ask for experiences, opinions, feelings, knowledge, sensory, or demographic data” (p. 136). In following these recommendations, during the interview, teachers were asked questions such as: How many students are there in your classroom? What is your philosophical understanding of technology? How do you perceive the role of professional development in helping you integrate technology for instructional purposes? And what is the best way of developing a policy related to educational technologies?

As a first step, I contacted teachers who had indicated their willingness to participate in an interview. A total of thirteen teachers were contacted. I sent individual emails to schedule a time for the interview as per their convenience and provided the interview informed consent form. Appendix C shows a copy of the informed consent form. Teachers were requested to return

the informed consent form prior to the interview. All responded to my initial email, however, one teacher stopped responding and another teacher, who was also the school principal, declined to participate due to a lack of time. Therefore, ten teacher interviews were conducted. The interviews were audio-recorded with teachers' consent. The digital recordings of the interview were transcribed. After the interview, member checks were conducted by sending the appropriate transcripts back to participating teachers for their commentary.

The semi-structured individual interviews were approximately 50 minutes in duration and conducted synchronously through virtual videoconferencing due to the COVID-19 restrictions during that time. Virtual interviews are like face-to-face interviews with a video component and help in rapport building (Merriam & Tisdell, 2016). By conducting virtual interviews, I was no longer constrained by geography and was able to reach out to teachers from across the province. Consequently, both urban and rural schools were represented by interview participants. Though there can be connectivity and access issues associated with virtual interviews (Merriam & Tisdell, 2016), I did not come across these barriers.

3.4.4 Classroom Observations

Observations are a common source of data in many types of qualitative research, which also includes case studies (Merriam & Tisdell, 2016). Classrooms for observations were selected based on the responses in the last section of the questionnaire; teachers indicated if they would like to participate. Because of COVID-19 pandemic guidelines, observations could be conducted only using video conferencing. Therefore, teachers from across the province could express their willingness to participate while COVID-19 guidelines were in place. A total of ten teachers from across the province expressed their willingness to participate in potential classroom observations. Later, since the COVID-19 pandemic guidelines had changed and in-person observations were

permitted, teachers who were situated in the Avalon East region were contacted for classroom observations due to geographical proximity. Observations for my study were conducted during the fall of 2021 in three urban schools. Permission to gain access to the school sites was obtained prior to observing the classroom. Furthermore, an informed consent form was obtained from teachers and an information letter was circulated to the parents before starting observations.

I conducted non-participatory style of observations, in which, according to Creswell and Poth (2012), the researcher is watching and taking notes from a distance without getting involved with anyone. Non-participatory style of observations provided “a firsthand encounter with the phenomenon of interest rather than a second-hand account of the world obtained in an interview” (Merriam & Tisdell, 2016, p. 137). I used an observation protocol to record notes while in the field and included both descriptive and reflective notes (Creswell & Proth, 2012). I reviewed different observation protocols available in the literature, however, I developed my own observation protocol. I added columns and rows to record teacher background, number of students present, classroom activities by the minute, overall classroom setting, and reflective notes. I included a detailed description of the setting, the participants, the activities and participant behaviours; and in my reflective notes I included my feelings, reactions, hunches, initial interpretations, and speculations (Merriam & Tisdell, 2016, p.151). I also created a rough diagram of the setting’s physical aspects which included any hardware devices present in the classroom and the seating arrangement of students, teacher, and myself. Additionally, after the observation, I audio recorded my reflections (Merriam & Tisdell, 2016). Hence, observations were conducted as a triangulation check to match teachers' perceptions of integrating technology with their responses in an interview. Triangulating data from multiple sources ensures validity

and reliability in qualitative case study research (Lincoln & Guba, 1985; Yin, 2009). The next section provides a detailed description of the procedures followed for analysing data.

3.5 Data Analysis

Data collection and analysis were an ongoing process in my research. According to Merriam and Tisdell (2016) “data analysis is the process used for answering your research questions” (p. 202). They go on to explain that these answers can be in the form of categories or themes or findings. Data pertaining to interviews and observation field notes for respective classes were documented in a systematic manner to facilitate information extraction during data analysis. I created folders on my Google Drive for each interview participant and included the informed consent form, a copy of the transcript, and audio recording. Additionally, document analysis was done by reviewing reports, policies, and the literature related to educational technology and professional development. I maintained a standard protocol using Google Docs to record and analyze the content. While reviewing documents from across Canada, I added nomenclature and phrases directly related to my research questions. I color coded, added keywords, and tally marks to identify patterns and categories. For example, dollars, budgets, and finances were all under the investment category.

Ryan (2009) asserts that “qualitative research methods require transparency to ensure the ‘trustworthiness’ of the data analysis” (p. 143). Therefore, to make the research process more transparent, computer assisted data analysis software can be used (Ryan, 2009). There are also numerous computer software programs that help in storing, sorting, and retrieving data (Merriam & Tisdell, 2016). Although, “no single software program can do everything well” (Miles et al., 2014, p. 50), Computer Assisted Qualitative Data Analysis Software (CAQDAS) was used for organizing and analysing data. CAQDAS programs “encourage a close examination of the data”

(Merriam & Tisdell, 2016, p. 224). Data was organized and analyzed using an interpretive analysis framework.

3.5.1 Interpretive analysis

Interpretive analysis was applied to my research for gaining an in-depth understanding of educational technology use in classrooms. Interpretive analysis focuses on comprehending subjective experiences of participants (Figgou & Pavlopoulos, 2015). It helps categorize data and is applied to gain a deeper understanding of the results about how and why educational technology was or was not effective (Sargeant, 2012). Blanche et al. (2006) note that when applying interpretive analysis, the purpose is to place real-life events and phenomena into some kind of perspective. The teachers who were interviewed explicitly talked about their instructional use of educational technology and the role of professional development and policy in supporting this use. Interpretive analysis not only helped in understanding individual perspectives on educational technology use, but also how these perspectives related to the other areas of the study. Interpretive analysis can begin after interviews are transcribed and verified with the audio recordings (Sargeant, 2012). Blanche et al. (2006) provide three steps for conducting interpretive analysis: familiarization and immersion, inducing themes, and coding, whereas Sargeant (2012) discussed three stages for conducting interpretive analysis: deconstruction, interpretation, and reconstruction. I adopted the latter.

Deconstruction

The first step was to get familiar with the data and this was done by reading and rereading interview transcripts. I listened to the interview audio recording while simultaneously reading the transcript. Bloomberg and Volpe (2012) note that “the real purpose of this initial read is to really immerse yourself in your data and gain a sense of their possibilities” (p. 139). I began

the process of analysing data by identifying segments that were directly linked to my research questions. I made notes on the transcript by highlighting and adding keywords and symbols next to the information that was most relevant to my study. A similar process was applied for transcribing the responses in the open-ended section of the questionnaire. I read and reread each response and made notes on the printed copies of the questionnaire. I highlighted keywords that were repeated and to record the repetitions I added tally marks at the end of the copy with a symbol. As an example, if five teachers noted time as a barrier for integrating technology into their instructions, then I drew a clock symbol with five tally marks. Merriam and Tisdell (2016) explain that this process of making notations is also called coding and therefore leads to constructing categories. As coding is a synonym for analysis (Miles et al., 2014), I went over the notes and grouped similar keywords together to begin detailed analysis.

Interpretation

I used different colors to code. Codes are labels that provide meaning to the description (Miles et al., 2014). As an example, I used the following colors to identify themes: green, educational technology instructional use; blue, motivational factors; and yellow, issues related to professional development. These color patterns were applied simultaneously to code both interview transcripts and open-ended sections of the questionnaire. Furthermore, I applied the in vivo coding method by using words and short phrases from participants' language to code the data. In vivo is commonly used in qualitative studies and helps prioritizing participants' voices (Miles et al., 2014). Interpretation of the categorized data was then done by comparing all ten transcripts and questionnaire responses and identifying emerging themes important to the study. At this stage, I tried to make sense of the emerging themes and made notes, drew diagrams, and brainstormed to identify possible overarching themes and sub-themes. Each interview transcript

and open-ended questionnaire responses were coded using the inductive coding approach, so as to access these as needed in both the analysis and the write-up of my findings. The inductive approach to coding allowed the data “to “speak for themselves” by the emergence of conceptual categories and descriptive themes” (Suter, 2011, p. 346). Hence, I applied a bottom-up approach of inducing themes rather than a top-down approach of having predetermined themes filled in (Blanche et al., 2006).

Reconstruction

I continued to sort the coded data into sub-themes or overarching themes by reviewing and modifying each theme until I could understand how data supported both my interpretation and empirical research. In the final stage, the findings were linked with existing theory, evidence, and practice (Sargeant, 2012). The main themes were used to build a relationship between existing knowledge and theoretical perspectives. Therefore, I looked at the data through the lenses of technological determinism, social determinism, and critical theory of technology; and placed the identified themes into these three theoretical perspectives or buckets of my study (Marshall & Rossman, 2016). What follows is a discussion on the integrity of the study.

3.6 Integrity of the Study

There is consensus in the literature that it is essential for qualitative studies to demonstrate credibility (Creswell, 2000; Lincoln & Guba, 1985; Merriam & Tisdell, 2016; Miles et al., 2014). Reliability and validity are the cornerstones for attaining rigor (Bashir et al., 2008) and triangulation and member checks are the two most common approaches in qualitative research to achieve this (Devault, 2018). Along the same lines, Miles et al. (2014) assert that the findings of a qualitative study should “include enough “thick description” for readers to assess the potential transferability and appropriateness for their own settings” (p. 314). Therefore, the

quality of naturalistic research can be assessed by applying certain strategies (Miles et al., 2014). What proceeds is a brief discussion on the strategies employed for establishing credibility, reliability, and transferability for my case study.

3.6.1 Credibility

Triangulation continues to be a predominant strategy from a constructivist perspective for ensuring validity and reliability (Merriam & Tisdell, 2016). Triangulation involves systematically sorting through the data and converging among multiple sources of information to form themes and categories (Creswell & Miller, 2000). Merriam and Tisdell (2016) explain that “multiple sources of data means comparing and cross-checking data collected through observations at different times or in different places, or interview data collected from people with different perspectives” (p. 245). For my study, I collected data from documentation, questionnaire, interviews, and observations. A review of policy documents, reports, and relevant literature was conducted within the context of Canada. This review provided a strong base and helped in comprehending the local context of my research. The questionnaire responses acted as preliminary findings and supplemented the interview and observation data. Interview data included ten teachers, each one having their own perspective on educational technology, professional development, and policy. Similarly, three teachers were observed at different times and at different schools. Therefore, data collected from observations were used to cross-check and match teachers' perceptions of integrating technology with their response in interviews. Through triangulation I increased the credibility and quality of my research and countered concerns “that a study’s findings are simply an artifact of a single method, a single source, or a single investigator’s blinders” (Patton, 2015, p. 674).

I also solicited feedback from interview participants as a means to extend credibility of my study. Although, there have been concerns on the use of member checking as a validation technique (Barbour, 2001; Morse, 2015; Sandelowski, 1993), according to Lincoln and Guba (1985), “the most critical techniques for establishing credibility” (p. 314) is by conducting member checks or seeking participant feedback. To ensure internal validity, member checks were conducted by sending initial findings back to the participants to see if these were plausible. Transcripts were shared with the interview participants so they could change something they said previously or provide clarification. All participants were provided an opportunity to react to findings and interpretations. Therefore, through member checks, the participants added credibility to the qualitative study by having a chance to react to the data (Creswell & Miller, 2000).

3.6.2 Dependability

In qualitative studies there are many ways of addressing reliability. I provided an audit trail so every step of data analysis is transparent and supported by rationale. All my research activities were organized and documented in a comprehensive manner. An audit trail is an essential element for establishing validity (Bloomberg & Volpe, 2012), dependability, and confirmability (Creswell & Poth, 2018). Through the audit trail, I kept track of the data collection process which became a part of the methodology section of the dissertation (Merriam & Tisdell, 2016). Moreover, I prepared data summary charts and maintained memos. Data summary charts include phrases from participants related to categories that emerge during coding (Bloomberg & Volpe, 2012). These charts helped in cross-case analysis and provided evidence to my findings and recommendations. As I recorded information in the summary charts and read through my data, there were thoughts that I captured using memos. Memos stimulated the

thinking process (Bloomberg & Volpe, 2012) and helped in reflecting on the emerging themes and categories during the research process. Memoing also adds to the researcher's reflexivity, by providing readers an understanding of the researcher's thought process in interpreting the data and concluding the findings. Therefore, data summary charts and memos reinforced the reliability of my study.

Additionally, to increase the reliability of my research, the data were used for peer examination purposes. Lincoln and Guba (1985) define peer examination as a "process of exposing oneself to a disinterested peer in a manner paralleling an analytic session and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's mind" (p. 308). Conversely, Merriam and Tisdell (2016) assert that peer examination is part of a graduate student's dissertation committee as every member of the committee provides feedback on the study. They go on to say that peer examination can be conducted by both someone familiar or unfamiliar with the research. A colleague who had no stake in the outcome of the research conducted peer examination by coding some of the same transcripts that I was working on (Bloomberg & Volp, 2012). The colleague checked for consistency and the validity of my codes through inter-rater reliability.

3.6.3 Transferability (External Validity)

Lincoln and Guba (1985) note that for transferability, the burden lies less with the researcher and more with the person looking to make an application somewhere else. To enable transferability, rich, thick description is used as a strategy (Merriam & Tisdell, 2016). This involves providing a "holistic and realistic picture" by describing in detail the setting, the participants, and the themes of the study (Bloomberg & Volpe, 2012, p. 113). Denzin (1989) explains that "thick descriptions are deep, dense, detailed accounts....thin descriptions, by

contrast, lack detail, and simply report facts” (p. 83). Providing detailed descriptions is typical in qualitative research, and in case study research thick descriptions are the foundation of the study. Therefore, I provided a detailed description of the setting, interview and observation participants, and the themes that became the findings of my study. Evidence of thick description was presented in the following manner: employing documents pertaining to educational technology from across the country, detailed analysis of questionnaire responses, direct quotes of interview participants, and field notes from observations. A detailed description helped in creating plausibility so readers could relate to the events described with their own experience (Creswell & Miller, 2000). Hence, readers speculate “the applicability of findings to other situations under similar, but not identical, conditions” (Patton, 1990, p. 489).

Shah (2019) emphasizes that “it is important that researchers consider and address every detail at the study design stage to avoid bias” (para. 8). On the other hand, Pannucci and Wilkins (2010) note that “bias can occur at any phase of research, including study design or data collection, as well as in the process of data analysis” (p. 619). In this study every attempt was made to minimize researcher bias. In summary, triangulation, member checks, peer examinations, data summary charts and memos, rich thick description, and an audit trail highlight the efforts of the researcher for avoiding bias.

3.6.4 Limitations and Delimitations

Bloomberg and Volp (2012) note that the researcher must explicitly acknowledge the potential limitations of the study. The following limitations may be identified in my study: (i) there may be bias associated with the questionnaire responses as grade 6 teachers who are members of the TESIC could be passionate about the use of educational technology, (ii) teachers may have responded randomly to the questionnaire and the answers may not be true to their

experience (ii) feedback from teachers may be biased during interviews and may not reflect their general practices, (iii) observation obtrusiveness, (iv) findings of my study cannot be generalized for other grade levels as well as other elementary schools beyond the NLESD, and (v) due to COVID-19 pandemic restrictions, data collection was done using virtual platforms which may have affected capturing gestures during interviews. Delimitations help in explaining how I narrowed the scope of my study (Bloomberg & Volp, 2012). For my study the delimitations included the following: (i) I conducted the study only within the context of NL, (ii) the French school district and private schools were not considered for the study, (iii) the focus of the study was only on teachers of one elementary grade level, and (iv) because of geographical proximity, only the Avalon East region was targeted for observations.

3.6.5 Ethical Considerations

Creswell and Poth (2014) assert that it is vital to seek and obtain permission from the institutional review boards. They go on to explain that the main purpose to do so is to provide evidence to the review board that the study design follows the guidelines for conducting ethical research (Creswell & Poth, 2014, p. 151). A detailed proposal was submitted for review to the Interdisciplinary Committee on Ethics in Human Research (ICEHR) at the Memorial University of Newfoundland and Labrador before commencing data collection. Additionally, the research proposal was also submitted to the NLESD for review by their research committee. I outlined the procedures related to sample selection, consent, access, privacy, data storage, and records. I provided a copy of recruitment and informed consent letters, student assent letter, questionnaire, sample interview questions, and observation protocols. A thorough review of all documents was conducted by both committees.

I followed the latest COVID-19 research guidelines provided by the NLESD, and adhered to the COVID-19 protocols for conducting research virtually. These protocols included: (i) research will be conducted virtually via a Google Meet URL issued by the District, with privacy settings in place to ensure access by invitees only, (ii) Google Meet URLs will not be shared with others other than those required to participate in the virtual meeting, (iii) researcher will not comment or share information on teachers participating in virtual meetings, (iv) researcher will ensure no other staff from their organization is able to view the virtual meeting other than those identified to participate, and are required to ensure a secure space is used for the meeting with no other viewers in the room, and (v) researcher will not record or photograph virtual sessions, unless with written consent of the teacher, parent and or student (as per signed research consent form) (NLESD, 2020).

All recruitment and consent documents were modified to include the latest COVID-19 guidelines in place. Interviews were conducted virtually via a Google Meet URL issued by the school district, with privacy settings in place to ensure access by invitees only. Furthermore, informed consents were obtained from all participants involved in the research process. Consent for audio recordings were also obtained. Teachers signed a statement indicating their willingness to participate in my research and pseudonyms were used in referencing the teacher's remarks to ensure confidentiality. Only publicly available documents were accessed and reviewed as data for the research study. Data will be kept for a minimum of five years, as required by Memorial University's policy on Integrity in Scholarly Research and will be confidentially destroyed after that time.

3.7 Conclusion

This chapter acts as a foundation of my research. It elaborated on the design and

the methodological approaches adopted for my study. A qualitative intrinsic case study design that aligned with the constructivist paradigm was considered as an appropriate research approach given that understanding participants' views was a fundamental part of my study. The main focus was to explore and understand how elementary teachers integrated educational technology into their instructional practices.

The chapter is divided into two broad sections: (i) research design and (ii) data collection methods and analysis. The first section discussed the paradigm choice, research design and methodology. I situated my research in a qualitative constructivist/interpretivist paradigm as I believed reality is socially constructed and multiple realities can exist simultaneously. I had a desire to discover, explore, and understand perceptions of participants around the use of educational technology, professional development, and policy. Therefore, my study relied on participants' views and collected data that was purely qualitative in nature. Qualitative research provides a greater understanding of the phenomena and supports exploration, discovery, and description. Hence, for my study qualitative research was the appropriate research method as I sought to explore teachers' perceptions and understand the process of educational technology integration in K-12 classrooms. Within the qualitative methodology approach I applied a single case study design. My research existed in a well-defined bounded system and provided thick description using multiple data collection methods. Additionally, since I was interested in studying how professional development and policy and practice informed the use of educational technology, I conducted an intrinsic case study. This style of case study is conducted when the researcher has a genuine interest in a situation.

The second section of this chapter discussed data collection methods and analysis. The study was conducted at the NLESD K-6 schools within the province of Newfoundland and

Labrador, Canada. Research data were gathered in the following manners: (i) Documentation: policy documents related to educational technology and professional development were reviewed from across Canada. (ii) Questionnaire: a questionnaire was circulated to all grade 6 teachers under the NLESD elementary school system and through the TESIC membership. (iii) Teacher interviews: ten teachers participated in a semi-structured interview related to the main research questions. (iv) Classroom observations: non-participatory style of observations were conducted for three teachers who also participated in interviews. An interpretive analysis framework was applied to categorize data and gain a deeper understanding of the results. Different strategies for establishing trustworthiness were employed to strengthen my study. The next chapter will discuss the findings of my research.

Chapter 4: Analysis

This chapter presents and analyses the findings of the data collected during the study. This analysis showcases data from the questionnaire, interviews, and classroom observation sessions. A total of sixty-three questionnaire responses, ten interview transcripts, and three classroom observation field notes were analyzed. Patterns and themes emerged which were reflected in the findings of the open-ended section of the questionnaire. Triangulation of data helped further confirm these results.

This chapter includes context, reminding the reader about the purpose of the study; an overview of individual participants, briefly introducing the ten interview participants and discussing their experiences with educational technology; the nature of educational technology, highlighting the participants' perceptions of technology in general and educational technology in particular; and emerging themes, discussing each in detail.

4.1 Context of Study

Throughout the investigation the focus was on how educational technology is integrated in the instructional practices of elementary teachers across Newfoundland and Labrador. This exploration was supported by three sub-questions that focused on the teachers' perceptions, professional development, and policy. Within the context of Newfoundland and Labrador, there are only a few studies that investigated the use of educational technology. However, the government continues to invest millions of dollars (\$20 million) towards the provision of educational technology (Education and Early Childhood Development, 2020). A purposeful sampling strategy was applied to gain insight and understanding of the phenomenon. What follows is a brief introduction to each interview participant that provides an insight into their experiences with educational technology within the context of teaching.

4.2 Experience with Educational Technology

The questionnaire that was circulated for this study in April 2021 included a section where teachers could indicate their willingness to participate in an interview; a total of 13 teachers agreed to participate. However, one teacher withdrew their participation due to time constraints and two teachers did not respond to emails for scheduling the interview. Therefore, ten interviews with grade 6 teachers were successfully completed. Since COVID-19 protocols were in place, the interviews were conducted using Google Meet, the recommended virtual platform by the NLESD. Teachers were provided with an opportunity to select their own pseudonym; however, if no pseudonyms were chosen, the researcher chose one to maintain anonymity. The interview participants were from the Avalon, Central and Western regions of the island portion of Newfoundland and Labrador.

4.2.1 Interview Participant 1 - Ms. Dora

Ms. Dora worked as a half-time teacher librarian and grade 6 Intensive Core French homeroom teacher. She had 20 students in her classroom. She had 12 years of teaching experience. Ms. Dora was also a member of the Technology Education Special Interest Council (TESIC). Ms. Dora recalled that when she first started teaching the latest technology was interactive whiteboards. Back then she was keenly interested in seeing how technology would work and aid in her instructional activities. She noticed that student engagement increased with the use of technology. Whenever students went to the computer lab, there was an interest in it and when students were leveraging digital tools to create a product there was an obvious pride in that product. This guided and motivated Ms. Dora towards using technology as opposed to any formal training.

4.2.2 Interview Participant 2 - Ms. Ann

Ms. Ann was a grade 6 homeroom teacher and a grade 4 music teacher; she had 24 students in her classroom. Ms. Ann recalled her initial interaction with educational technology, referring to her university days in 1998. She went to Acadia University in Nova Scotia and availed of the Acadia Advantage Program, which provided all students with a laptop. Additionally, Acadia University had Internet access everywhere, so Ms. Ann was able to use technology to support her education during her first degree. Ms. Ann's classroom had a SMART Board for the last 12 years, but she acknowledged that she does not use it often.

4.2.3 Interview Participant 3 - Ms. Sarah

Ms. Sarah was a grade 6 homeroom teacher with 12 years of teaching experience; she had 24 students in her classroom. Ms. Sarah recalled her experience with TeamBoards, SMART Boards, voice to text software, and Google Workspace (formally known as G-Suite). She was familiar with Google Workspace even before the district-wide use was implemented because the Assistant Principal of her school encouraged the use of it.

4.2.4 Interview Participant 4 - Ms. Precious

Ms. Precious was a grade 6 homeroom teacher and librarian at a rural school; she had 19 students in her classroom. Ms. Precious had 14 years of teaching experience that also included one year at an international school. She had bachelor's degrees in science and education and also a master's degree in education, leadership and administration. She shared the most vivid memory of her first experience with educational technology, which was creating a Hotmail account. Ms. Precious reflected on how she has learned and how technology has advanced since then.

4.2.5 Interview Participant 5 - Mr. Smith

Mr. Smith had more than ten years of experience as a teacher; he had a bachelor's degree in education and was currently working towards his master's degree in curriculum, teaching and learning studies. He taught a combined class of grade 5 and 6 students at an urban school. He had 18 students in his classroom; seven grade 5 and eleven grade 6 students. Mr. Smith noted that his first interaction with educational technology was during an introduction to some basic tools during professional development sessions in his early years of teaching. His use of educational technology was driven by his own experiences, interests, ways of learning, and students' needs. He also pointed out that during the same time large investments were being made in providing access to wi-fi and SMART Boards for schools, which probably had an influence on his teaching approach.

4.2.6 Interview Participant 6 - Mr. William

Mr. William worked at an urban school and had more than ten years of teaching experience. He taught grades 5 and 6 and had 18 students in his class, which included two students with pervasive needs. His qualifications included a bachelor's degree in education and a master's degree in educational technology. Mr. William looked back at his initial interaction with educational technology which was when he went to a computer lab as a student. When he started post-secondary education there were SMART Boards instead of chalkboards in his university. After graduation when he started teaching, he realized how much technology was present in education. Along with SMART Boards, a few classes also had iPads and some students who were struggling with writing on paper used iPads to do their work.

4.2.7 Interview Participant 7 - Ms. Bella

Ms. Bella was a grade 6 homeroom teacher at an urban school. Her experience with educational technology dates back to her high school years in a small town. She had to take some of her courses online through the Center for Distance Learning and Innovation (CDLI) as there were not enough high school teachers to provide advanced courses. By the time she was 18 years old she understood the opportunities available for online learning. She went on to do her bachelor and master's degree in education and started teaching in 2016. In the past five years, she noticed that the school district has been investing more on technology, purchasing more iPads, Chromebooks, Makey Makeys, and circuit boards. As she further reflected, she mentioned that learning has evolved, and educational technology is evolving with it.

4.2.8 Interview Participant 8 - Mr. Joshua

Mr. Joshua was a school principal and a grade 6 Technology and Arts teacher at a rural school. He had 20 years of experience in the education field and completed a bachelor of English philosophy and folklore and also a bachelor of education and master's in education information technology. The school had a total of 85 students which included 11 students from grade 6. Mr. Joshua recalled that he took a course at Memorial University, where the instructor tasked students to build a website. After Mr. Joshua completed his bachelor's degree, he was offered a job as the network supervisor at a rural school because he had taught himself how to build a website. His interest in technology grew from there and went on to pursue a graduate degree in education and information technology and out of that spawned more work. He worked with the school district on various technology related tasks for seven years. Mr. Joshua realized the power of technology as he worked on different projects and developed a desire of getting students out

of books and exposing them to real life experiences, which he said is now renamed as authentic learning.

4.2.9 Interview Participant 9 - Ms. Honey

Ms. Honey was a grade six early French immersion homeroom teacher in an urban school and had 8 years of teaching experience. She had 20 students in her class. While reflecting on her educational technology journey, Ms. Honey explained that her personal interest largely contributed to the use of technology in her classroom. She hinted that since she grew up with technology and social media around, technology was ingrained in her generation, and she felt more comfortable applying it. However, Ms. Honey emphasized that she was not a techie person and didn't know how to fix things but her interest in technology grew knowing that her students were interested in it. Additionally, she pursued a master's degree in educational technology, offered in collaboration from Memorial University and Cape Breton university. She elaborated on the courses that focused on instructional designing, digital citizenship, and others which further sparked her interest in this area. These courses helped her understand that the use of educational technology should have a purpose and not just a substitution for paper. Ms. Honey also proudly noted that through these courses she was introduced to the use of Twitter and because of that now she is an active member of the professional learning communities from across the country. Her own interest and support from the Twitter community helped her in trying new technologies and not being afraid to fail. Ms. Honey also discussed her role on a project related to educational technology with the Faculty of Education, MUNL. The experiences that she gained from the project were phenomenal and invaluable and further helped her in exploring student engagement with regards to educational technology use.

4.2.10 Interview Participant 10 - Ms. Cindy

Ms. Cindy worked at a school that welcomed students from nearby communities. She had 26 students in her grade 6 class. Ms. Cindy called herself a computer geek and credited TESIC for introducing various educational technologies even before these were introduced in schools. She regularly participated in the four-day summer institute organized by TESIC that exposed teachers to new and interesting ways of teaching. Because of TESIC she was introduced to Google Classroom long before it was endorsed by the school district. Ms. Cindy also shared that due to a spinal injury she was unable to use her right hand properly and therefore could not do a lot of things. This is when educational technology became a necessity in her classroom, and she was able to use it for different purposes such as grading and making notes.

As evident from the introductions of interview participants, the sampled group included both rural and urban schools. Additionally, the sample included different genders; some teachers represented schools from rural communities while others were from urban areas. They also had a range of teaching experiences. It is important to note that several teachers residing in small communities were hesitant to provide any demographic information out of concern that they could be easily identified. The next section provides an in-depth description of the classroom observations that were done with the three grade 6 teachers who also participated in an interview.

4.3 Observations

Throughout the observations the focus remained on exploring the answer to the main research question – How do grade 6 teachers integrate educational technology into their instructional practices? Prior to conducting observations all three teachers were informed that the intent was to observe their day-to-day teaching activity and not a planned lesson. Teachers had circulated the research information letter to parents and had also informed their classes about my

visit. What follows are descriptions and findings from the three classroom observations. All three teachers incorporated educational technology in their daily lessons; however, the most representative activities are discussed for each participant. A summary of the educational technology used in each of the three classrooms is provided in Table 2. Observations were followed by informal discussions within the context of classroom observations. Nonetheless, teachers were consistently asked if the activities undertaken could have been completed without integrating educational technology.

Table 2*Educational Technology Overview for Classroom Observations*

Classroom Observation	Educational Technology Hardware in the Classrooms	Borrowed Hardware	Educational Technology Software
Mr. Smith	an overhead projector, a SMART Board, a whiteboard, a desktop computer, keyboard, and a wired computer mouse	Chromebooks	Mystery Doug , Je lis, Je lis, Littérature! , Prodigy , Math Mystery , coding , podcast , Jamboard , Google Workspace
Ms. Honey	an overhead projector, a SMART Board, and a whiteboard, a desktop computer, keyboard, a wired computer mouse, speakers, a remote control for the projector, a 3D printer, six Chromebooks in Tech Tub plus three additional Chromebooks	Chromebooks iPads	Esti-mystery , Veterans Affairs Canada website , Skyview Lite application , Read&Write , Google Workspace
Mr. William	an overhead projector, a SMART Board, two whiteboards, a desktop computer, keyboard, a wired computer mouse and a basket with five Chromebooks	Chromebooks	Super Teacher Worksheets , Kahoot! , Esti-mystery , Prodigy , Epic , Mystery Doug , Jamboard , Google Workspace

Note. This table provides an overview of the educational technology used during the classroom observations.

4.3.1 Mr. Smith's Classroom Observation

Mr. Smith was a grade 6 French Immersion homeroom teacher at a 5-9 intermediate urban school. He had 18 students in his classroom, eight girls and ten boys. He taught a combined class of grades 5 and 6 students and mentioned that some of his students had learning disabilities such as ADHD, but all students could work independently. Also, he did not have a teacher learning assistant, since his class size was manageable.

Teaching Environment

Mr. Smith's classroom was a medium-sized room with huge windows on one side of the wall overlooking the soccer field. The visible technology included a digital clock displaying the time, an overhead projector, a SMART Board, a whiteboard, bookshelves, a button maker machine, and an engraving set. There were four crescent-shaped student desks with four chairs

on each desk. There were also a total of three exercise balls, also known as stability or balance balls, on three desks. There was a foldable table near the entrance door that displayed students' projects on it.

A total of three teacher desks and two office chairs were present in the classroom, with one teacher desk in the corner of the classroom and two at the back of the room. One office chair was placed with the corner desk that the teacher used. The corner desk also had a desktop computer, keyboard, and a wired computer mouse and a portable microphone and a stand next to the office chair. The other two teacher desks were mainly used for displaying students' projects. I positioned myself on the extra office chair at the back of the room and used one of the teacher desks to keep my belongings.

Observation Context

A total of nine classroom periods of 45 minutes each were observed during the month of November. The learning tasks using educational technology included: Mystery Doug, a free web-based video series that entirely focuses on questions that are asked by real students; reading using Je lis, Je lis, Littératie website, a leveled reading resource for French Immersion students that promotes metacognition; Prodigy, a fantasy wizard style math game; Math Mystery, coding, and podcast and Jamboard. The first period started at 8:53 am after the school announcements, which students listened to on the audio paging system.

Classroom Observation Findings

The findings for the observation sessions are presented holistically for better analysis and discussion. What follows are descriptions of two of Mr. Smith's instructional uses of educational technology.

Math Mystery

Mr. Smith asked students to grab a marker and mini whiteboard for the math mystery task, which he explained was students' favorite thing to do. Math mystery worked using various clues and an estimate chart, which is used to cross out students' potential answers. The correct estimate is then shared by the teacher. Mr. Smith displayed his email page on the screen and showed his class that he had reached out to the person who designed math mystery questions and that he even replied to him. The class was filled with excitement. Some students asked Mr. Smith to arrange a virtual classroom visit. However, for now, Mr. Smith collaborated with the class and composed a reply about the math mystery question and then sent the email. Interestingly, the next day Mr. Smith received a reply from the person, and he shared it with the class.

Podcast and Jamboard

After recess, students grabbed drawing sheets and were excited and ready to continue listening to a serial podcast from the previous day. Mr. Smith provided a quick recap of the story and then played the podcast episode, which was approximately 15 minutes long. When the podcast episode finished, he asked students to grab a Chromebook and log into their Google Classroom and join the Jamboard link. He then explained the task, each student was expected to post on three different slides about the podcast – something about the characters, what they are curious about, and what unknown or mysterious things were happening. Students responded by using colorful virtual stickies and added their initials at the end of the sentence so the teacher could identify them.

Debriefing

During the lunch break, Mr. Smith chatted with me and addressed some questions around educational technology use in the classroom. For instance, I asked him if any of the activities that he included in his teaching could be done without the use of educational technology. He

responded that some of the activities could be done but would not provide the same collaboration opportunities. He gave an example of the Jamboard use, although the same activity could have been done as a group on a piece of large sheet of paper, students would not be able to link their ideas and share simultaneously and openly while working together in small groups. It not only saved a lot of time but provided ownership and students could go back to the same Jamboard anytime to see all the ideas there and use it later in their writing. I also enquired about the availability of Chromebooks, he showed me the Chromebook cart which is also a charging station for the same. He discussed the accountability aspect and shared the Chromebook schedule that was maintained on a cloud calendar. Teachers booked the time when they needed the Chromebook cart and were responsible to provide the next teacher with charged Chromebooks. Mr. Smith also reiterated that these Chromebooks were purchased through fundraising efforts by the school administration. It was also apparent in his classroom that students were prompt in shifting between tasks without complaining. To this, Mr. Smith explained that providing choice to work on tasks helped in maintaining discipline.

4.3.2 Ms. Honey's Classroom Observation

Ms. Honey was a grade 6 French Immersion homeroom teacher at an intermediate urban school with grades 5-8. She had 20 students in her classroom, 13 girls and seven boys. Ms. Honey taught only grade 6 students. Also, she did not have a teacher learning assistant since her class size was manageable.

Teaching Environment

Ms. Honey's classroom was a medium-sized room with huge windows on the corner wall overlooking an open field. The visible technology included an apple shaped clock, a digital clock displaying the time, three bookshelves, a 3D printer, a basket with six Chromebooks plus three

additional Chromebooks on the table, an overhead projector, a SMART Board, and a whiteboard. There were 22 student desks with 24 chairs. Four desks were joined together to form a group, therefore there were 5 groups and an extra two hexagon shaped tables joined together with four chairs. The hexagon table was placed at the back of the classroom and was mainly used for extra work; this is where I was seated. There was an office chair and one crescent shaped desk near the teacher's desk at the front corner of the classroom. The teacher's desk also had a desktop computer, keyboard, a wired computer mouse, speakers, and a remote control for the projector.

Observation Context

A total of six classroom periods of 45 minutes each were observed during the month of November. The learning tasks using educational technology included: Esti-mystery, science experiment, reading, writing, and listening activity, use of iPads and Chromebooks for learning about constellations. The first period started at 8:10 am after the school announcements, which students listened to on the audio paging system.

Classroom Observation Findings

The findings for the observation sessions are presented holistically for better analysis and discussion. What follows are descriptions of two of Ms. Honey's instructional uses of educational technology.

Reading, Writing, and Listening Activity

Ms. Honey accessed the Remembrance Day classroom materials posted on the Veterans Affairs Canada (2021) website. She displayed a slide on the SMART Board with several activities to choose from and students could do as many as they liked. All activities were posted on the Google Classroom for students to access. There were eight Chromebooks that most students shared as a pair and used a headphone jack with dual input so both students could listen.

For the reading activity, Ms. Honey had posted an article, Tales of Animals in War, that students could read and then summarize it in their reading folder or using the Google Doc. She further mentioned that students had recently learned how to use the Read&Write chrome extension, so they also had the option to listen to the article. For the writing activity, students made sentences using vocabulary words and for the listening activity, students could watch a video or listen to a song/poem about Remembrance Day and then complete a worksheet about the same. Ms. Honey displayed a 30-minute timer on the screen and worked with two students at her desk who were finishing their previous writing task. She walked around to see if other groups needed assistance.

iPads and Chromebooks

Ms. Honey showed a video about constellations and asked questions about the same after the video. She then showed the science textbook and the chapter on constellations. All students were required to read pages 34-37 before opening their science folders. Once they finished reading the chapter, students took their science folders and drew two columns and labeled as shown by Ms. Honey on the SMART Board. On the first column students were required to add the name of the constellation, on the second column they had to write the number of stars, and on the last column they had to draw the constellation. Students then took an iPad from the cart and opened the Skyview Lite application. They moved the iPad around to view the constellations and then recorded the information under each column. There was excitement in the classroom as they located the constellations and shared with each other.

The next morning, Ms. Honey asked students to log into their Google Classrooms using Chromebooks and work on the assignment posted. The goal of the assignment was to write an organized, well-researched paragraph on a constellation of their choice and represent it through a method of their choice (artwork, light box/flashlight, Google Drawing, Tinkercad, etc.). While

Ms. Honey explained the first step of the assignment, she asked students to keep their Chromebooks in respect mode, which meant that the screen be lowered down but not completely closed. Students were required to read and research about constellations using the web links provided.

The next step was to choose one constellation and research in more detail. Students were provided a research template on Google Docs where they had to take notes. The research template had three different sections; the first section included a list of brainstorming questions such as: How did your constellation get its name? In which hemisphere (north/south) is your constellation visible? During what time of year is your constellation visible? The second section – *Bibliography*, required students to give credit to any sources that they will use and also copy and paste any website links, book titles and authors that they will use along the way. For the last section – *Good Copy*, once students had researched enough, visited at least three web links, they had to compose a clean version of their paragraph (introduction, supporting ideas, conclusion) while making sure that their ideas were organized and well supported. Ms. Honey emphasized the use of punctuation and capitalization. Additionally, she explained the importance of crediting the work of others and paraphrasing sentences.

Before students began working on their assignment, Ms. Honey asked the class to first read through the steps again and then start reading about constellations. One student struggled with clicking on the material online. Ms. Honey quickly figured out that it was because the wireless mouse had a low battery and asked the student to use the Chromebook mouse pad instead. Another student asked where they should type if they ran out of space in the box provided on the Google Doc. Ms. Honey showed on the screen that as you keep typing inside the box, it will keep adding more space when you click Enter. A few students did not know how to

copy and paste, so Ms. Honey showed them how to do that. She walked around the classroom to see if any student needed assistance. One student inquired if they should write Google as a source in the bibliography section and Ms. Honey explained that Google is only helping you search so write the source or website that has the full information. Some students noted that the websites are loading slowly, and Ms. Honey agreed that the Chromebooks were a little glitchy today. However, the class continued working without any interruptions.

Debriefing

After students were dismissed for the day, Ms. Honey spent time answering some of my questions. I asked if the research activity was already listed in the science textbook. She explained that although a few ideas were mentioned in the textbook, she compiled the activity on her own and added website sources for students to research from. She wanted students to have choices that are authentic and at their level of understanding and not random material from the Internet. Regarding the technology issue, she said that it may be because Chromebooks are running low on storage and she had discussed it with the district, who indicated that it is a Google issue. I asked about the availability of Chromebooks, and she said that grades 5 - 6 shared a cart with 25 Chromebooks in it and they also had a tub in each class with six sets of Chromebook in it. For booking the Chromebook cart, teachers used Google calendar.

Additionally, she also had three Chromebooks that were acquired from two separate grants.

When asked if any of the educational technology activity could be done without it, Ms. Honey answered yes and no. While providing the example of the research activity, she said that students could go to the library to research about Constellations using books, but the use of educational technology made their learning experience more tangible, giving it a real feel and hence more relevant. I also enquired about the Skyview Lite application that the students were

using on the iPads. She said that the technology education teacher in junior high had a certain amount of time allotted to assist teachers with technology needs and that he submitted a ticket to the district to get the application approved and then he installed it. Ms. Honey noted that it can take more than a week to get approval, so teachers need to plan ahead of time. She had used the same application last year too, so it was easier to apply it again.

4.3.3 Mr. William's Classroom Observation

Mr. William was a grade 6 homeroom teacher at a K-6 elementary urban school. He had 20 students in his classroom, 9 girls and 11 boys. He taught only grade 6 students and mentioned that five students in his class were diagnosed with learning disabilities related to reading and written output, but all students could work independently. Also, he did not have a teacher learning assistant since his class size was manageable.

Teaching Environment

Mr. William's classroom was a medium-sized room with four windows on one side of the wall overlooking the city. The visible technology included a clock, three bookshelves, a Chromebook basket, an overhead projector, a SMART Board, and two whiteboards. There were 20 student desks with 23 chairs. Five desks were joined together to form a group, therefore there were four groups. There were two extra tables, one rectangle shaped table at the back of the room, which had five Chromebooks in a basket connected to an extension cord for charging, this is also where I was seated; and a crescent shaped table with a chair, mainly used for extra work. An office chair and teacher's desk were at the front corner of the classroom. The teacher's desk also had a desktop computer, keyboard, and a wired computer mouse.

Observation Context

A total of nine classroom periods of 45 minutes each were observed during the month of November. The learning tasks using educational technology included: worksheets, Kahoot!, Chromebook, Prodigy, Epic, Jamboard, Google Doc, Esti-mystery, Science activity, and Mystery Doug.

Classroom Observation Findings

The findings for the observation sessions are presented holistically for better analysis and discussion. During both sessions, Mr. William used the SMART Board to display the topics. What follows are descriptions of two of Mr. William's instructional uses of educational technology.

Chromebooks

After recess, Mr. William listed all the activities on the whiteboard with different colors that students had to complete (in any order) using a Chromebook, these included:

- Prodigy, students practiced math concepts related to identifying patterns using place value charts;
- Epic, a digital reading platform, students were assigned books to read and take quizzes about flight, their next unit in science;
- spelling practice, students were expected to go to Google Classroom and use Google Doc to type and practice spelling words from the paper list;
- and a journal entry.

Mr. William had posted a Google Doc on Google Classroom with a question: Who is your best friend and why? Students had to write a detailed paragraph. Every student was expected to work independently by spending 20 minutes on each activity. Mr. William walked around the room to

see if students were on task. He reminded students not to copy and paste content from the Internet.

Jamboard

Students joined the Jamboard that was shared on Google Classroom. It was about how students were feeling today. There were some pictures of Pikachu, a cartoon character, with various emotions and students were instructed to add a sticky note next to the emotion that they found more relatable. They also had to add their initials on the sticky note so that the teacher could see their work. Mr. William asked students why they had selected a particular emotion. Students were reminded to refrain from being silly and moving around other students' sticky notes. Mr. William then related the concept of interpreting emotions and having different perspectives to their Social Studies lesson. He then displayed the next slide with Among Us characters, which represent different colors in the game, and asked students to select a color that expressed their emotions and also add their last name on the sticky note. For example, blue was associated with being drowsy, orange for mixed emotions, green as happy, etc. This Jamboard activity was linked to the Social Studies lesson on stereotypes, that they had reviewed the previous day.

As a follow up to this activity, another Jamboard link was shared, and each group had to write a paragraph about a real stereotype on the slide assigned to them on Jamboard. The sentences had to be formed in collaboration with the group members, so each member contributed with a word to form a sentence that made sense. He reminded students to focus on their grammar while compiling the paragraph. Each group worked on a real stereotype, such as all young people text and drive, all kids are spoiled, and only boys play hockey. Students worked together to form sentences, some even added pictures on their slide. After they finished, Mr.

William displayed each group's work on the SMART Board and read it out loud. He appreciated their ideas, choice of words, and grammar usage. He also asked each group to share any problems they had while working on the activity. Most groups said that communication among group members was an issue, however, they were able to identify a solution. For example, each member of the group selected a color for the sticky note, so everyone knew who was writing the words. Mr. William then highlighted the purpose of the activity, which was teamwork, communication, collaboration, reviewing sentence structures, conventions, and paragraph formation. A student added that it was nice to see everyone's strengths and weaknesses about the concepts of grammar.

Debriefing

After school, Mr. William answered some of my questions. For example, I asked if the Esti-mystery was used to meet a particular outcome in Mathematics. He said that he mainly used this activity for team building and collaboration among students and that was one reason why he didn't ask all students to use the mini whiteboards. He added that sometimes he did use Esti-mystery as an individual activity as well. I also asked about the Chromebook cart, and he said that the cart had around 15 Chromebooks, there used to be more but due to technical issues with some Chromebooks the number was reduced. However, since five of his students had their assigned Chromebooks they always had enough. Furthermore, he mostly did center times and did not require a full set of Chromebooks for all students at the same time. They took turns while working on different subject areas. Mr. William also said that he worked with smaller groups when explaining a math concept as opposed to standing in front of the class, because most students lack the attention span.

I asked him about the activities done using the Jamboard. For the emotions activity, he said it was mainly done to understand students' perspectives and their interests. Also, the activity formed the basis for the main writing activity and helped in reminding the Jamboard usage by doing a quick introduction. I also wondered why he switched between asking students to add last names instead of initials. He said it was done to check if students were following verbal instructions. When asked if any of the educational technology activity could have been done without it, Mr. William said for sure, but engagement would have been lower.

The next section discusses the identified themes: the nature of technology, highlights various perceptions of teachers towards technology and educational technology; instructional use of educational technology, provides examples of instructional uses of educational technology and discusses supportive and unsupportive aspects for the same; professional development, discusses the characteristics of professional development; administrative support, highlights the role of administrators; administrative planning, discusses the role of policy. These themes are woven together with data from the interviews used as an anchor and data from the questionnaire and observations used to achieve triangulation in a coherent manner.

4.4 The Nature of Technology

Technology and educational technology form the basis of this study, and as such, it was important to understand teachers' perceptions within their classrooms. Most teachers considered technology and educational technology as a tool. Ms. Sarah considered both technology and educational technology as a tool but further added that educational technology is "a tool that would help give a different way for a student to share their learning or a different way for a teacher to go about a lesson than the traditional way." On the other hand, Ms. Dora understood educational technology as "digital tools that we can leverage for teaching and learning."

Generally, there was consensus that educational technology made teaching and learning easier. Mr. William explained that technology is any tool that makes a task easier and educational technology provides tools that accelerate the process of learning for students by both making the tasks easier and helping in understanding the material in the curriculum easier. Similarly, Ms. Bella noted that technology is anything that aids or assists in a task and with regards to education anything that is regularly done with pen, pencil, and paper. For Ms. Bella, educational technology is the advances in pen, pencil, and paper and includes everything from a pencil grip, mechanical pencils to Chromebooks and SMART Boards.

Ms. Ann perceived technology and educational technology as one and the same, noting that both “kind of go hand in hand,” whereas Ms. Precious defined technology as a broad term that takes on different forms in the classroom, music room, computer lab, or learning commons. She explained that although iPads, Chromebooks, laptops, and SMART Boards come to mind when thinking of technology, there is a lot more that helps in “different ways of bringing out different learning styles for children.” Ms. Precious added that there are technologies that incorporate learning with iPads and Chromebooks such as green screens, coding devices, micro bits, Makey Makeys, Arduino, and Meccano Dinosaurs.

Some teachers had a more in-depth interpretation of technology. Mr. Joshua explained that “technology is not something to be done, you don't do technology” and “in terms of using technology it's all about the actual use of it to accomplish a goal, more of a vehicle than something to get to.” Ms. Cindy looked at technology as a pill that can improve or augment teaching practices in different and interesting ways. She asserted that the methods and how you are using it turns technology into technology in education. Additionally, she emphasized that technology needs to have a purpose so it can facilitate learning, “if it doesn't have a purpose then

you're just using tech for the sake of using tech.... then you're just cool with the kids and you're not actually getting anywhere.” Similarly, Ms. Honey explained that teachers should use “a computer or software or a website in such a way that they can learn from it, or it can help them learn, help the process of learning, facilitate learning, making the learning process easier or more accessible and more attainable.” It is worth noting that only three teachers discussed the facilitation aspect of educational technology. Moreover, none of the teachers addressed the ethical considerations of technologies in their interpretations.

The questionnaire data showed that the majority of the respondents valued educational technology and believed that it was important for teachers to use it in the classroom. As an example, 61 teachers out of a total of 63 agreed that educational technology made their job as a teacher easier. However, only four teachers considered that the selection of web-based educational resources should be from a trusted site. Nonetheless, during the classroom observation sessions, all three teachers promoted responsible use of educational technology. For example, Mr. Smith reminded students about the importance of being vigilant when on the Internet. He also discussed at length about the cyber-attack on the health system in the province. He addressed questions from students and sorted the answers into two categories– factual information and what we heard. Mr. Smith also reiterated that no one should click on suspicious emails and give out their personal information.

4.1.1 Philosophical Perceptions

Teachers were also asked to look at technology from a philosophical lens. They reflected on whether technology is socially created based on the needs of human beings, if they think that technology drives human needs, or if they see it as both. During the interviews almost all teachers acknowledged that they never thought about this before and unanimously agreed that

technology is an important part of society that is embedded in everything that is done on a daily basis. The following sub-themes are discussed holistically: (i) teachers and technology, (ii) society and technology, and (iii) COVID-19 and technology.

Teachers and Technology

Mr. Smith provided a technology driven example, while considering the NLESD's school development plan, he said that it is a common practice of the district to hand over the technology "to a broader range of schools and teachers and saying 'Hey, this is the technology we're using now', and when we're in-serviced it is presented as 'Here's a micro bit and here's an outcome in a curriculum that it can help satisfy.'" Although this approach is driven by technology, when it is introduced to teachers, they are the ones connecting it back to students' needs. Mr. Smith explained,

it sorts of flips back on itself, and teachers are able to see it in context and say, Oh actually you know, this voice recording technology we brought in so that we could do this with it, but I think it might fit this need for this student.

Along the same lines, Ms. Cindy stated that when adaptive technology is introduced to teachers "there are also interesting things that teachers find, like different ways to incorporate it for all students, not just students that need adaptive technology." Ms. Sarah also asserted that "a lot of times the technology is there, and we see how it can help us." In the case of voice-to-text, "we see it and then we see how that can be used to our advantage." Therefore, "it depends on who's driving it. If the acquisition of the technology is teacher driven it's much more needs based. If it's departmental or private-sector driven, it's more technology-based" (Mr. Smith).

Ms. Honey, however, provided an example of educational technology companies and organizations that look for ways to help students and teachers. Noting that they explore "what is

best for the student to be able to learn better, what is best in a universal design for learning sense” and so now “a site or an app or a piece of technology is more accessible to a wider audience.” Likewise, Ms. Cindy also added that

we do use certain adaptive technologies a lot for students so they can use the Read&Write software, so students who can't read, the technology helps read the material to them or students who can't write they use voice to text, so I think it definitely started from a need.

The questionnaire data also supported this theme as 59 teachers agreed that educational technology enabled personalized learning for individual students. Additionally, they also believed that educational technology made their job as a teacher easier. The observation data also supported this theme as all three teachers used technology to provide students with more options. For example, in all three classes students used Prodigy to work on math concepts. Mr. Smith also showed me the teacher's view of Prodigy. He explained that students were assessed initially to identify their level of understanding and then he selected the provincial curriculum and math concepts. He assigned those to students and tracked each student’s progress.

Society and Technology

Some teachers aptly illustrated the relationship between technology and society. Ms. Dora perceived human beings as both producers and consumers of technology. She explained that as an educator it is her “role to make sure that students critically analyze what technologies they're using and how they're using technology and kind of become smart consumers of technology and then also know how to produce technology as well.” On the other hand, Ms. Bella observed that

as a society we bring ourselves to technology but as the technology develops it brings new ways and new ideas for our society to interact and do things and make things easier in ways that we've probably never seen before, so I feel sometimes it drives us and sometimes we drive it.

Ms. Bella also provided an example of her classroom where her students' conversations revolved around technology. She said in her grade 6 classroom

all the conversations that kids are having is about things that they are doing on devices at home...it's never hey let's go get on the bike after school, it's like oh let's go out and make this new Tik Tok or let's meet on snapchat after school or let's go home and talk through Fortnite.

Ms. Cindy also echoed the same sentiments about students' technology use, "when they're outside of school that's what they're doing, when they're inside of school that's probably all they're thinking about so like it is in society, it's all around us."

Ms. Precious reflected on how technology has become a part of the day-to-day routines and provided an example of online banking, "when online banking was new, we had to learn it but now it seems like it's just part of society, it's part of how humans interact daily." For Ms. Precious the COVID-19 pandemic had changed her perceptions. She now perceived technology as a necessity, observing that "after living through the pandemic, I see a true need for the technology because while we were home and we could not come into the classroom, technology played a huge role and it kept us connected." However, Ms. Precious had some concerns regarding the availability of funds for small schools in rural areas. She said,

I don't ever see regressing from the point we're at right now in terms of technology, but I am a little bit concerned about things like if two of my Chromebooks get dropped tomorrow, how fast will I get two more Chromebooks.

Ms. Honey also noted that “though technology is going to change it's not something that's going to go away, so we kind of need to build ourselves up to meet it and keep running with it.”

Overall, the questionnaire data saw teachers embracing technology use in the classroom. For instance, when teachers were asked about the importance of using educational technologies in the classroom, out of 63 responses 49 teachers acknowledged that it was absolutely important. And 14 teachers believed that educational technology is somewhat important. There were no comments about stepping back from the use of technology. Similarly, it was apparent in all three classroom observations that teachers included technology in their daily instructions. Although there were some minor issues that came up, teachers resolved those without interrupting their instructions. For example, in Mr. William’s class a student accidentally enlarged his Chromebook screen. Mr. William searched on Google to find a solution and resolved it within a few seconds.

COVID-19 and Technology

The interview data showed that in general teachers’ perceptions towards technology did not change because of COVID-19 pandemic. However, out of ten, seven teachers mentioned that the perceptions of their colleagues had changed. While referring to the “20 million dollars¹ worth of technology that was pumped into the K-12 system” and the willingness of teachers, Mr. Joshua alluded that

¹ Education and Early Childhood Development. (2020). Provincial government announces \$20 million for technology to support digital learning.
<https://www.gov.nl.ca/releases/2020/eecd/0706n02/>

if there's anything positive that will come out of the pandemic it is that the infrastructure and the technological willingness amongst teaching staff and students alike has grown to the point that it's just the way we do business now. This is life. So it's become more ubiquitous.

Likewise, Ms. Precious noted that “I see less apprehension now,” and teachers who were reluctant earlier are able to see that “this is something beneficial, something we can do if we collaborate, work together and lean on one another and I think that since the pandemic, people are seeing much more value in having the technology at our fingertips.” Mr. William concurred that prior to the pandemic he shared his practice of maintaining digital portfolios but was met with resistance from his colleagues. But as a result of the pandemic, his colleagues’ “perceptions changed massively,” Mr. William said, “as soon as this online stuff happened, I was the only person who had a digital portfolio and all of a sudden there were a million reasons everyone had why they could no longer do paper portfolios and they were obsolete.” Along the same lines, Ms. Dora admitted that “COVID-19 pandemic opened the door a bit to the different possibilities” and she was able to “try different learning styles and different pedagogies that incorporated technology” and acknowledged that “because of the nature of the business of the classroom and having to book the Chromebooks” she would not have explored otherwise. For instance, she started incorporating digital portfolios into her Mathematics unit.

On the other hand, though Ms. Honey’s perception did not change, she saw “how incredibly important technology is.” Although some teachers realized the importance of technology, they struggled to engage with students online. For example, Ms. Ann said that she had been using Google Classroom for several years and when the first lockdown happened she

was connected with her students mainly for providing social and emotional support and during the second lockdown she said the attendance was very low,

people got tired of the online platform pretty fast and I found certain classes especially with the older kids, grade six, it was really difficult to get them, I'd be talking and they'd have their cameras turned off and it was really hard to get them to engage.

The questionnaire responses supported these findings. Teachers were asked, given the COVID-19 pandemic situation and thinking about the next school year, how often they think that they or their students will use educational technologies. 30 teachers indicated that they would use educational technology more often this year and 29 indicated that they would use about the same as this year. None of the respondents indicated that they do not plan to use educational technology in the future. However, four teachers indicated that their usage of educational technology will reduce in the coming year. As part of the open-ended questions, teachers were also asked how the COVID-19 pandemic impacted their teaching practices with regards to the use of educational technology. There were a lot of statements on how the pandemic changed teaching practices significantly. For example, a teacher noted that "I've learned it's incredibly easy for me to teach using technology - the curriculum can still be met." Therefore, it was evident from the data that the COVID-19 pandemic had an influence on teachers' perceptions regarding the use of educational technology in the classroom.

The next theme focuses more broadly on the instructional use of educational technology and then narrows down to the supportive and unsupportive aspects of the same.

4.5 Instructional Use of Educational Technology

Several times during the interview teachers referred to hands-on technology learning such as Circuit kits, Ozobots, micro bits, and Makey Makeys. These references were predominantly

related to the science concepts taught in grade 6. While highlighting the importance of hands-on technology learning, Ms. Dora said, “it is a huge tool for student engagement because typically kids really enjoy this kind of hands-on learning and that's where technology comes in.” She explained with excitement that their science learning goal, understanding how a series circuit versus a parallel circuit works, was met using Snap Circuit kits,

so one group actually made a popsicle stick flashlight with batteries and LEDs and another group used a snap circuit kit. Another group was on the computer using a simulator...[T]hat was kind of like our assessment piece because they were using the simulator to make a switch. So we'd have Google slides that said like, I can make a series circuit, and then they would take a screenshot of their simulator making that circuit.

Along the same lines, Ms. Honey shared about the PhET simulations, a research-based teaching and learning digital platform for Science and Mathematics. Ms. Honey explained the science activity that her class did using the virtual DC circuit construction kit. Students could click and drag all the components of a circuit out and build a circuit like prototype it...they can put a circuit together safely and it will catch on fire so they can see what happens if they don't wire something correctly or put too much power into their circuit. And then from there they can go ahead and take the wires and the bulbs and the batteries that we have in our class to make a circuit.

She continued to explain that students took notes of their observations on Google Slides and maintained a record of their activity. Ms. Bella shared an activity from the Solar System Unit that the class was currently working on. Students were assigned a different planet and provided several options to express based on the questions that Ms. Bella had posted. She said, “they've got all these outlets now at their fingertips to be creative above and beyond.” So, students could

use websites that provided music and beats to make their own song or a rap and then record. They could work on their devices to make a poster, brochure, slideshow or write an essay. Ms. Bella added that they could also do something hands-on like making a paper shaped planet and orbits.

Mr. William discussed his forthcoming activity with his students that will explore the human digestive system using Ozobots, tiny robots that read color codes. He shared an example of the same activity done by grade 5 students who drew a picture of the digestive system along with a pathway through the esophagus. Students programmed the Ozobot to move through the pathway while audio and video recording themselves, “telling the viewer where the food is going, so you know the digestive system starts in the mouth...”

Ms. Precious shared a simpler use of educational technology, her students wanted to use technology to draw a favorite scene from a book that they were reading– Raven’s Quest. She said,

a lot of the students wanted to get the Chromebook to search up pictures of what a raven looked like or pictures of what a wolf looked like and then we had students watching tutorials...so they could follow along and draw the wolf.

Ms. Precious also provided an example of using the makerspace for doing maker faire projects. Her students completed an interest survey where each group had to select a technology for creating their projects. Each group worked on a different project, which included green screen technology, sewing machines, and blogs. Ms. Precious highlighted the cross curricular connections that these projects made, all addressed socialization, health and well-being, components of Mathematics and Language Arts. Ms. Precious added,

whether it's designing their quilt, drawing it out on their graph paper and measurement, writing up their instructions or creating a script for the green screen or typing for their blog...so using technology to do the same thing but in many different ways.

Ms. Dora also concurred that hands-on technology learning “develops a stronger skill-set in students as they’re achieving curriculum outcomes in science, math, and social studies.”

On the other hand, Ms. Ann was content with using Google Classroom for posting assignments, projects, and novels, “in the grade 6 class that's the majority of what I use” she said. She was looking into Minecraft Education but admitted having technical difficulties for setting up student accounts. Ms. Cindy, however, shared her experience with Minecraft Education saying that it took some time for her students to understand that they have to use it for the purpose of learning. As initially when students joined the Minecraft world, they blew up everything. Ms. Cindy exclaimed, “so using the same tools but using them for a different purpose and I think that's the difference between like an educational technology versus regular...it has to facilitate learning.”

Several teachers also highlighted web-based learning resources such as Raz-Kids, Epic, Zorbit, Prodigy, Khan Academy, and YouTube. Ms. Precious provided an example of using Raz-kids with her students. She could monitor her students’ reading progress because the teacher’s Raz-Kids account was set-up like a classroom, and she could see who read the book and took the quiz and which questions students got incorrect. She added that there was “also an option to communicate with the children and parents so I sat down one afternoon, and I gave voice messages through Raz-Kids and I sent every child a voice message for them to listen to about their progress.” Another teacher used YouTube videos and songs in her French class, “so that the

kids hear somebody else speaking French [different accents] because otherwise they're listening to their French teacher the entire way through school” (Ms. Sarah).

The questionnaire had asked teachers to indicate if it was easier to design learning activities that incorporated technology. A majority of the respondents (58 teachers) agreed with the statement. During the observation sessions, all three teachers displayed the same. For example, Mr. Smith used the *Je lis, Je lis, Littératie*, a reading website. If the student was unsure of the pronunciation, then they clicked on the word and listened to the audio. A student's reading level was recorded on an excel sheet that was generated from the website and shared with parents and students so they could track their progress. The website also had the option to share an audio recording with the teacher. Also, students could listen to the audio book while controlling the reading speed which aligned with the universal design of learning model.

4.6 Supportive Aspects of Educational Technology

All interview participants integrated educational technology in their instructional practices. This section discusses the following sub-themes: (i) differentiating by offering choices and (ii) teaching with Google Workspace.

4.6.1 Differentiating by Offering Choices

An overwhelming number of teachers accredited educational technology for providing more choices to students for completing a task. Ms. Dora explained that if educational technology is used just for student engagement and motivation purposes then it will get old very quickly. Instead, she said, “students should have the opportunity to choose digital tools that are going to help them showcase their learning in the best way.” Hence, Ms. Dora alluded that educational technology allows teachers to “open up the door for students to have multiple means of representation and multiple means of exploring something.” She provided an example of a

project that her class was currently working on. They were researching a francophone country, so students had the option of creating a video, presentation, SCRATCH animation, or using paper and pencil. Likewise, Ms. Cindy noted that by giving students options, they were able to find new and interesting ways to present without feeling anxious to get up, stand, and speak in front of the class. She added, “so instead of just doing the old-fashioned puppet show they can do videos where they're speaking for the character that they've drawn on the screen.” Mr. Smith, who taught a combined class of grades 5 and 6, said “it's much easier to differentiate, it gives access to a huge amount of content and ideas.... gives a sense of deep learning where we're asking kids to activate prior knowledge.”

Additionally, some teachers highlighted how providing choices to students helped them in their teaching process. For example, while referring to the Solar System activity, Ms. Bella said that by giving students options to do their work helped her to see not only what they were learning but also their learning styles. She could see which student gravitated towards music, essay writing, hands-on learning and then used their strengths in the next assignment. Similarly, Ms. Precious and her colleagues were exploring the Responsive Teaching and Learning (RTL) model to make meaningful connections by understanding the needs of individual students. She said, “we try to find ways where we can bring out their best learning and lots of times that includes different types of technologies.”

The questionnaire data showed that a considerable number (51 teachers) strongly agreed that educational technology provided more resources to teachers. Additionally, an overwhelming number (59) of teachers also believed that educational technology enabled personalized learning for individual students. There were also several responses in the open-ended section about the supportive aspects of educational technology, for example, a teacher commented,

I have always been an advocate for the integration of technology across all curriculum levels. In my experience, it often gives students unique avenues to show their knowledge of learning goals. Technology can be motivating for students, but it can also allow them to create products (i.e. a film, a coded animation, etc.) that showcase their curriculum content knowledge while also allowing them to build important skills.

The observation data also concurred the same as all three teachers provided a lot of choices to their students and used different educational technologies that aligned with the curriculum goals. For example, Mr. Smith used a podcast along with a Jamboard to work on the comprehension skills of the students. Ms. Honey provided a lot of options to her class to complete their Remembrance Day activities that focused on reading, writing, and listening skills. And Mr. William's class used Prodigy for practicing math concepts and Epic for reading and comprehension.

4.6.2 Teaching with Google Workspace

Ms. Honey explained that the NLESD is a “Google District so the majority of what we use is through the Google Apps for Education Suite [Google Workspace].” All teachers mentioned that they used Google Classroom for posting subject material and Google Docs and Slides for collaboration purposes; Ms. Honey, also used Google Sites with her students. While highlighting the sharing aspect of Google Workspace, Ms. Bella said “thanks to the Google interface and being able to share.... I found students were really engaged and found their own independence in their learning, they were doing almost like self-guided learning and I really loved it.” Moreover, Ms. Bella noticed her students were more creative and expressed their ideas in fun ways when they used Google Doc for writing as opposed to paper and pencil.

Google Classroom was used for posting subject related resources, assessments, and homework. For example, Ms. Precious explained that during math block time students “can go and either look at tutorial videos, use worksheets, or play games that are related to the math unit.” Furthermore, students could access the material any time on their own or revisit content that they needed to review for better understanding, Ms. Precious added “that is also a way of taking down the restricted classroom walls.” Several teachers also noted that it was easier for students and parents to keep track of activities when someone was absent from school. This was particularly helpful during COVID-19 because students who had even one symptom had to stay home.

There were some teachers who described Google Drive for ease of use, access, better planning, and organizing. Ms. Honey noted that

it's been so much easier, since, if I'm home sick then I can open my drive, make a sub-plan, share all of my files. It's super easy. Whereas before if I was home sick, all of my stuff was in school so I'm trying to rack my brain with okay where is this, how can I get this to my substitute.

Likewise, Mr. William explained that “I don't need to be going through folders and binders finding stuff, everything's in a digital portfolio on my google drive” and he could easily access his content and upload it to Google Classroom. Ms. Cindy talked about how technology helped in “simple things like making notes” she said “I always used to write up on the board but now I make them once and every year I take them up, so it's saving me a significant amount of time.”

Mr. Joshua emphasized the ease of conducting assessment and evaluation and providing feedback using the Google interface. He had created an evaluation form where a few comments were posted for students to view, he added that “the mark is irrelevant, kids don't even care about

the mark, they want to see what I've said about their work, I do it all in a matter of minutes.” Mr. Joshua went on to explain,

it gives you the ability to remove the deficit approach to evaluation, which essentially is what didn't they do right, you include that, but it gives a lot of rich feedback on the positives as well so in terms of assessment and evaluation the possibilities are limitless.

Since Mr. Joshua was also a school principal, he provided an example of his discussion with a teacher about assessing student work, he explained that,

if you want to know if a child in your grade can build a block tower, why would you have them draw it out on a piece of paper on a test and explain in a paragraph in a traditional pencil and paper format. Why not have them build the tower, take a video of it, take a photo, put it in an ongoing record for that child, do a quick interview with them and record that..... you have learning evidence in front of you.

An overwhelming majority of teachers also spoke about the benefits of Read&Write software, a third-party chrome extension that provides comprehensive reading and writing support for Google Docs and the web. Ms. Sarah provided a quick background on Google Read&Write, saying that teachers “had to apply for students and if they had a particular learning disability in reading and writing then they would qualify for it.” She added that probably because of COVID-19 “this year the NLESD made it available for all students.” Now, Ms. Sarah’s students often used Read&Write to check spelling, searching and researching, and also for punctuation. She said, “some of them like to use it to find their punctuation and listen to the voice read and when the voice never ever pauses, they realize ‘Oh I got to go back and put in my periods’.”

Similarly, Ms. Bella said that when students required assistance with spelling or writing they were able to use Read&Write. She added that

students who can hardly get a word down on paper they can flourish, and they can do a whole assignment for me without being singled out, because they can work shoulder to shoulder with another student who may be miles ahead academically but they're both making progress at their own pace and without technology you can't do that in the same way. I'm only one human, so if it's only me in here with paper and pencil, the same thing can't happen, so technology helps me. It's almost like an additional set of hands to provide students with a lot of opportunities to express their learning.

Several teachers alluded to the fact that, Read&Write supported students with learning disabilities. For example, Mr. William had three students in his class who had been diagnosed with learning disabilities and struggled with written output. He said, “they cannot get the words from their head to their fingertips onto the pencil, so they use Read&Write on their Chromebooks and that helps to transmit ideas from their minds and through their mouse onto the computer.” Along the same lines Ms. Ann added that, “I've seen kids with very severe learning disabilities in reading, so Read&Write technology really takes away that disability because it puts them on a level playing field with everyone else.” Ms. Cindy also highlighted it as “an assistive piece for people who have any kind of physical learning disabilities.

The open-ended questionnaire responses also included many comments about the Google Workspace interface. Teachers were asked to describe any teaching experiences that may have supported their teaching using educational technology. A respondent mentioned that “having a fully available/integrated Google Suite [Google Workspace] made organization, production, and sharing of student work much easier.” While another teacher added that “I've been using Google

Classroom for years.” During the observation sessions, it was apparent that all three teachers used Google Classroom in their day-to-day teaching and posted in-class assignments for students to access and complete using Google Docs, Slides, or Forms. The next section discusses the unsupportive aspects of educational technology.

4.7 Unsupportive Aspects of Educational Technology

Some of the major unsupportive aspects of technology were more linked with issues of personnel than the technology itself. Likewise, teachers' lack of willingness to use technology was seen as an unsupportive aspect. What follows is a discussion on the following themes: (i) the lack of resources, (ii) the lack of willingness, and (iii) dangers of distraction.

4.7.1 The Lack of Resources

Many teachers asserted that more district technology aide was needed to assist in day-to-day issues such as connecting wi-fi. For example, Ms. Dora said “no one in our school has access to the wi-fi password so we have to fill out a help ticket request and get a board technician to actually come in to solve that.” The waiting time after submitting a help ticket was a concern as well. Ms. Ann explained that

in our whole western area there's one tech person who fixes those [technology] kind of problems and he goes I think from Port aux Basques to Burgeo, like the whole area is huge that he covers so I've been waiting now for two weeks to get my wi-fi or to get my hardwired Internet back in my music room.

Ms. Cindy echoed the same concerns, “our tech aide, I don't know how he does it, like he has so many schools.” She continued,

it's lovely that the government is putting in all this tech and encouraging technology and all this stuff, but they also have to put in the personnel to keep it all running because like

I said if I put in a ticket for a laptop that's not working, four or five days later nobody shows up.

Likewise, Mr. Smith said that “they [NLESD] brought in this idea to get all the kids Chromebooks, which was fantastic.... but they haven't added enough IP addresses to the schools” so the wi-fi was being affected.

Additionally, although millions of dollars had been spent on providing access to devices in the K-12 school system, several teachers wanted more provision. As an example, for Ms. Sara access to devices was the biggest barrier, she explained “there was money put forth in the notes last year for Chromebooks, that was for grades 7 to 12 students that doesn't do anything for where I currently am.” Ms. Dora echoed the same,

what we did for 7 to 12 was great. It would be awesome to have an influx of devices like that in K-6, maybe not as take-home devices but ensuring that K-6 classes had access to devices would go a long way as well.

Almost all teachers mentioned that they booked a Chromebook cart in order to use it in their classrooms. While appreciating NLESD’s efforts and highlighting the importance of frequent access to devices, Ms. Cindy said

having access to it every third day is great, but it doesn't lead to any kind of prolonged engagement, I have to pick things that are short because you lose momentum if you have to wait two days to come back to the project again.

The questionnaire data mirrored the same concerns. In the open-ended section, when teachers were asked to describe any teaching experiences that may have hindered their teaching using educational technology, the majority of them reported concerns related to the infrastructure and resources. For example, a respondent stated that

the main problem for me has always been the lack of available technology (i.e., Chromebooks). Some older devices, such as the laptops, are outdated and very slow. The iPads are okay but are not suitable for older students who need to write reports.

The questionnaire also asked teachers what they would do differently if they could with regards to the integration of educational technology in the classroom, the majority of the teachers wanted better wi-fi connectivity and access to devices more regularly. For example, a teacher noted, “if each student had consistent access to a device, Google Classroom could be used in conjunction with in-class instruction. This would help with classwork, behavior management, assessment, and individualized work ethic.” Another teacher stated that,

I would like to see more technicians at the school board so that technology difficulties can be addressed in a timely fashion. The teachers/school need to have more autonomy. For example, if I need an app downloaded it needs to go through a technician and can take a long time. If a teacher or group of teachers could download something free without having all the red tape, I think it would open up more opportunities. I’d also like to have technology in my room for as needed use. Having to share resources and book things out means it’s hard to get them when needed.

The data from observations also supported this theme. All three observation participants booked a Chromebook or an iPad cart to work on the activities since they did not have a dedicated set for their classrooms. Also, as mentioned earlier, Mr. William had some Chromebooks that did not work due to technical issues and Mr. Smith had indicated about wi-fi connectivity issues. Also, Ms. Honey had pointed out that it could take more than a week to get approvals for apps.

4.7.2 The Lack of Willingness

Though all the interview participants were comfortable in using educational technology in their instructions, they shared the perceptions of their colleagues who were reluctant to do so. According to Mr. Joshua, “the only negatives are footholds for the luddites amongst us, who for some reason resist the idea of the power that this stuff can positively do.” In a similar vein, Ms. Cindy expressed, “in our school, definitely we have a lot of teachers that are still really hesitant, they're like I don't know, I'm not good at it, I don't want to use it, I'm going to stick with the way I know.” However, while acknowledging the reluctance of teachers Ms. Honey provided some insight on the reasons, she explained that

there is a mindset amongst teachers, especially older teachers, that this is all going to change. I've been through this before, like we get stuck on something we think it's so awesome and great and a few years down the road it's all going to change again, so that is definitely a frustration among teachers.

Ms. Honey added, “I think it's hard to get sold on something when you've been around so long that you know it's going to end up changing.”

Ms. Honey also connected the lack of willingness to a lack of time. She said, “I think one of the major reasons why people don't try something new is because technology can be super overwhelming of course and it's always changing, there's always new stuff on the go.” Along the same lines, while addressing professional development and support for teachers, Ms. Dora said that

the lack of professional development time and also just like one shot professional learning, that's like okay here it is but there's no follow-up and there's no continued

support...especially for teachers who aren't just comfortable with technology can be a huge barrier.

The questionnaire data supported these concerns as many teachers identified the lack of time as a challenge in integrating educational technology. In the open-ended section of the questionnaire, teachers wanted more time to explore, practice, and become comfortable with educational technology. For example, a teacher mentioned that “the most important thing is to provide time to actually try it ourselves before being expected to use it with students.”

A few teachers also mentioned about the approach of other teachers related to educational technology in their open-ended responses. For example, a respondent commented, “it is difficult to fight against the opinions of some teachers that technology is a distraction for students, and that it is too much work to implement it into the classroom with too little rewards.” Another teacher stated that, “coming up against teachers who are anti-technology creates a very negative environment when it comes to technology.” During classroom observations, it was apparent that all three teachers were comfortable with educational technology use and were able to resolve any minor technological issues that came up.

4.7.3 Dangers of Distractions

Several teachers shared their concerns about students being off task when using a device. Ms. Ann said, “it's easy for them to instead of doing their assignments or whatever that they can be on some sort of game instead.” She acknowledged that it needs monitoring on her part to make sure that all students are on task and doing what they are required to do. Conversely, Ms. Bella explained that “my eyes can't always be on what they're working on, so as much as educational technology is great the students really need to learn about digital citizenship.” She was concerned that if she's working with one group of students then what are the other groups

looking at on their screen, “are they actually doing their work, are they googling pictures of something else, or are they playing Minecraft on the side.” Ms. Bella was also “worried that students might approach things online that are not of the classroom nature.... that’ll lead them to darker parts of the web or cyber bullying.” Therefore, she believed it was vital for students to “learn how to properly use interfaces and forums online.” Similarly, Ms. Precious’s concern was beyond the classroom walls because when students accessed learning resources online in school, the NLESD restricted certain websites, blocked advertisements, etc. However, she said “all the online resources that we use here in school, they continue their learning at home but then there's no control over commercials and ads that pop up when they're home using their own personal wi-fi.”

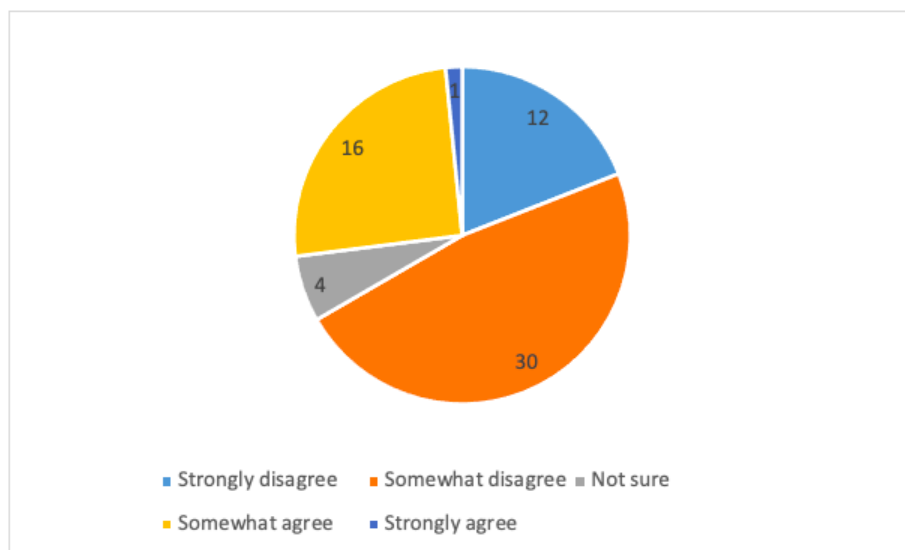
Conversely, Ms. Honey pointed out that teachers need some basic policies, not too complex, across what is expected of teachers when it comes to integrating educational technology. She added, “there's such a disparity in the understanding of and the use of technology between teachers and students.” Although, Ms. Honey said, “the district does mandatory digital citizenship lessons every year that the teachers deliver to students...there definitely needs to be more education on digital citizenship for teachers before we deliver that to students.”

Regarding concerns that educational technology distracts students, the questionnaire saw the majority of the respondents somewhat disagreeing with this (see Figure 1). In fact, there was also an inclination towards strongly disagreeing with this statement. On the other hand, although there were teachers who somewhat agreed, there were only a few who strongly agreed. The open-ended responses included a few comments regarding this concern. For example, a respondent wrote that in addition to “bad wi-fi and lack of working devices, inappropriate use by

students caused setbacks to the successful use of technology in some of the classes.” During the classroom observations, although all three teachers reminded the students to make meaningful use of their time using devices, none of them were concerned about students getting distracted or being engaged in inappropriate use of technology. There were only a few instances where a student did not follow the required guidelines. For example, a student in Mr. William’s class joined the Kahoot! activity using another classmate's name, as a result he was asked to leave the class and go to the office. Additionally, it is worth noting that as a non-participatory observer I was limited in viewing the Chromebook or iPad screens of the students.

Figure 1

Educational Technology Distracts Students



The next section focuses on teacher professional development with regards to educational technology use in the classroom. The following themes are discussed: (i) collaborative professional development, (ii) self-directed professional development, and (iv) relevant professional development.

4.8 Collaborative Professional Development

Many teachers credited the school culture and collegial relationships for learning and using educational technology in their classrooms. Ms. Dora acknowledged her school for supporting collaboration among colleagues and believed that her grade 6 colleagues were part of “a very tight-knit team.” She added, “we meet every Monday to plan what we're doing together, so there's a lot of sharing back and forth.” Some teachers explicitly mentioned that they learned best through others. For instance, Mr. William noted that “the pedagogy of how he teaches always comes from talking to other teachers and how they do it and what works for them and what doesn't.” Similarly, Ms. Honey also approached her colleagues who had similar interests to learn something new. When prompted to know if they have the time to collaborate with their colleagues, Mr. Smith exclaimed, “it sort of happens when it needs to happen, it's a bit more out of necessity I'd say,” he added, “it would be fantastic if there was more time just left to that, so a PD day where everybody could just bring things to the table and we could create some things together or create some templates.”

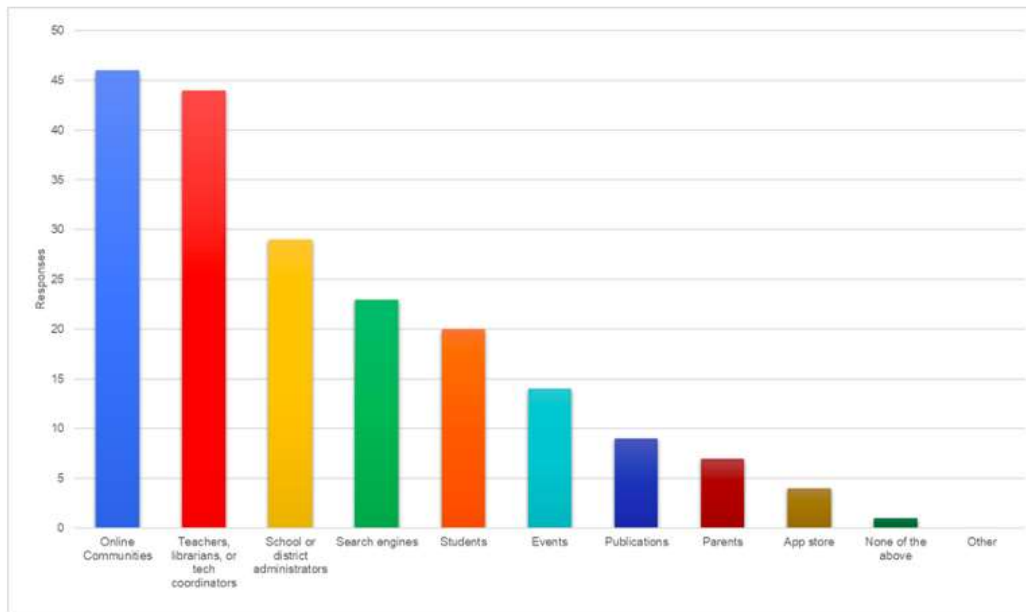
There were also teachers who collaborated beyond the school walls and connected online for sharing ideas and getting inspiration from others. Mr. Smith was one such teacher who was part of a large professional learning network, he explained, “we're either letting each other know about professional development or we're sharing particular ideas or pictures of things we've done in our classrooms or links to Google Slide presentations or just different resources.” Along the same lines, Mr. William credited the various social media platforms such as Facebook for collaborating online and learning different types of technology uses in the classroom. He provided an example of Google Jamboard, although he was familiar with it he was unsure on how to incorporate it into the curriculum. Mr. William generally used it as an ice breaker by

asking students to post about how they were doing. However, once he joined Facebook groups, he was able to explore “different lessons that could be implemented through Jamboard.”

This theme was also reflected in the questionnaire data as shown in Figure 2. Teachers were asked, how did they find out about educational technologies for instructional use. The majority of the teachers relied on online communities or social networking sites (e.g. Facebook, Twitter, etc.) to collaborate. In the open-ended section of the questionnaire, a respondent noted that, “I tend to seek out professional development on educational technology on my own time through social media and like-minded colleagues.” Another teacher said, “I have already participated in professional development for technology at school and through social media. I benefit from teachers getting together to share ideas informally and practice using technology in novel ways for instruction and assessment.” Likewise, all three observation participants were also part of various social media communities. For example, as a homework activity, Mr. Smith had asked students to search the meaning for the term octothorpe. He discussed the answer in the class and provided an example of his own Twitter use. On the other hand, during our debrief session, Ms. Honey mentioned getting ideas for classroom activities through her Twitter online teachers’ community.

Figure 2

Techniques Used by Teachers to Find Out About Educational Technologies



4.9 Self-Directed Professional Development

Self-directedness was evident in all interview participants. They all went out of their way to broaden their knowledge or assist others for the same. For example, Ms. Bella spent a lot of time on her own after school in the evenings “looking things up online, at teacher blogs, websites, things that are recommended...I do a lot of that independently,” she continued, “I see other teachers who are having success in their classrooms...I follow Facebook, TikTok pages, Pinterest boards you name it, I'm online searching for what other people are doing in their classroom to see what I can transfer over to my classroom.” Also Ms. Bella added that she takes the foundational skills from the professional development sessions and builds on them independently by looking at her own sources. While lobbying for more professional development days during the academic year, Ms. Dora believed that

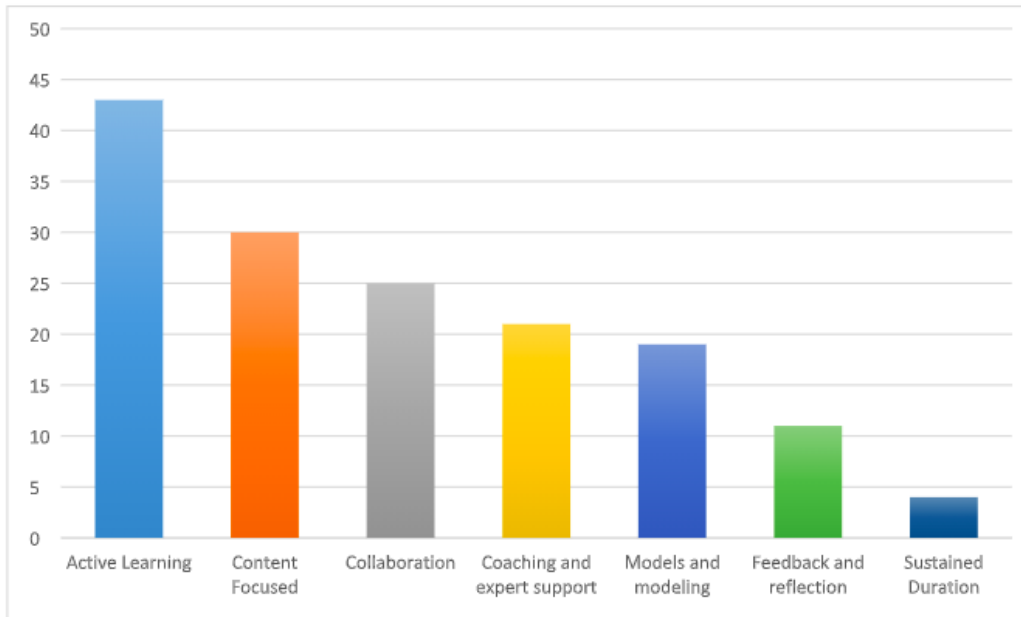
it is on teachers to continue their learning journey and that's not necessarily always going to be during school hours and obviously work life balance is tremendously important but there are times....when teachers have to pursue their own learning opportunities too.

Along the same lines, Ms. Precious attended virtual sessions and workshops shared either through email membership or on Twitter by TESIC, tinkercad, Brilliant Labs, Canada Learning Code, and Let's Talk Science. She noted that although sometimes the time zones were restrictive, she was able to access the recordings later at a convenient time. During the COVID-19 pandemic, Ms. Cindy curated relevant resources and conducted sessions four times a week for teachers who were interested in learning about educational technology use in the classroom. Ms. Sarah was pursuing her master's degree in education and actively connected with the network of people within that program and shared resources. Mr. Smith was involved in testing new educational technologies by staying up to date and providing feedback to TESIC. He said, “I kind of early adopt some of these things or trial run or I'm given demos of things to try....just because that's something I'm willing to do and I'm kind of interested to do.”

The interview data also mirrored the questionnaire and observation data. Figure 3 shows the responses from the questionnaire where teachers had to rank the most important professional development characteristics. Most of the teachers selected “Active Learning” as their top preference followed by Content Focused and Collaboration. Similarly, it was evident during the observations that all three teachers looked for resources on their own that provided authentic learning experiences for students and aligned with the curriculum goals. For example, Mr. Smith included podcasts, Ms. Honey utilized the Veterans Affairs Canada website, and Mr. William used Mystery Doug to align with the curriculum goals.

Figure 3

Important Professional Development Characteristics for Educational Technology



It is worth noting that Ms. Cindy, who was also part of several groups on Facebook, acknowledged that the online communities can be overwhelming as there are so many resources available. She added that

I'm just filling my basket with all these things and then it's like too many resources.

Sometimes it is not good, it just clutters and then you want to do all these things and I get too ambitious and then I have to slow down.

Likewise, a questionnaire respondent also pointed out that it can be overwhelming for students as well, so the focus should be “on just a few technologies at a time and to build on certain skills.”

Many teachers also took advantage of the membership offered through the Technology Education Special Interest Council (TESIC). Some teachers who were members discussed it at length. Ms. Honey was appreciative of the funding that she received from TESIC and Brilliant Labs to attend the ISTE's Creative Constructor Lab in New Orleans. She said it was “an excellent learning experience.” Similarly, Ms. Cindy was grateful for the opportunity to attend a virtual international conference through TESIC. She repeatedly acknowledged the contributions of

TESIC and offered suggestions to bring more awareness about TESIC among the school communities. She explained, “I think that the TESIC that we have is phenomenal and I think the NLESD should collaborate more with them” she added, “there are probably hundreds of teachers who don't know that this council exists so I think if there was more communication about the great things that they're doing then it will pull more people on board...and make a huge difference.” Several teachers applauded the professional development sessions offered by TESIC. In fact, Mr. Smith explicitly stated that “at this point, far more professional development opportunities and support are available from the TESIC than from the NLESD.”

4.10 Relevant Professional Development

Many times during the interview teachers mentioned that professional development needed to be tailored and relevant to the needs of the teachers. For example, Ms. Sarah said, “I wish there was a way to individually tailor it....a way to kind of individualize it so that you were getting things that you personally needed.” Ms. Ann shared the same thoughts and wanted different levels and content for teachers “who already had a basic understanding.” Likewise, Ms. Bella explained that “I find a lot of conversations in PD's get tied up on things that maybe are not relevant to me and then things I might ask or question may not be relevant to someone else.” She compared the professional development sessions to teaching her students and said,

it's really just like when you're teaching in the classroom I feel the same thing with PD, you're teaching two groups of teachers who are all at different levels in their careers, who are all at different comforts with technology...if you're teaching reading to students, they are at different levels similarly we are all at different levels as teachers, we all got our own strengths and weaknesses.

Mr. Joshua also believed that professional development for educational technology had to

be needs-based and focused on direct requests and feedback from teachers

generally, we try to capture as many people in one group as we can, it needs to move away from everyone at once model...It would provide a much richer experience for the people involved and give them more equity in terms of getting what they need versus being told what's needed.

Ms. Cindy thought that since she always explored professional development opportunities on her own, most sessions offered through the district included content that she already knew and she admitted “that's not their fault, that's just because I do more than the average, so I guess they're shooting for the average audience.” She added, “so they [NLESD] usually start more towards a beginner level, which is pretty much where everybody is, so I think they have done very well that way, for the most part there's a little bit there for everybody.”

Within the realms of relevant professional development, some teachers wanted direct support in the form of educational technology coaches. For example, while addressing the need to continually support teachers who are not comfortable with educational technology use in the classroom, Ms. Dora said that “I do think the development of positions within our province, a technology integrationist or technology coaches or something like that could be beneficial in kind of filling that gap more effectively.” Ms. Honey shared the same thoughts,

I'd love if we had ed tech coaches, that would be an amazing role for the district to take on, it's becoming more popular in the United States and across Canada ...this is what we need, especially when you do have that ability across the province with ed tech...it would be a really cool position for the district to take on.

She continued to advocate that in order to help teachers integrate technology with the curriculum, there needed to be more expertise in the leadership roles. Ms. Honey added,

there should be more positions dedicated to educational technology. We're living in the 21st century, technology is something we're doing, something we're using all of the time and if we have one person at the district and one person at the department who has technology in their title then that's not enough ... Newfoundland and Labrador seems to adapt later to those kinds of things [ed tech coaches].

The questionnaire data echoed similar thoughts. Teachers were asked to consider educational technology use and explain if they would do anything different with regards to professional development. A respondent commented that

I think that technology professional development has to be differentiated and mindful of teachers' needs, rather than a one size fits all approach...When we have a school-based technology professional development, it is often offered at the most basic level (to take into account beginners). However those of us who implement technology frequently do not often get PD at the school or district level to advance our skills.

The next themes focus on the administrative aspects related to educational technology. The following two themes are discussed: (i) administrative support and (ii) administrative planning.

4.11 Administrative Support

Many teachers alluded to the fact that they had supportive administrative teams at their schools. For instance, while referring to the curriculum implementation, Ms. Dora said, "I'm a big believer in teacher autonomy so while I am responsible for the curriculum outcomes, I have a lot of discretion on how I achieve those curriculum outcomes and I'm lucky I have a very supportive administration." Similarly, Mr. Smith said that "I'm fortunate right now I'm in a school that has a very responsive administration and one that values technology very highly."

While highlighting the role of principals, Mr. Smith mentioned that in Newfoundland and Labrador principals have control over the direction of a school and it is up to them to set priorities and accordingly use the budget. He provided an example of his daughter's school,

urban school in St. John's, large population, incredibly diverse, young families...and they have 30 Chromebooks for 690 children, they don't have blanket wi-fi access for the school and the fundraisers are going to buy replacement basketball jerseys for the third basketball team.

Whereas in Ms. Bella's previous school, the fundraising efforts resulted in the purchase of a full classroom set of iPads and Chromebooks for both primary and elementary classes.

Likewise, Ms. Honey also appreciated the fundraising efforts of her school community. She explained that

we are very fortunate that we've spent a lot of time and funds over the last few years, so any fundraising money that we've gotten into technology in our building because we see the importance of providing students access to technology and also learning how to use it appropriately and responsibly.

Mr. Smith alluded that "there needs to be some kind of very fundamental evidence-based cycle of feedback from classrooms and students, what do students need and want, and from the private sector and just about anything else." He further provided an example of his school, previously he had another school principal and during that time "there was almost no technology implementation at all, there was no physical acquisition of things, there was no pressure or support to engage in anything new and innovative whatsoever so nothing happened...it was very sort of chalk and talk." Then a new principal was hired who had different priorities

and very quickly tens of thousands of dollars that had been going in other directions were all going into training, acquiring physical things to be in the building and even just the language around it and the sense of what was important changed entirely.

The questionnaire data also confirmed the role of principals with regards to educational technology use in classrooms as the majority of the teachers indicated that their principals made decisions about the purchase of educational technologies at their school.

On the other hand, Ms. Cindy highlighted the role of her school's Library Learning Resource Commons teacher who looked after all the technology devices. She explained that if schools don't have the organization system for it then it makes educational technology integration ridiculously difficult...I could see a lot of schools that have all these things and they're not really thinking about what's the best way to use it, organize it, and store it; like it could be a logistical issue too that would slow down your ability to get the maximum impact out of it.

The data from the open-ended questionnaire also highlighted the role of top-level stakeholders in supporting the educational technology use. For example, a respondent noted that, many opportunities exist for 'deep-learning' projects where educational technology can be implemented, but a curriculum that is still based on course objectives/outcomes can sometimes act as a deterrent. Flexibility is very important, and teachers need to be encouraged from a department or board level to engage in such activities to ensure it is an acceptable practice.

4.12 Administrative Planning

Although there were several teachers who addressed the role of administrators with regards to educational technology planning, Mr. Smith, particularly, expressed his views more openly than others. He explained,

there needs to be a fundamental understanding of what student needs are, not just now but in the future, and there has to be really a decision made about what that district's priority is going to be and how they're going to make those decisions.

While referring to the COVID-19 pandemic, Mr. Smith said he was helping by providing professional development sessions to teachers on certain educational technologies, but he found it extremely frustrating because he said,

there wasn't actually anyone in the department or the board who could tell what to do or who would actually instruct on what needed to be taught. So, there were these moments where I was kind of having these ethical dilemmas of like, I'm telling people they should be doing this or I'm suggesting this is the best way to use this tool and I'm not a researcher. I don't have a PhD; I don't work in policy. I'm a teacher.

Mr. Smith added

I'm hoping for that view of people who've gotten really good information from a bunch of different perspectives and are able to say concretely, look this is a really good way to do this or in this place this is how it worked out...that's my dream.

Similar perspective was echoed in the questionnaire data as well. A respondent noted that, "I would like to see more research on effectiveness, and more side-by-side comparisons, before choosing one technology to embrace."

On the other hand, Ms. Honey explained the professional development situation with regards to administrative planning during the pandemic. Ms. Honey, along with some other teachers, were asked by the NLESD to provide professional development sessions on Google classroom and Google meet for six weeks. She added,

I think it's great to amplify teacher voices and that if you're a leader in your school or in your community then to provide the platform to help others because that's something that we're probably doing on our own time anyway. But, at the same time, there should be people at the district who can do that without having to pull teachers from the classroom.

Ms. Honey also noted that since the NLESD is a Google district then there should be refresher sessions or sessions on new updates. She said, “you need that constant support which is not there all the time.”

Policy Planning

It was believed that constant support needed concrete policies. According to Mr. Smith, “it doesn't feel like there's much policy at all on educational technology, honestly, feels like it's a moving target...it's more reactionary, it feels like there's a very small cluster of people making very huge decisions.” While referring to the district, Mr. Smith provided an example of Google Workspace stating that,

it's sort of a bit of an in for a penny in for a pound mentality...so hey look we want

Google Suite [Workspace] so we're going to ignore whether or not this is the best tool for the job because this is what we've decided.

He said some of his colleagues feel “we're just being kind of talked down to” and they feel their advice or input isn't solicited until educational technologies get implemented. Mr. Smith added

that “teachers feel that if this is really important then why are they not being more deeply involved in it earlier.” For him,

the root of that however is in the fact that there isn't firm policy because if there was then there would be a much more grassroots approach to it...it's a problem with government acquisitions and private sector and all kinds of things but it's also hard because I think the kicker in all of this is that we have to sit in rooms every day, full of students who know this technology better than us.

Ms. Cindy discussed at length about the involvement of her colleagues at the district or government level. She explained that

I wonder what they do to the door in the [district or government] building because it's like when they walk through that door they're zapped and all the concepts and everything they know about teaching they just forget and so then they make these policies that are like, what were you thinking, you were here just last year, you know that's not gonna work.

Ms. Cindy added that the best way to develop a policy is through consultation from all stakeholders. She believed that people who work on policies remain disconnected from the realities of the classroom and “they're thinking oh we should do this, I think they're forgetting what it's like to be in the streets and down where everything is happening...because if you're not in the everyday mode, there are angles that you're just not going to see.”

In a similar vein, Ms. Honey believed that in order to make policies around educational technology, input from classroom teachers was essential “because if it's not useful then why are we spending time worrying about it, so we need to make sure that it's something that teachers want to use,” She continued,

then of course you're going to need people at the school district because there's always legal ramifications and also people from IT to see if it's going to be feasible...so I think it really needs to be like a joint effort from many different areas in order to create those policies. I don't think it should be top down because teachers are on the front line they're the people that are using ed tech daily so obviously their opinion should be there regardless.

Ms. Precious related the process of policy planning to her classroom. She said at the beginning of the school year we develop a draft of class rules and take some time to implement them and then review and finalize them. Similarly, she explained that educational technology policies need constant review and renewal by a team which should include people with different areas of expertise, "a team that comes together to develop a draft and then that draft will be reviewed and then once the policy is developed it still goes under review, a couple of years' time, it's under review again." She added, "technology is ever changing and it changes at a very fast pace and to remain relevant and current we have to keep those policies under review and keep them relevant." Ms. Honey pointed out that teachers need some basic policies, not too complex, across what is expected of teachers when it comes to integrating educational technology.

Mr. Joshua, who was also a school principal, supported and practiced the idea of cyclic policy making at the school level. He provided some insight, teachers map out their needs at the beginning through a survey that we use to inform ourselves in terms of what we can offer. We reach out again to check if this is something that they want, so it's always a give and take. It is indeed a cyclical and responsive process.

In a similar vein, although Ms. Sarah wanted teachers to be a part of the consultation process, she also wanted to highlight that the teachers need to take the responsibility when the time comes as “it's one thing to say like oh teachers need to be consulted, through whatever the chosen method of consultation is, if you don't actively take part then you don't have a place to say like well we should be consulted.”

In the open-ended section of the questionnaire, teachers were asked if they would do anything different regarding policy related to educational technology. Although some teachers answered no or not sure, there were some who explicitly shared their thoughts. For example, a teacher stated that, “there should be a dedicated person/group at all organizational levels, who is in charge of proactively finding problems and solutions related to tech policy...this person or department would identify and research the best options, and coordinate training and implementation.” On the other hand, when asked about the importance of teachers' role in policy development for educational technology use in classrooms, all respondents unanimously wanted teachers to be involved in the process. For instance, a teacher explained,

Often those out of the classroom may miss the bigger picture of the how and why technology should be implemented to achieve learning goals. Involving teachers in policy development is always important to have a firm, practical understanding of its impact on teaching and learning.

Another respondent added, “teachers are important in helping decide what may work best for the students that they teach. Teachers are familiar with the curriculum, the learning outcomes, students' needs and the challenges with technology implementation in the classroom.” As evident from the data there was a strong sense of advocacy among teachers for being more involved in the decision-making process for educational technology. All three classroom

observation participants also lobbied for more teacher involvement during their interview. Additionally, the need for a dedicated person to address technological issues was apparent during the classroom observations. For example, a few Chromebooks in Mr. William's classroom were not working so he sent a request to the gym teacher who also dealt with technical issues. Similarly, Ms. Honey mentioned that their technology teacher for grades 7-8 also assisted with any technical issues that teachers had in the school.

4.13 Conclusion

This chapter presented the themes that were identified from the data collected through the questionnaire, interviews, and classroom observations. A total of sixty-three questionnaire responses, ten interview transcripts, and three classroom observation field notes were analyzed. The focus remained on how educational technology is integrated in the instructional practices of grade 6 teachers across Newfoundland and Labrador. The overarching theme discussed in detail the instructional uses of educational technology. Within this theme, two strong sub-themes emerged: supportive and unsupportive aspects of educational technology. There was an apparent link between professional development needs of the teachers and the administrative support available to them with regards to educational technology. Teachers supported collaborative, self-directed, and relevant professional development and they reinforced the need for more resources and better planning that included teachers in the decision-making process regarding educational technology. The next chapter will discuss the findings in relation to the research found in the literature.

Chapter 5: Discussion

This chapter discusses the themes identified in relation to the research located throughout the literature and proposes answers to the research questions. The data revealed rich themes around the instructional use of educational technology in grade 6 classrooms, along with meaningful insights on professional development and policy. Themes were identified by analyzing data from the questionnaire, interviews, and observation field notes. Data included sixty-three questionnaire responses, ten interview transcripts, and three observation field notes. The existing literature is used to assess the themes that emerged.

There is an ongoing interest in the K-12 education system to equip schools with necessary educational technology for integrating it in the instructional practices to enhance student learning (Council of Ontario Directors of Education, 2017; Education and Early Childhood Development, 2020). Often the provision of educational technology is accompanied by professional development opportunities for teachers so they can comfortably make use of technology in their classrooms. However, several factors have been reported in the literature that hinder the process of meaningful educational technology integration. These factors generally include shortfalls in training and lack of support in using available educational technology (Kusano et al., 2013; Potter & Rockinson-Szapkiw, 2012).

Within the context of Newfoundland and Labrador, the government recently provided \$20 million in support of digital learning in the K-12 education system (Education and Early Childhood Development, 2020). In order to support digital learning in the classroom, the NLESD is responsible for planning and providing teachers with professional development. This study was conducted to understand the process by which teachers integrate educational technology into their instructional practices in elementary classrooms in Newfoundland and Labrador. The

following main question and sub-questions remained the focus of analysis: How do grade 6 teachers integrate educational technology into their instructional practices?

- How do elementary school teachers perceive the role of educational technology in their teaching?
- What are the components and characteristics of professional development related to educational technology that motivate or demotivate teachers towards using educational technology?
- How does provincial policy influence teachers' integration of educational technology in their classrooms?

This chapter includes the following sections: teachers' understanding of educational technology, which addresses the literature in relation to the themes that emerged in the data collection; educational technology and instructional practices, which discusses the main themes that emerged along with supportive and unsupportive aspects of educational technology in relation to the literature; professional development and educational technology, which highlights the characteristics and components of professional development related to educational technology through support from the literature; policy and educational technology, which identifies the gaps and discusses the key determinants of policy implementation; and key research findings, which summarizes and proposes answers to the main research question and sub-questions.

5.1 Teachers' Understanding of Educational Technology

To understand teachers' experiences with educational technology, it was important to gauge what technology meant to them. As seen in the literature, technology has multifaceted meanings and can be complex to understand (Burgelman et al., 1996; Hughes, 2005; Selwyn,

2017; Winner, 1977). Teachers' understanding of technology and educational technology was mostly superficial, as they saw both as one and the same. Technology was generally seen as any tool and educational technology as tools dedicated for learning. However, this did not come as a surprise, as some research scholars also had a basic understanding of educational technology. For example, Armsey and Dahl (1973) defined educational technology as “things of learning” (p. 21). Moreover, MediaSmart, an established Canadian organization, mapped educational technology policy documents across Canada, but Newfoundland and Labrador was only represented for technology education and did not present any documents related to educational technology. Hence, even MediaSmart misinterpreted technology education with educational technology.

Kerr (1991) conducted a study that explored the way teachers imagine educational technology in their everyday classroom life. The general understanding was that educational technology served as a learning tool in the classroom. Likewise, the interview data showed that the majority of the teachers considered technology as mostly devices or tools and educational technology as the tools used for learning. Nonetheless, their understanding of educational technology was apparent in the examples of their instructional use, where most teachers used educational technology to facilitate the learning process.

The in-depth definition of educational technology that was adopted for this research states that “educational technology is the study and ethical application of theory, research, and best practices to advance knowledge[,] as well as mediate and improve learning and performance through the strategic design, management and implementation of learning and instructional processes and resources” (AECT, 2018). There were only a few teachers who included some of these elements in their understanding of educational technology. For instance, Mr. Joshua, Ms.

Honey, and Ms. Cindy believed that educational technology should have a purpose that is supported with best practices and facilitates learning. Surprisingly, none of the teachers considered the ethical values that are embedded in designing and using educational technology. This relates to Moore and Ellsworth (2014) who highlighted the issue of perceiving ethics “as the domain of philosophy rather than action” (p. 113).

Conversely, teachers’ perceptions of technology were considered using the three lenses that form the basis of this study: technological determinism, social determinism, and critical theory of technology; even though all teachers valued technology and agreed that sometimes technology is driven through the needs of society, they all supported having an analytical perspective for the use of educational technology. Teachers strongly endorsed the provision of a full set of Chromebooks in their classrooms for all students; however, they also emphasized the need for better professional development opportunities. Similar to the One Laptop Per Child (OLPC) program, where a deterministic approach was adopted (Warschauer & Ames, 2010), the NLESD also plans to provide each student with a Chromebook in the K-6 school system. The NLESD’s Chromebook approach may be viewed from the perspective of social determinism as it derived based on a need during the COVID-19 pandemic. However, the data from this research saw teachers encouraging an analytical perspective towards acquiring educational technology, hence, teachers were supportive of the critical theory of technology lens. The critical theory of technology questions the rationale for using educational technology and applies an analytical perspective (Bruce, 1997; Feenberg, 1991; Friesen, 2008; Okan, 2007; Schmid, 2006; Selwyn, 2017).

Although the need for One Chromebook Per Child (OCPC) seems to have derived during the pandemic situation, it is important that teachers are prepared and convinced to use these in

their instructions. It has been noted in the research that most 1:1 device programs expect that technology will improve student outcomes automatically, instead of preparing teachers to integrate the technology in ways that promote cooperation, learning differentiation, and problem-based learning (Weston & Bain, 2010). Additionally, Ely (1995) asserted that “decisions can be made from the ‘top’ but unless the classroom teacher is convinced that change is important and has the knowledge and skills to make it happen, innovations will languish even as equipment gathers dust” (p. 10). The data indicates that the NLESD did not consult teachers in the decision to implement OCPC; however, it offered teachers professional development opportunities to help integrate Chromebooks in their instructional practices. Since COVID-19 guidelines were in place, professional development was offered online mainly on the use of Google Workspace and other related educational technology software. Researchers have repeatedly advised caution for using educational technology (Cuban, 2001; Fullan, 2016; Selwyn, 2017; Yu, 2020) and therefore robust understanding and planning is required. The findings from Rowe’s (2011) study about the SMART whiteboard technology highlighted the need for understanding the contextual inter-relationships of technologies and social communities through the critical theory of technology lens. Additionally, the findings identified in this study confirm the same, as the need for using educational technology was accompanied by the need for professional development opportunities.

The next section discusses teachers’ perceptions on the role of educational technology in relation to their instructional practices.

5.2 Educational Technology and Instructional Practices

Overall, teachers’ perceptions about educational technology were positively related to their instructional practices. Two broad categories emerged from the data that reflected

educational technology's positive use with instructions: (i) differentiating by offering choices and (ii) teaching with Google Workspace. Teachers also identified the following factors as barriers for educational technology integration: (i) the lack of resources, (ii) a lack of willingness, and dangers of distraction. What follows is a discussion of both supportive and unsupportive aspects of educational technology.

5.2.1 Differentiating by Offering Choices

For many, educational technology offered teachers and students different ways to meet the curriculum outcomes, reinforcing Kozma's (1994) claim that both media and methods are instrumental in providing differentiated instructions. All three sources of data supported the finding that educational technology offered students more choices to do their work. For example, Ms. Honey provided a variety of options to students in the science unit - constellations to work on their assignment. Additionally, students were able to use math (Prodigy) and reading (Epic) software to practice the curriculum content.

After reviewing the literature and conducting the research, it was confirmed that even though there are many different educational technologies available, teachers use their best judgment to match their students' needs. For example, Mr. Smith, Ms. Cindy, and Ms. Sarah all agreed that when a particular educational technology is introduced to meet a learning outcome or assist in instruction, it is the teacher who makes the connection to her students in the classroom. For instance, Mr. Joshua mentioned using Flipgrid, a website for facilitating video discussions. He acknowledged that although he received professional development on Flipgrid, he discontinued its use as students did not respond positively to the website. Hence to understand what works best for their students, teachers have to remain flexible and experiment with different educational technologies. This is similar to Aurini et. al's (2017) study in which they examined

the use of robotics in nine school boards in Ontario. They indicated that teachers were using robotics to teach in a variety of creative ways. Likewise, the Organization for Economic Cooperation and Development's (OECD) (2015) report concluded that "technology can amplify great teaching, but great technology cannot replace poor teaching" (p. 4); therefore, highlighting the important role of teachers in using educational technology to meet the curriculum outcomes.

5.2.2 Teaching with Google Workspace

Teachers widely utilized the Google Workspace applications in their day-to-day instruction. The applications are collaborative by design and can be used by students to do their work as a group and share with their teacher within the existing platform (Schoenbart, 2015). Teachers in this study discussed Google Workspace applications such as Google Classroom, Docs, Forms, and Sites to provide an insight on the collaborative features used by the students. They posted materials for students to access on Google Classroom which could then be completed using Google Docs, Forms, or Slides. Teachers found students engaged in their learning as they either independently or collaboratively completed their work. Some teachers also noticed that students were more creative in expressing their ideas through the Google interface. Additionally, they also described Google Drive for ease of use, access, better planning and organizing. The literature supports that the Google Workspace provided students collaboration opportunities (Dodson, 2020; Gulati, 2011; Hostrup, 2015; Schuck et al., 2018; Yaroshenko & Samborska, 2020). On the other hand, there has been limited research on teacher's use and experience of Google Workspace applications (Sahin et al., 2016).

Conversely, teachers identified several factors that affected the process of educational technology integration. These factors included (i) the lack of resources, (ii) a lack of willingness, and (iii) dangers of distraction.

5.2.3 The Lack of Resources

The data from the questionnaire, interview transcripts, and observation field notes were consistent with teachers asking for more support in the form of devices, wi-fi connections, and technology aides. This implies that “billions are spent to buy technology with limited thought to how it will be used” (Fullan, 2016, p. 45). Teachers had to book an iPad or Chromebook cart for their classrooms and so at times activities were left incomplete as the time was limited. Wi-Fi connections affected the functioning of Chromebooks. If teachers needed something fixed or downloaded, the wait times were prolonged for a technology aide to arrive. Therefore, these reasons demotivated some teachers to integrate educational technology in their instructions. Aurini et al. (2017) outlined that challenges, such as lack of resources, continue to exist. Ditzler et al. (2016) also noted issues related to the Internet connection in their study on the use of iPads. Likewise, Rizk (2020) conducted a study in Ontario where one of her findings was the need for greater access to digital tools across schools. These findings have been recurring in the literature for decades. For example, Cuban (2001) conducted a study across Silicon Valley and the San Francisco Bay area to analyze how often and in what ways teachers and students used computers. Out of the eleven primary school teachers who participated in the study, only two teachers seamlessly integrated computers into their daily routines. Teachers noted that the lack of technical support often resulted in not using technological devices for months. It is astounding that the issue of lack of resources continues despite huge investments in technology.

5.2.4 A Lack of Willingness

This study identified, in a manner similar to Aslan and Reigeluths (2011) findings, that teachers’ lack of willingness to use educational technology was associated with the lack of time or insufficient training. All three sources of data addressed the lack of time as a challenge in

integrating educational technology. Teachers wanted more time to explore, practice, and become comfortable with educational technology. For instance, Mr. Precious explained that, although she had been using Google Classroom for quite some time, it was only a couple of years ago that she “discovered assignments, testing, creating own quizzes that would autocorrect and pie charts, graphs and spreadsheets.” Ms. Precious added “so there's a lot of value in professional learning and having the time to do it.” Meanwhile, Mr. Joshua pointed that,

you can't just go and do a session on something and be an expert in it. In terms of my professional responsibility, I gotta play with the stuff, I've gotta use it, I've gotta try it and part of that is not being afraid to do so and be prepared for a class of failure at times.

Along the same lines, Ms. Bella also said, “I think it's our responsibility as teachers to dive into that [educational technology], make ourselves aware, so that we can take whatever advantages are out there, that can help our students. It's really important that we take responsibility for learning.” In other words, teachers need to make an effort to experiment with different educational technologies and explore the possibilities themselves. Thus, it takes time and effort to become comfortable with educational technology. If teachers have enough time, they will be inclined towards using it to experiment with educational technology and make connections with the curriculum. The issue of a lack of time has been around for decades and continues to appear in studies related to educational technology use in classrooms (Al-Alwani, 2005; Aurini et al., 2017; Cuban et al., 2001; Kopcha, 2010; Schrum, 1995).

In the U.S., the National Staff Development Council (NSDC), an association (now known as Learning Forward) that exclusively works to increase student achievement through more effective professional development, asserts that “school districts dedicate at least 10 percent of their budgets to staff development and that at least 25 percent of an educator’s work time be

devoted to learning and collaboration with colleagues” (NSDC, 2001, p. 3). Furthermore, the NSDC suggests that if school districts want investments in technology to be successful, schools must devote at least 30% of their technology budget for teacher training, planning, and practice. Nevertheless, on average, only 1% to 3% is spent on professional development in the U.S. per year (Miles et al., 2004). Considering the local context, the NLESD provides only six professional development days during the academic year. As an example, Ms. Bella noted that,

we have three or four PDs in a year and then there's a lot more that are offered after school. But then after school you've got phone calls, emails to send, reviews to write...And lots of times I'll sign up for a PD for 3:30 pm and I can't get to it because I'm still dealing with something that happened at 2 o'clock in the playground. So I wish there were more daytime PD opportunities.

Hence, the lack of willingness to use educational technology is understandable.

5.2.5 Dangers of Distraction

Some teachers expressed their concerns that when using educational technology students may get distracted and be off task. Although teachers identified this as an issue, they were not discouraged to use educational technology in their instruction. Moreover, during classroom observations only a few students were seen being distracted. Unlike the findings from Ditzler et al.'s (2016) qualitative study, where the use of iPads created distractions towards learning, this study did not find strong evidence that distraction is a major issue in the use of educational technology. It was mainly reported as a concern rather than an issue. Additionally, it is important to note that the teachers' role in minimizing the distraction was paramount. For example, when asked about the discipline in using educational technology in Mr. Smith's class, he said that providing students with choices helped them to direct their learning and establish accountability.

Along the same lines, teachers too need self-guided professional development opportunities where they can direct their own learning. The next section discusses the components and characteristics of professional development related to educational technology that motivated or demotivated teachers towards using educational technology.

5.3 Professional Development and Educational Technology

Although teachers were offered professional development opportunities to use educational technology in their instructions, there were several factors identified from the data that could improve this process. Three fundamental professional development characteristics: collaboration, self-direction, and relevance frequently appeared in the data and will be holistically discussed with support from the literature.

5.3.1 Collaborated, Self-Directed, and Relevant Professional Development

The three primary findings of professional development for educational technology focused on collaboration, self-directedness, and relevance. These three findings directly aligned with Fishman et al.'s (2013) findings. They utilized both online and face-to-face professional development platforms to study the implementation of a new science curriculum that required familiarity with GIS software and interactive simulations. The fundamental professional development characteristics identified were contextual, relevant, self-paced, and collaborative in nature. Along the same lines, findings of Akiba and Liang's (2016) longitudinal study also supported collaborative teacher professional development opportunities. They analyzed six different types of professional development associated with student achievement growth. These included the following: professional development programs, teacher collaboration, university/college courses, professional conferences, informal communication, and individual learning activities. Activities that promoted teacher-centered collaboration and research-based

learning resulted in improved student achievement. Further, informal communication had a greater effect on student growth than formal teacher collaboration activities. Likewise, the data showed that teachers made use of informal online communities to learn about the best practices. Ms. Cindy, for example, followed “Twitter blogs of teachers” and was also part of teacher communities on Facebook. She said, “I hate Facebook for personal things...but I do have a lot of groups on Facebook, where we can share ideas and resources. A lot of people have shared their websites, blogs, and made their resources available for free.”

Richter et al. (2011) defined professional development as an “uptake of formal and informal learning opportunities that deepen and extend teachers’ professional competence, including knowledge, beliefs, motivation, and self-regulatory skills” (p. 116). Richter et al.’s definition was adopted for this study and aligned perfectly with the themes that emerged. Teachers were part of both formal and informal learning as they independently directed the process of improving their teaching practices. For instance, Ms. Dora collaborated with her grade level colleagues by meeting with them each week to discuss educational technology use in the classroom in relation to the curriculum. She also attended and delivered educational technology professional development sessions across the district.

The core evidence-based elements of effective professional development have been widely discussed in the literature (Combs & Silverman, 2016; Darling-Hammond et al., 2017; Desimone, 2009; Garcia & Weiss, 2019; Sims & Fletcher-Wood, 2021). Many provinces in Canada (Alberta, British Columbia, Ontario, and Prince Edward Island) have a common understanding that effective professional development must be collaborative, sustainable, and resourced (Collins et al., 2017). These provinces have included statements about effective professional development in policy documents. For example, in Prince Edward Island there is

The Professional Learning Report; Ontario has A Working Table on Teacher Development, and in British Columbia there is Provincial Curriculum Days (Collins et al., 2017). Darling-Hammond et al. (2017) reviewed 35 methodologically rigorous studies and identified seven elements of effective professional development. These included the following: content focused, active learning, collaboration, models and modeling, coaching and expert support, feedback and reflection, and sustained duration. This research further confirms some of those elements within the context of Newfoundland and Labrador. Active learning, content focused, and collaboration were identified as the fundamental characteristics of professional development for educational technology use in the classroom. Teachers in this study were motivated to collaborate with other grade level colleagues and try out different teaching strategies. In fact, the majority of the teachers were even engaged in directing their own learning. Darling-Hammond et al. (2017) explained that active learning “engages teachers directly in designing and trying out teaching strategies...” (p. v). Ms. Cindy’s interaction through Facebook teacher communities motivated her to create her own blog to provide free grade level resources. She said, “I’m gonna join the masses and start putting that out there, so anybody can use it or have it.” This mirrors Marich’s (2016) study where her teacher participant used Twitter to connect with other teachers online and was motivated to take ideas for implementing in her grade 2 classroom.

On the other hand, teachers appreciated content focused educational technology professional development opportunities. Ms. Precious provided an example of Brilliant Labs. She said that NLESD invited Brilliant Labs to provide professional development to grade 6 teachers. Ms. Precious explained that during

science professional learning we talked about coding. They had examples and materials so that we could try some of the activities related to a unit in grade 6 science

[curriculum]. They also had a person from Brilliant Labs there to speak to us and to help us as well. I mean you couldn't ask for any better, it's fantastic.

This example incorporated some of the effective elements of professional development such as content focus, modeling, and expert support. Darling-Hammond et al. (2017) noted that “at times, the defined elements of effective professional development can overlap. For example, collaboration can be both an active learning strategy and an element unto itself” (p. 25). This was also evident in the use of social media platforms such as Facebook and Twitter. These online platforms were utilized to engage in professional development. Many teachers actively collaborated online by connecting with other teachers to share ideas and resources and therefore were involved in active learning as well as collaboration at the same time.

Conversely, sustained professional development was seen as the least effective characteristic in the questionnaire data. This is not reflective of Kopcha’s (2012) longitudinal case study. His findings suggested that sustained professional development was more beneficial than one-day workshops. There are several things to consider in order to understand the rationale for placing sustained professional development at the very end in the questionnaire. First, this may indicate that some teachers probably assumed that changes in educational technology take place at a fast-pace and sustained professional development may not be applicable. The data does support this assumption, for instance, Ms. Honey pointed out that

there is a mindset amongst teachers, especially older teachers, that this is all going to change. I've been through this before, like we get stuck on something we think it's so awesome and great and a few years down the road it's all going to change again.

Ms. Honey also believed that “I think one of the major reasons why people don't try something new is because technology can be super overwhelming of course and it's always

changing, there's always new stuff on the go.” Thus, indicating that sustained professional development may not be appropriate for educational technology. Second, this could also suggest that the teachers under the NLESD have yet to experience a sustained professional development program to know if it will be helpful. The latter is more logical as the theme, lack of willingness also identified lack of time to explore, practice, and become comfortable with educational technology as a barrier. Hence, teachers may not have understood what sustained professional development entailed.

Likewise, although mentors and expert support were not seen as being among the top three characteristics of professional development, these were brought up several times in the open-ended section of the questionnaire and during the interviews. In fact, some teachers wanted a technology instructional coach in a similar manner as in Kopcha’s (2012) study. For instance, while talking about mentors and expert support, Ms. Precious asserted that

teachers are incredibly busy from the time they enter the building until the time they leave, it is just non-stop. So any training that we can receive is great. Because we're listening to someone, we're having someone show us instead of here it is, when you get a chance...because a day is very hectic and you might never get that chance.

In a similar vein, Ms. Dora noted that “when professional learning opportunities are designed, they do need to be designed with kind of the best teaching learning strategies in mind and sometimes that's not always the case.” Involving teachers in the process of planning, selecting, constructing, and implementing processes may lead to a more meaningful professional development experience. Open lines of communication and constructive feedback from teachers can help in analysing best practices and supporting administrators in planning and designing professional development for educational technology. Therefore, the role of administrators is

paramount in reaching out to teachers and moving along as a team.

5.3.2 Administrative Support

Along with the need for professional development that worked within a given context there was also a need for visionary leadership. Therefore, academic support was identified as an important component for professional development related to educational technology. Particularly, the school principal plays a vital role in providing an environment that cultivates professional growth of teachers. Many research studies discuss the role of principals as an important component for meaningful integration of educational technology (Barton & Dexter, 2020; Dawson & Rakes, 2003; Machado & Chung, 2015; Peled et al., 2011; Schrum et al., 2011; Thannimalai & Raman, 2018). Sergiovanni (2009) asserted that the school principal is the one who is empowered to ensure the effective use of educational technology in instructional practices. Therefore, senior administrators must create a plan to support teachers and students in the process of meaningful instructional use of educational technology (Green, 2017). The data from this research highlighted the capabilities of the principal in shaping the instructional use of educational technology. For example, Ms. Cindy repeatedly credited her school principal for encouraging and financially supporting teachers in their efforts to obtain professional development on their own. She provided an example of attending workshops and requesting subscriptions related to educational technology and being approved and reimbursed for the same. Additionally, Ms. Cindy also mentioned that her principal had a three-year plan to use funds towards educational technology planning.

Principals need to have a robust understanding of educational technology before engaging in technology planning (Ugur & Koc, 2019). Moreover, principals must include teachers and students in the development and implementation of a technology plan (Dunham, 2012). Many

teachers mentioned that they were consulted regarding professional development at the school level but not at the district level. In fact, Ms. Dora said, “I think there's consultation if the teacher initiates it and reaches out [NLESD]. I don't think there's consultation just as a general rule.” Though the role of the principal is paramount, it is the teachers who implement the plan at the classroom level and therefore should be actively involved. Machado and Chung (2015) conducted a mixed methods study to assess the perceptions of principals related to technology integration from four school districts in California. They found the role of principals to be substantial, however, teacher willingness and professional development were noted as the strongest obstacles to technology integration, highlighting the role of teachers. These findings mirror the data. For instance, while discussing the perceptions of her colleagues about integrating educational technology into their instructions, Ms. Cindy noted that “in our school, definitely we have a lot of teachers that are still really hesitant.” Along the same lines, Ms. Dora recalled that there are “just five days a year” for professional development and believed that there should be more professional development opportunities. Hence, teacher willingness to incorporate educational technology also depends on professional development opportunities.

Conversely, many researchers have also acknowledged the importance of teachers' attitude, belief, and interest as factors responsible for successful implementation of policies (Cerna, 2013; Darling-Hammond, 1990; Grantmakers Institute, 2011; Mclaughlin, 1987; OECD, 2017). Though all teacher participants in this study were motivated and interested in learning about educational technology and using it in their instructions in meaningful ways, they shed light on the perceptions of their colleagues. For instance, while discussing teachers' attitude, beliefs, and interests, Mr. Joshua, who was also a school principal, highlighted that there will always be teachers who, even if they have the time, “could be sitting around complaining and watching

Facebook or whatever, drinking coffee in the staff room treating it as a crap pit to complain.”

Meanwhile, Ms. Dora emphasized that,

it is on teachers to continue their learning journey and that's not necessarily always going to be during school hours. Obviously, work life balance is tremendously important but there are times when teachers should be supported by their administration but might not always have professional development. They have to pursue their own learning opportunities too.

Hence, with regards to educational technology, ongoing learning was seen as a fundamental requirement by all teachers. Administrators could help direct learning through both formal and informal means of professional development by providing clear expectations.

Consequently, good leadership, that is stable, has been recognized as the driving force for motivating teachers (Young & Lewis, 2015). Therefore, a robust plan may overcome these obstacles by adopting a cyclic process of implementation of educational technology. Where teachers are not only involved in the consultation process but also at each step moving forward so they are confident in integrating educational technology in their instructions. Mr. Joshua provided an overview of how he and his vice principal work together to organize professional development for their teachers. He said a survey is sent out asking “Do you have anything that you are seeking professional learning for? Or are you aware about opportunities that you'd like outside the building?” He then drafts an agenda for professional learning and forwards it to teachers for feedback, asking “Is there anything here that we’re either missing or that you feel at this point is moot?” Mr. Joshua added that he “also has personal conversations with individuals as well...it's not all on the computer.” The data on the computer helps in planning and “making sure we've got everything planned out the way we want.” He concludes that “teachers have very very meaningful

say in the kinds of learning that they're exposed to, at least within our building,...of course then there are the mandatory things from district that nobody really has a say (laughs)” Therefore, Mr. Joshua perceived professional development planning at his school as a cyclic and responsive process.

A similar process may be appropriate for implementing educational technology. Therefore, policies can be made around the same so a standard procedure is followed across schools and not just in some. Hence, an amalgamation of professional development and educational technology policies may lead to an influence at the classroom level. The next section elaborates on how provincial policy influences teachers’ integration of educational technology in their classrooms.

5.4 Policy and Educational Technology

The data showed that there were no concrete policies in place that would influence teachers’ instructional use of educational technology. A policy “usually proposes a vision to achieve, sets goals to meet, and may even spell out the means to reach them” (OECD, 2017, p. 21). There was no policy related to educational technology that proposed a roadmap to achieve a goal. It is astounding to learn this as the Newfoundland and Labrador Government has invested a huge amount in educational technology without establishing a policy for the same. This reflects that there is a gap in the manner the investments are being made. Conversely, the only two policies that were mentioned in the data were the Social Media Use policy and the Acceptable Use of Technology policy. Both of these policies are targeted towards students and hence are very basic and operational in nature. Interestingly, the NLESD’s Safe and Caring Schools policy (Department of Education, 2013) was not addressed in the data, even though it includes a section on Teaching Digital Citizenship. As mentioned earlier, MediaSmart (MediaSmart, 2015) only

referred to the Technology Education curriculum in its report while addressing policies in Newfoundland and Labrador and overlooked the Teaching Digital Citizenship policy from the NLESD. However, the NLESD's Safe and Caring Schools policy mentions MediaSmart in its document while referring to the online resources that support digital citizenship. This is concerning, as none of the teachers acknowledged the presence of this policy, indicating that better communication is needed from the district to bring awareness of these existing policies. This was evident in the data, for example, Ms. Bella said "I'm aware there are policies out there but I feel like...you need to take the responsibility to go and investigate yourself." Furthermore, the Safe and Caring Schools policy document includes superficial information on Teaching Digital Citizenship, as though it were a tick mark that needed to be met. Moreover, the Safe and Caring Schools policy is almost a decade old and requires an immediate review to include teachers' role in using educational technology for instructional purposes.

Educational technology policies across Canada, when reviewed, tended to be dated and inconsequential in nature. Most provinces did not have policies around educational technology and related teacher professional development. A select few provinces such as Alberta and Saskatchewan provided more in-depth documents highlighting digital citizenship and acceptable use policies (e.g., *Learning and Technology Policy Framework, 2013* and *Digital Citizenship Education in Saskatchewan Schools, 2015*) that serve as guides for formulating and implementing policies for educational technology and professional development. While these documents were released a decade ago, they are still functioning as inspiring models for many stakeholders within the field.

The findings of this study suggest that a well-designed professional development plan along with the availability of devices and technical support can lead to productive instructional

use. Although the NLESD has begun the distribution of 1:1 Chromebooks in the K-12 education system, it also needs policies in place to provide timely technical support and relevant professional development at both introductory and advanced levels. These policies need to be formed with consultation from all stakeholders. The data show overwhelming support for consultation from all stakeholders confirming Fullan's (2015) assertion that successful implementation of policy is possible when teachers, school administrators, and other stakeholders in education understand the policy. For example, Ms. Ann noted that "they need to have input from teachers, but also even maybe input from students and their parents as well." Mr. William concurred the same. He said, "definitely the students, the teachers and administrators should be part of the development of the policy, especially when they're the ones who are experiencing it in the classroom." Overall, participants strongly felt that educational technology policy should have a direct connection to the classroom. Furthermore, in the future, if purchases are planned for educational technology, it is necessary that consultation begins from the classroom. There were repeated mentions of teachers being the frontline implementers (Lipsky, 2010) and therefore need to be part of the policy early in the process. For instance, Ms. Sarah said, "I think it's important to involve the people who are going to be using it...we've all probably have policies and stuff handed down on us that comes from somebody who probably has not been in the classroom recently, if ever."

Additionally, teachers highlighted the need for relevant professional development that prepared them to use educational technology in their instructions. This is a clear indicator that professional development had to be designed in a manner that matched the level of teachers' technological capabilities. Several teachers noted that the professional development for educational technology was mostly offered at the basic level with no possibility for advanced

level learning. This finding coincided with Murphy et al. 's (2020) study that analyzed a web-based platform, ASSISTments, for two years to help grade 7 students solve mathematics homework problems and assist teachers by providing data to track student progress. Each student was given a laptop and teachers were provided with introductory and advanced level training and technical assistance. The policy of providing 1:1 laptops was supplemented with content specific software, well designed teacher professional development, and continuous technical support. Teachers in this study also lobbied for the same. They wanted relevant educational technology, well designed professional development, and timely technical support. Moreover, similar to Murphy et al.'s (2020) study, teachers requested differentiated professional development. For example, Ms. Dora noted that educational technology professional development is offered at an “intro level...it's very much okay how to use it, but there's not often [any] kind of differentiated sessions. So now that I've been using it for a little while, how can I take it to the next level or how can I incorporate it more effectively.” Teachers with advanced skills were eager to learn more about the different possibilities of integrating an educational technology with the curriculum. Therefore, results of this study provide useful insights that can be considered when planning policies, designing professional development activities, and adopting educational technologies.

There are many determinants addressed in the literature for effective education policy implementation (Cerna, 2013; Darling-Hammond, 1990; Durlak & DuPre, 2008; Fullan, 2015) and likewise these can be beneficial in planning educational technology policies. For instance, considering context when planning policy has been a constant determinant component on the list of many researchers (Darling-Hammond, 1990; Durlak & DuPre, 2008; OECD, 2017; Young & Lewis, 2015). Several other components such as resources (Cerna, 2013), communication and coordination (Darling-Hammond, 1990), stakeholders, and accountability and evaluation (OECD,

2017) are also pivotal to effective policy implementation. Some of these determinants continue to recur, highlighting the interrelationships between educational technology, professional development, and policy. The key determinants are briefly discussed herein in relation to the data.

5.4.1 Context

To design a policy for a given context, first and foremost, the need has to be identified. According to Hill and Hupe (2002) it is important to have an in-depth understanding of the context as “the right approach might depend upon the issue” (p. 56). Careful examination is essential to understand if the perceived needs or policy goals set by decision makers align with the priorities at the local level. For example, teachers may not see the need for 3D printers in the classroom as a means to enhance student learning outcomes and therefore the school may instead allocate funds to acquiring full classroom sets of Chromebooks. The data supported considering the context when planning for educational technology integration. For example, Ms. Dora, asserted that “especially with regards to PL around educational technology, teachers very much want to see how this can be integrated in the classroom, how can we use this either in a cross-curricular context...or how can we use it in the curriculum.” Hence, not only the provision of educational technology needs to be contextual but also the accompanying professional development has to be relevant.

5.4.2 Resources

The availability of resources such as, funding, technical support, and training are vital for initial planning (Durlak & DuPre, 2008). Making effective use of funds is critical as there might be enough financial support for purchasing technological devices for teaching and learning, but not enough support for maintaining these devices and providing teachers with effective professional development opportunities to get acquainted with technology. Appropriate

allocation of resources for professional development is essential for successful implementation of educational technology policies. The data highlighted the need for better planning, as a lack of resources emerged as one of the key findings. As Mr. Smith noted that although students may have the educational technology to facilitate their learning process, if the school has a glitching Internet connection then the expected result from the technology will not transpire.

5.4.3 Stakeholders

Many stakeholders are involved in the policy implementation process (Darling-Hammond, 1990; Fullan, 2016; OECD, 2017). In the context of K-12 education, the government, the faculty of education, professional organizations, school districts, school leaders, teachers, students, parents, and community members can all be considered stakeholders. Stakeholders must act in the best interest of students. The role of school leaders and teachers is particularly essential as they directly interact with students on a day-to-day basis. Hence, school leaders and teachers need to have the capacity to implement policies with minimal constraint on a daily basis. Capacity may include intangible components that contribute towards effective policy implementation like leadership skills, school culture, teachers' knowledge, beliefs, and attitudes. Understanding the perception of school leaders and teachers, their motivation and skills, and their reaction to the policy can help in influencing the enactment of the policy (OECD, 2017). All of these factors also resonated in the findings of this study. The main themes discussed thus far are interwoven under this broad category, such as the role of teachers as implementers, administrative support, and teachers' willingness are all determinants for policy implementation.

5.4.4 Communication and Coordination

Communication and coordination among all stakeholders are essential (Baber et al., 2011; Haddad & Demsky, 1995). Absence of communication among stakeholders, particularly

between school leaders and teachers, can undermine the policy implementation process (Young & Lewis, 2015). Research conducted by Cheung and Wong (2012) to study the implementation of a new curriculum in Hong Kong, concluded that although the government provided funds to school districts which helped them hire more teacher assistants to reduce the workload of teachers, good leadership, effective communication and coordination among stakeholders were key to successful policy implementation. Therefore, clear lines of open communication should be encouraged and a positive work environment that supports coordination among school leaders and teachers must be established so as to work together effectively. All teachers in this study acknowledged that they had good communication and coordination with their colleagues. In fact, Mr. Joshua mentioned that “I find a lot of benefit from helping my colleagues figure out something because the best way to learn something is to teach it. So, even if I've got a good understanding, I get a better understanding by helping people as they integrate it themselves.”

5.4.5 Accountability and Evaluation

Individuals and groups responsible for implementing a policy are also accountable for meeting the policy requirements. To know if a policy is being implemented in the right manner, regular evaluation needs to take place which may be in the form of data collection and scheduled meetings. OECD (2017) highlights that since the government does not control all aspects of the policy implementation process, it is important to have proper mechanisms to hold different actors accountable for their actions. These mechanisms need to be in place for the purpose of evaluating and improving where and when needed (Baber et al., 2011). Although the data did not explicitly identify accountability as a major hurdle for educational technology implementation, it was seen as an integral part of the process. Accountability was associated with each barrier mentioned above (the lack of resources, a lack of willingness, and dangers of distraction). Since NLESD

decided to provide students with Chromebooks, the district should also be accountable for providing timely tech support and formulating related policies. Similarly, Ms. Precious pointed out that teachers are also responsible for providing genuine input when approached by the district. Hence, highlighting the importance of accountability on teachers themselves.

It is apt to say that no single factor will lead to the successful implementation of a policy. There is a plethora of determinants that add on to each other to create a strong foundation that leads to a sustained policy implementation. These factors may either facilitate or hinder the implementation process. Furthermore, each factor addressed here requires careful consideration even before the process of policymaking begins. Conversely, some factors listed here can be completely disregarded from time to time. For instance, “teachers' prior learning, beliefs, and attitudes are rarely considered as an essential ingredient in the process of teaching itself, much less in the process of change” (Darling-Hammond, 1990, p. 344).

In order to include all ingredients in the process, a framework must be adopted to keep track of policy. The framework acts as a roadmap, provides policy direction and ensures alignment across different systems (Government of Alberta, 2013). The alignment would also include the various determinants discussed above. The literature mainly discusses three different types of frameworks for successful implementation of policies, as previously discussed (Barber, 2011; Bell & Stevenson, 2015; Nakamura & Smallwood, 1980; Suggett, 2011). These are analytical, normative, and action-oriented frameworks. An analytic framework essentially provides required knowledge for policy implementation that forms the basis for developing a policy (Note, 2012). Normative frameworks prescribe a path forward by educating policymakers regarding conditions that would lead to success (OECD, 2017). Action-oriented framework offers steps to consider and highlight the prescribed path forward on what needs to be done

(OECD, 2017). One analytical framework by– (1) Bell and Stevenson; one normative framework by– (2) Suggett; and one action-oriented framework– (3) Deliverology were discussed in Chapter 2. Out of the three frameworks, a modification and implementation of Deliverology may be helpful for the context of Newfoundland and Labrador. Chapter 6 will explore the possibility of this framework in relation to the findings of this study, along with other evidence-based approaches in the literature.

5.5 Key Research Findings

In this section, I will summarize and propose answers to the main research question and sub-questions.

(1) How do grade 6 teachers integrate educational technology into their instructional practices?

Teachers integrated educational technology into their instructional practices to help facilitate the learning process. A variety of educational software were used along with Chromebooks and iPads to encourage students to take control of their learning process. For instance, students independently practiced math concepts using Prodigy, reading through Epic, and Science from Skylite application. Teachers also used educational technology to provide students collaboration opportunities, such as, students worked on math Esti-mystery clues to guess the answer as a team and Jamboard was used to brainstorm answers to the podcast story by adding digital sticky notes.

Therefore, two broad categories emerged from the data that reflected educational technology's use in instructions: (i) differentiating by offering choices and (ii) teaching with Google Workspace. Providing choices helped students take responsibility for their learning and resulted in enhanced engagement. On the other hand, Google Workspace applications offered a collaborative platform for students. They were able to easily access and submit their work online.

Moreover, it also helped teachers in preparing and organizing their class work. Teachers also identified several factors that affected the process of educational technology integration. These factors included (i) the lack of resources, (ii) a lack of willingness, and (iii) dangers of distraction.

(a) How do elementary school teachers perceive the role of educational technology in their teaching?

Teachers' perceptions about educational technology were positively related to their instructional practices. Their perceptions of technology were assessed using the three lenses that form the basis of this study: technological determinism, social determinism, and critical theory of technology. Though all teachers valued technology and agreed that sometimes technology is driven through the needs of society, they all supported having an analytical perspective for the use of educational technology. Hence, reinforcing the critical theory of technology lens.

(b) What are the components and characteristics of professional development related to educational technology that motivate or demotivate teachers towards using educational technology?

Collaboration, self-direction, and relevance were identified as the three fundamental professional development characteristics that motivated teachers towards using educational technology. Administrative support was perceived as an important component for the provision of educational technology professional development. The school principal, in particular, played a vital role in providing an environment that encouraged professional growth of teachers.

(c) How does provincial policy influence teachers' integration of educational technology in their classrooms?

Provincial policy with regards to educational technology was nonexistent and hence did not influence teachers' integration of educational technology in their classrooms. Teachers support the development of policy related to educational technology and involvement of stakeholders, particularly teachers, in the process. Therefore, context, resources, communication and coordination, stakeholders, and accountability and evaluation were identified as the key determinants of policy implementation. Additionally, to keep track of policy a framework must be adopted; hence, an action-oriented framework was perceived as a better fit for the context of Newfoundland and Labrador.

This study conducted a documentation review of educational technology policies and procedures across Canada. It was apparent that nationally guiding documents focused on educational technology are relatively non-existent. Predominantly, Alberta and Saskatchewan were the leading provinces that showcased worthwhile examples of policies related to educational technology. Alberta's *Learning and Technology Policy Framework (2013)* offers a foundation for establishing educational technology and professional development implementation routines. Saskatchewan's *Digital Citizenship Education in Saskatchewan Schools (2015)*, developed to address bullying and cyber-bullying, offers a policy planning guide for schools to implement digital citizenship education from kindergarten to grade 12. Therefore, there are overarching policy limitations within the Canadian landscape that should be acknowledged and a great amount of development can be achieved with regards to educational technology strategies. The following chapter will discuss the possibility of a modified action-oriented framework and prescribe a way forward.

5.6 Conclusion

This chapter synthesized the themes in relation to the research present in the literature and proposed answers to the main research question and sub-questions. Educational technology was integrated into instruction to help facilitate the learning process. Teachers were supportive of the critical theory of technology and appreciated educational technology professional development that was context specific, provided room for collaboration, and self-directed opportunities. Additionally, since the need for a policy is evident, an action-oriented framework is suggested as a foundational step and will be discussed further in the next chapter along with implications and future directions.

Chapter 6: Conclusion

The final chapter of my research includes the following sections: study summary, which reinstates the purpose of the study; successes and challenges of conducting the study, which highlights the role of participants and acknowledges the challenges; moving forward, which proposes a framework that may work in the given context; implications, which provides suggestions for various stakeholders; and future directions, which identifies potential research avenues.

6.1 Study Summary

This study was undertaken to understand how teachers in elementary schools integrate educational technology into their instructional practices within the context of Newfoundland and Labrador. The Newfoundland and Labrador Government has invested heavily in educational technology and promised to distribute Chromebooks to students across K-12 schools. Prior to this research, there had been a few studies that investigated the adoption and the use of educational technology at schools under the NLESD, but there were no empirical investigations that explored the integration of educational technology along with professional development and policy. I analyzed how professional development and policy relate to the adoption and utilization of educational technology in classrooms across Newfoundland and Labrador.

The main question of this study focused on how educational technology is integrated into instructional practices in elementary classrooms. From this question and a subset of three additional inquiry questions, a qualitative intrinsic case study was designed that included an online teacher questionnaire, semi-structured interviews, classroom observations, and documentation review as part of the data collection process. I framed my study as an intrinsic case study because as a former grade 6 teacher, I had an inclination towards this subject and

wanted to understand the process by which grade 6 teachers integrated educational technology. My study applied a purposeful sampling strategy as I wanted to “discover, understand, and gain insight” (Merriam & Tisdell, 2016, p. 97). Interpretive analysis was adopted to deconstruct, interpret, and reconstruct the collected data (Sargeant, 2012). A rich thick description of overarching themes and sub-themes emerged that contextualized teachers' instructional use of educational technology in Newfoundland and Labrador. The next section sheds light on the successes and challenges of conducting the study.

6.2 Successes and Challenges of Conducting the Study

Participants' timely involvement in this research has been an integral part and contributes to the success of this study. From the start, teachers responded with enthusiasm to participate and cooperated in scheduling online interviews, given the COVID-19 protocols. The initial intent was to recruit at least six teachers for interviews and conduct two classroom observations. However, because of the COVID-19 pandemic situation the interviews had to be conducted virtually and teachers from across the province could participate. Therefore, a total of ten teachers participated in virtual interviews. Similarly, the COVID-19 situation changed during observations and therefore three classroom observations were conducted instead of two. Teachers were naturally involved in the conversations and openly shared their ideas and thoughts which resulted in rich descriptive data. Observation participants also spent time with me to answer all my questions after each session. They displayed a lot of passion while discussing their classroom activities and provided comprehensive details about the same. With their valuable input, the data set was in-depth.

While carrying out my study, the major challenge that I came across was that the responses collected from the questionnaire remained low even after circulating it several times.

Therefore, I had to amend the data collection method and request TESIC to share the questionnaire through their membership. Although a drastic change did not occur in the number of responses, my main concern remained that only teachers who are already interested in educational technology would be actively participating. Hence, representation from the general group of grade 6 teachers in Newfoundland and Labrador may have been insufficient. Nevertheless, this challenge was somewhat overcome during the interviews, as teachers openly shared about the perceptions of their colleagues. Moreover, now there is a baseline understanding of how this subset of teachers are integrating educational technology into their instructional practices. This will act as a springboard for future research that can focus on other related aspects of educational technology integration. Additionally, a foundation has been established that provides policy direction for educational technology and professional development in the Newfoundland and Labrador context.

6.3 Moving Forward

The findings from the data further confirm that an action-oriented framework, such as Deliverology, could be an appropriate framework for the context of Newfoundland and Labrador, as currently a guiding policy for educational technology does not exist. Deliverology incorporates three main components: the formation of the delivery unit, data collection for setting targets and trajectories, and the establishment of routines. The flexible characteristics and accountability aspect of Deliverology can result in better outcomes from educational technology implementation. The data acknowledges that there is a lack of accountability in the present system. For example, even though investments in educational technology continue, professional development for the same remains mostly optional. Additionally, as noted earlier, some teachers were asked to conduct sessions on educational technology while being absent from their

classrooms for several weeks. Hence, if there is no policy then decisions are usually made abruptly without proper planning in place.

The Deliverology framework requires continuous cycles of assessments and encourages active involvement at all levels. This process helps in redirecting resources where needed the most. Also, it can identify employment gaps and accordingly create job opportunities, such as creating positions for hiring technology integration coaches and increasing the presence of technical support staff across the region. Moreover, clear communication, coordination, and relationship building are vital aspects of this action-oriented framework. The findings of this study underpinned the need for open communication, particularly between the district and the teachers. For example, teachers were not aware of the Safe and Caring Schools policy in relation to educational technology. The next section proposes a new action-oriented framework that builds on existing frameworks in the literature.

6.3.1. Educational Technology Action Cycle

This study is proposing an action-oriented framework called Educational Technology Action Cycle, see Figure 4. The framework incorporates components of both Deliverology and Alberta's professional development planning cycle. Deliverology provides a cyclic approach for “managing and monitoring the implementation of activities” through relationship building (Barber et al., 2011, p. 33). On the other hand, Alberta’s planning cycle (see Chapter 2) combines the art and science of professional development. “The art is the creativity and imagination necessary to produce an innovative and effective PD program; the science is necessary to systematically develop a program that meets participant, school and jurisdiction needs, achieves its goals and can be evaluated using data” (Alberta Teachers’ Association, 2005, p. 4). Both Deliverology and Alberta’s planning cycle are action focussed. With regards to

educational technology implementation in Newfoundland and Labrador, a framework is needed that not only acts as a roadmap but also embeds a culture of open communication, support, and action that is based on research and best practices. Combining components of both the frameworks into one could result in a consolidated robust process, ensuring that a well-designed professional development is paramount for successful implementation of educational technology. Therefore, professional development and educational technology should be viewed as complementary. Table 3 lists the main characteristics of Deliverology and Alberta’s professional development planning cycle. It can be observed that Deliverology has much more to offer than Alberta’s professional development planning cycle. Deliverology considers elements of rigor like accountability, budgeting, relationship building which align well with the findings of this study.

Table 3

Key Characteristics of Deliverology and Alberta PD Planning Cycle

Characteristics	Alberta’s PD Planning Cycle	Deliverology
Knowledge building	✓	✓
Best practices	✓	✓
Strategic design	✓	✓
Flexibility	✓	✓
Follow-up	✓	✓
Revisions	✓	✓
Coordination	✓	✓
Regular evaluation	✓	✓

Accountability	–	✓
Budgeting	–	✓
Relationship building	–	✓
Consequences visibility	–	✓

Key components of both Deliverology and Alberta’s professional development planning cycle are elaborated in Table 4. A list of potential elements listed in the table below are derived from both approaches and have been identified to lay the foundation for the proposed framework. The potential elements identified for consolidation are critical as they emphasize on the clarity of the expected outcome, setting appropriate goals, building effective strategies, and setting a clear action plan with efficient communication mechanism and periodic follow-ups.

Table 4

Key Components of Deliverology and Alberta PD Planning Cycle

Deliverology	Alberta PD Planning Cycle	Potential Elements for Consolidation
<ul style="list-style-type: none"> ● Set direction and context ● Establish clear accountabilities and metrics ● Create realistic budgets, plans, and targets ● Track performance effectively ● Hold robust performance dialogues ● Ensure actions, rewards, and consequences 	<ul style="list-style-type: none"> ● Conduct environmental scan and participant needs assessment ● Develop professional development program goals ● Identify possible professional development strategies ● Finalize action plan and measures ● Implement action plan ● Revising action plan as required ● Undertake summative evaluation 	<ul style="list-style-type: none"> ● Baseline analysis ● Set Goals ● Develop strategies ● Action ● Communication ● Follow-up ● Evaluation

A robust plan would lead to consistency and continuity in professional development for educational technology. This would result in an efficient outcome for teachers, students, and schools at large. Moreover, embedding the effective elements of professional development that are identified in this study such as collaboration, self-directed learning, and relevance would be ideal for addressing teachers' need for educational technology professional development. An important supplement to the introduction of educational technology into classrooms is the professional development activities for teachers through which technology utilization can be facilitated. Therefore, professional development acts as a bridge between educational technology and classroom implementation.

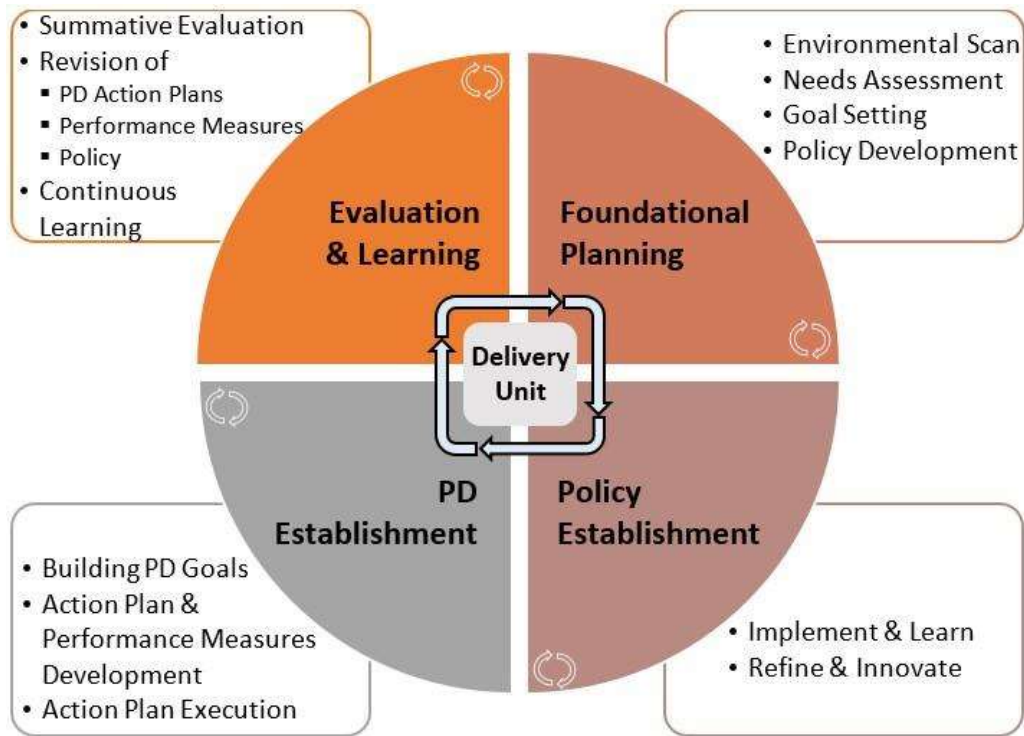
For successful implementation of educational technologies, research and training needs to be paired together. The proposed Educational Technology Action Cycle is an attempt to ensure that the major elements of a high-level professional development strategy are comprehensively covered. The delivery unit remains the central part of the process and will not only be responsible for conducting needs assessments and consultation but also set goals with regular follow-ups to make necessary adjustments.

As a preliminary step, NLESD could establish a delivery unit that would be responsible for overlooking educational technology related needs. If done, the series of recommendations would look similar to the following and would need to progress in order to be effective in relation to the gap found in policy. The unit would include dedicated individuals who will exclusively focus on achieving and improving outcomes. As stated by Barber et al. (2011) this "delivery unit will constantly challenge performance and ask difficult questions, taking any excuses off the table" (p. 33). This delivery unit could adopt the AECT's definition as its vision and then could apply the lens of the critical theory of technology for any undertaking of the unit.

As part of their responsibilities, this unit would conduct research and gather data by contacting other school districts to learn about best practices. Findings can be presented to stakeholders for generating input in the form of a needs assessment. Feedback can be obtained through town hall meetings, questionnaires, surveys, and/or emails. Based on the needs assessment, the delivery unit will be able to consult administrators and policymakers who can determine goals and policies with regards to educational technology. Making these decisions in conjunction with the professional development needs of the teachers would allow for an appropriate budget to be allocated for education technology. The Educational Technology Action Cycle offers flexibility and encourages continuous improvement as the policy is being implemented. Thus, it incorporates modifications depending on the context.

Figure 4

Educational Technology Action Cycle



The proposed Educational Technology Action Cycle comprises four major stages: (1) Foundational Planning, (2) Policy Establishment, (3) PD Establishment, and (4) Evaluation and Learning. Each of these stages are characterized by a set of activities as described below:

1. Foundational Planning

- a. *Environmental Scan*: A thorough scan of best practices and supporting research related to educational technology use, along with professional development activities, are the starting point of a strong foundation. The findings of the environmental scan will highlight the best practices undertaken at different schools in different regions.
- b. *Needs Assessment*: An assessment highlighting the findings from the scan should be circulated for input and to understand the needs.
- c. *Goal Setting*: Appropriate goals are then built based on the identified needs.
- d. *Policy Development*: Based on the environmental scan, needs assessment, and goals, experts will then devise a policy with subsequent guidelines.

2. Policy Establishment

- a. *Implementation*: The developed policies should be implemented at different levels according to the hierarchy of the education district.
- b. *Refine*: Based on the challenges faced while implementing the policy, necessary refinements can be made to achieve anticipated outcomes.
- c. *Innovation*: Refining policy can be driven through innovation, either due to the technological developments or due to the emergence of unknown parameters influencing the policy implementation.

3. PD Establishment

- a. *Building PD Goals*: Depending on the needs of teachers/classrooms, appropriate PD goals should be developed in consultation with teachers and through the involvement of related stakeholders.
 - b. *Action Plans and Performance Measures Development*: Once the goals are defined as appropriate, action plans along with performance measures have to be developed. While action plans are necessary to assure timely achievement of goals, performance measures will help in assuring the minimum level of PD desired for teachers.
 - c. *Action Plans Execution*: The developed action plans will now have to be executed to achieve desired goals for PD.
4. Evaluation and Learning
- a. *Summative Evaluation*: A thorough evaluation of every stage starting from foundational planning, policy establishment, and PD establishment is necessary to gauge the success.
 - b. *Revision of PD Action Plans, Performance Measures, and Policy*: Based on the evaluation, appropriate revisions should be made for PD action plans, performance measures, and policy for the next cycle.
 - c. *Continuous Learning*: Continuous learning is now a global phenomenon irrespective of the field; insights from past and current cycles of PD and policy will drive the success of the following cycles.

It has to be noted that periodic evaluation of each stage within the proposed framework is important. Therefore, each step under each stage needs to be revisited and evaluated periodically.

6.4 Implications for Practice and Policy

This study revealed the importance of teacher professional development for educational technology as well as the need for a clear and robust policy framework. There is an apparent link between professional development needs of the teachers and the administrative support available to them with regards to educational technology. The current study proposes implications for the following:

Instructional designers: Instructional designers can use information from this research to design online professional development activities for teachers that are self-paced and collaborative in nature. Additionally, every effort should be made to incorporate users' perceptions in the process of designing.

Developers: Both software and hardware developers can use the data from this study to prepare educational technology that embeds the values of the suggested AECT definition. Teachers mostly incorporated educational technology that included cross-curriculum connections, involved critical thinking, and collaboration opportunities. Software that allowed teachers to monitor students' progress and generate real time reports were valued.

Department of Education and Early Childhood Development: Millions of dollars are allocated to provide schools with educational technology. This research examined the instructional use of educational technology in elementary classrooms and provides the department with important information on the spending; it gives a sense of direction moving forward. The Department of Education and Early Childhood Development can consider using the lens of the critical theory of technology as the basis for future investments.

Policymakers: Provides policymakers with evidence and data for their consideration. A framework is suggested that can be useful in developing and implementing policies related to

educational technology and professional development. This study has created a baseline of knowledge that can impact future policies and practices related to educational technology. It encourages evidence-based decision making when creating policies and planning professional development activities for teachers within the local context.

NLESD: This research has considerable implications for the jurisdiction as they continue to invest in educational technology. In order to invest in educational technology, understanding teachers' and students' needs is paramount. As the NLESD continues to collect data and analyze teachers' professional development needs, the suggested framework can provide a strong foundation for maintaining the momentum and establishing accountability. Additionally, involving teachers in feedback loops can help in directing resources where needed the most. The study also provides helpful insights on how elementary teachers are integrating educational technology in their instructional practices. This study discusses several educational technologies for which the NLESD has purchased district-wide subscriptions and therefore validates the use of the same. The NLESD can also consider collaborating with TESIC in circulating important information regarding professional development opportunities.

TESIC: The data indicated an appreciation for TESIC. The Council can use the data as a springboard and continue its efforts to offer teachers the support they need for integrating educational technology into their classrooms; as well as strive to reach out to more teachers to share their accomplishments.

Administrators: Administrators can use this information to understand the needs of the teachers and collaborate and communicate regularly as they interact with learners on a daily basis.

Teachers: This research empowers the voices of people that have not been heard in NL – elementary school teachers. It highlights the role of teachers as implementers and places them at

the forefront of educational technology use. Teacher participants may gain new insights to their personal pedagogies and methodologies related to student engagement and collaboration through the integration of educational technologies. Teacher participants may gain knowledge of the broader spectrum of the educational technologies and the potential support networks that are already in place to help them move forward in this area.

School Community: Additionally, this research informs parents and the school community at large about how the investments in educational technology are being utilized at a classroom level. It benefits students, as corresponding learning activities will be aligned with meaningful teacher professional development and should lead to improved learning outcomes. Lastly, this research contributes to the existing body of scholarly knowledge and adds to the theoretical position of educational technology in K-12 schools.

6.5 Future Directions

This study has laid the foundation for future research that can be undertaken for exploring the further implementation of educational technology in classrooms. Unfortunately, due to the constraints of my study, these could not be explored. Researchers can study the perceptions of administrators in the implementation of educational technology, along with examining the policy formation process. Additionally, since all teacher participants in this study were frequent users of educational technology, it would be worth conducting this study again with inexperienced users of educational technology. This can be done by conducting a cross-case study analysis to investigate the similarities and differences between the two groups and recognize areas that need attention. The proposed consolidated framework can also be modified to include the potential findings.

Research can also be conducted to analyze how educational technology is being used to meet the curriculum outcomes. Since grades 7-12 have already been equipped with personal Chromebooks, it would be worthwhile to mirror this study in the junior high classroom context. A multi-grade level case study can be conducted to understand the perceptions of junior high teachers about the integrations of educational technology in their instructional practices.

Despite overwhelming support for sustained professional development in the literature, sustained professional development for educational technology was not perceived as effective. Hence, it would be interesting to explore this further to have an in-depth understanding of the rationale behind this perception. More research is required in the Canadian K-12 schools' context, which analyzes the benefits and challenges of different elements of professional development with regards to educational technology use in classrooms. Moving forward, it would be beneficial to identify and conduct empirical research at schools that have already implemented the professional development planning cycle. Similarly, there is a need for research to analyze the different frameworks adopted by school districts. These are a few possible avenues that can help in advancing this research for understanding the role of educational technology in classrooms.

6.6 Conclusion

This chapter reinstated the purpose of the study, discussed the implications of my research, and proposed a way forward. Understanding the resolution of need, which includes the crucial components of policy awareness and policy implementation, is fundamental, and the selection of an appropriate framework is critical for successfully implementing educational policies. Furthermore, embedding a well-designed professional development plan, based on effective elements within the framework, will act as a bridge to enhance teacher practices and

result in improved educational technology usage. Whereas, if professional development continues to be delivered in a manner that neglects the way teachers learn, then teachers will remain at lower levels of effectiveness than they otherwise could be. Therefore, an action-oriented framework, Educational Technology Action Cycle, is proposed as a way forward for integrating educational technology into instructional practices. The remarkable work of teachers needs to be supported by the dedication of the district so every student experiences learning in the same manner.

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Appendix A

Sample Questionnaire for Grade 6 Teachers

This questionnaire broadly focuses on the integration of educational technology in instructional practices. The Association for Educational Communications and Technology (2018) defines educational technology as “the study and ethical application of theory, research, and best practices to advance knowledge[,] as well as mediate and improve learning and performance through the strategic design, management and implementation of learning and instructional processes and resources” (AECT, 2018).

Please note that you can skip any questions that you do not wish to answer.

A. Close Ended Questions
1. For how long have you been teaching at your current school?
2. How many years have you taught in total (rounded to the closest full year)?
3. Which region of the NLESD do you currently work in? <ul style="list-style-type: none"><input type="radio"/> Avalon East<input type="radio"/> Avalon West<input type="radio"/> Vista/Burin<input type="radio"/> Central<input type="radio"/> Western<input type="radio"/> Labrador
4. What is your age range? <ul style="list-style-type: none"><input type="radio"/> 18-24 years old<input type="radio"/> 25-34 years old<input type="radio"/> 35-44 years old<input type="radio"/> 45-54 years old<input type="radio"/> 55-64 years old

the **highest** degree or level of school you have completed? If currently enrolled, the highest degree received.

- Some college credit, no degree
- Trade/technical/vocational training
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree

6. Which of the following best describes your employment status?

- Employed full-time
- Employed part-time

Other _____

7. Which gender do you identify as?

- Male
- Female
- Non-binary
- Transgender
- Prefer not to disclose
- Other: _____

8. Are you currently integrating educational technology in your day-to-day lessons?

- Yes
- No

9. If you answered no to question 8, when was the last time you taught using educational technology in your lessons?

- a. 1 week ago
- b. 2 weeks ago
- c. 1 month ago
- d. Other, please specify _____

10. I have reviewed policies regarding the use of educational technology at (select all applicable)

- school level
- district level
- government level

B. Attitude towards Educational Technology	Strongly Agree	Somewhat Agree	Not Sure	Strongly Disagree
<ul style="list-style-type: none"> ● Educational technology makes my job as a teacher easier. ● It is easy to design learning activities that incorporate technology. ● I give advice to other educators about new trends in educational technologies for the classroom. ● I would like to use educational technologies in the classroom more than I do now. ● I am among the first people to try out new educational technologies for the classroom. ● I tend to be skeptical about new educational technologies for the classroom. 				
<ul style="list-style-type: none"> ● How much do you agree or disagree with the following statements about using educational technologies in the classroom? <ul style="list-style-type: none"> ○ It increases student engagement in learning. ○ It distracts students. ○ It improves student outcomes. ○ It expands resources available to teachers. ○ The challenges of implementation outweigh the benefits. <ul style="list-style-type: none"> ○ It helps students collaborate with each other. 				

<ul style="list-style-type: none"> ○ It places too many demands on teachers' time ○ It enables personalized learning for individual students. 				
<ul style="list-style-type: none"> ● How important do you think it is for teachers to use educational technologies in the classroom? 	Absolutely essential	Important	Somewhat Important	Not Important
<ul style="list-style-type: none"> ● Given the COVID-19 pandemic situation and thinking about next school year (2021-2022), how often do you think you or your students will use educational technologies? 	Do not plan to use	Will use, but less often than this year	Will use about the same as this year	Will use more often than this year
B. Administrative Support	Strongly Agree	Somewhat Agree	Not Sure	Strongly Disagree

<ul style="list-style-type: none"> ● Belief <ul style="list-style-type: none"> ○ I am expected to use technology to support content objectives. ○ There is strong administrative backing for using technology. ○ The demands/goals placed on me for using technology are reasonable. ● Access <ul style="list-style-type: none"> ○ The technology available is, for the most part, useful for teaching. ○ I received help fixing technology problems in a timely manner. ○ The technology available is, for the most part, reliable. ● Time <ul style="list-style-type: none"> ○ Integrating technology takes less time than I thought it would. ○ I am given time to learn to integrate technology into my lessons. ○ I have enough time to plan and prepare lessons that use technology. ● Professional Development <ul style="list-style-type: none"> ○ The training I receive can be easily applied in my classroom. ○ I feel adequately trained on the skills needed to use technology. ○ I have enough opportunity to share technology lessons with other teachers. ● Educational Policy and Practice <ul style="list-style-type: none"> ○ I am aware of the policies and procedures related to educational technology use in the classroom. ○ I feel overwhelmed with continuous changes in policy related to educational technology use in classrooms. ○ I am consulted prior to making decisions about providing educational technology devices (e.g. ipads, Chromebooks) to students. ○ I provide feedback prior to my school purchasing 				
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<p>educational software (e.g. RazKids, Prodigy, Epic, IXL) for students.</p> <ul style="list-style-type: none"> ○ There is a lack of careful planning when considering the use of educational technology. 				
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● What are the biggest challenges to integrating educational technologies in your school? Please select up to 3 responses.

- Lack of funds / budget limitations
- Insufficient technology infrastructure in the classroom (connectivity, hardware)
- Lack of time to implement

- Lack of training for teachers on how to use and implement these products
- Lack of student access to technology outside of school
- Difficulty determining which products are of high quality
- Not enough information about the products' alignment with standards
- Difficulty getting required approvals to implement educational technologies
- Lack of trained, appropriate staff
- Other

- What are the most important characteristics in selecting educational technologies for classroom use? Please select up to 3 responses.

- Has learning potential for students
- Is a free resource/ no cost
- Is fun and engaging for students
- Aligns to academic standards
- Helps teachers teach
- Overall high quality
- Recommended by teachers
- Approved by department head, district and/or school administrator
- Available from a trusted site
- Rigorously rated by experts
- Other

- How do you find out about educational technologies for instructional use? Please select all that apply.

- Teachers, librarians, or tech coordinators/media specialists
- School or district administrators
- Online communities or social networking sites (e.g. Facebook, Twitter, etc.)
- Education events (e.g. trade shows, conferences, seminars)
- Online or print education publications
- App store or marketplace descriptions and reviews
- Students
- Parents of students
- Search engines (e.g. Google, Yahoo!, Bing, etc.)
- Other: _____
- None, I don't find out about educational technologies

- Who is involved in the decision to purchase educational technologies at your school? Please select all that apply

- Me
- Technology coordinator(s) or media specialists, or librarians in my school/district
- Other teachers at my school
- Parents of students
- Students
- Teachers in my school district
- Other school staff (e.g., principals)
- Other district-level staff
- Other

- What are the most important professional development characteristics for educational technology? Please select up to 3 responses.
 - Content focused
 - Active learning
 - Collaboration
 - Models and modelling
 - Coaching and expert support
 - Feedback and reflection
 - Sustained duration

Note: Questions under the subheadings- access, belief, time, and professional development are modified and adapted with permission from Theodore J Kopcha – Kopcha, T. J. (2012). Teachers’ perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education*, 59(4), 1109-1121.

C. Open-ended Questions

1. Would you do anything different if you could with regards to integrating educational technology in classroom, professional development, and policy? Please briefly state in the space provided.

a. Educational technology:

b. Professional Development:

c. Policy:

2. How would you describe your ideal educational technology professional development session?

3. How important is the role of teachers in policy development for educational technology use in classrooms?

4. Please describe any teaching experiences that may have supported your teaching using educational technology (pre COVID-19 pandemic).

5. Please describe any teaching experiences that may have hindered your teaching using educational technology (pre COVID-19 pandemic).

6. How has the COVID-19 pandemic impacted your teaching practices with regards to the use of educational technology?

Please click the [Submit](#) button to have your responses recorded.

Thank you for your participation.

If you would like to contribute more to this research project by participating in a potential interview or classroom observation, please [click here \[link will be inserted for Section D\]](#).

D. Continued Participation

Note: A total of 6 teachers will be contacted for interviews. Teachers for the interview will be invited based on their responses in this section. The responses to the questionnaire will remain anonymous and the details provided in this section will be securely added to a password protected file on the computer which will only be accessible to the researcher. No personal information will be disclosed during or after the research is completed. Data will be kept for a minimum of five years, as required by Memorial University's policy on Integrity in Scholarly Research and will be confidentially destroyed after that time.

Until COVID-19 guidelines continue to be in place, six teachers of grade 6 from across the province will be contacted for virtual interviews and potential classroom observations. However, if COVID-19 NLESD protocols change then due to geographic proximity, teachers from the Avalon East region will be the priority for in-person interviews and potential classroom observations. Therefore, irrespective of the region, any grade 6 NLESD teacher can express their willingness to participate in an interview and classroom observations.

1. Please select all that apply:

- . I am a grade 6 homeroom teacher.
- a. I have at least 2 years of teaching experience in grade 6.
- b. I have less than 2 years of teaching experience in grade 6.
- c. I have never integrated educational technology in my teaching.
- d. I somewhat integrate educational technology in my teaching.
- e. I regularly integrate educational technology in my teaching.
- f. I have never integrated educational technology in my teaching and I never will in the future.
- g. I intend to integrate educational technology in the future.
- h. Educational technology is a waste of time and resources.
- i. Educational technology helps facilitate learning in my classroom.

2. I agree to participate in an interview if selected

- a. Yes
- b. No

3. I agree to participate in a classroom observation if selected

- a. Yes
- b. No

4. Name:

5. Email address:

6. Phone number:

Please click [Submit](#) to record your response.

Appendix B

Sample Interview Questions

Title: [Educational Technology: Assessing Instructional Use in Elementary Classrooms](#)

Note: Due to the COVID-19 pandemic, if classroom observations are to be conducted virtually, the researcher will adhere to the NLESD COVID-19 research protocols.

The interviews will follow a semi-structured format. The following questions will be used as guides.

Teacher Interview Guiding Questions

A. Preamble – informal dialogue as ice breaker to hopefully identify common ground.

Will include things like

1. hometown
2. high school
3. collegial connections
4. COVID-19 pandemic
5. interests outside of academic/school setting

How many students are there in your classroom?

Name of your school

How many grade 6 teachers are there?

B. Questions/prompts about the nature of technology

1. Ask for their personal interpretation of technology and educational technology.
2. Ask how that interpretation relates to their daily teaching. ...give eg.
3. Ask about their philosophical understanding of technology.
 - a. Socially created **or/and** b. Technology derives society
4. Prompt them to discuss how they were introduced to educational technology.
5. Ask about the potential supportive and unsupportive aspects of educational technology.
6. Ask if their perception of educational technology has changed since COVID-19 pandemic?

C. Questions/prompts about their professional development (PD) experiences.

1. Ask about their responsibilities around curriculum and implementing the knowledge gained from the PD sessions.
2. Ask how informative are the PD sessions and do they think there should be more of them.

3. Ask if they are consulted about the types of PD offered and do they feel that PD aligns well with their teaching practice.
4. Ask if educational technology professional development sessions are delivered at the level of expertise that they expect.
5. Ask them to describe their typical way of learning technical and pedagogical skills for educational technology.
6. Prompt them to discuss if they have noticed changes in PD activities because of COVID-19 pandemic.

D. Questions/prompts about their administrative and policy experiences.

1. Ask how aware are they of the policies and procedures within the district and ministry related to educational technology use in the classroom.
2. Ask according to them, what is the best way of developing a policy related to educational technologies.
3. Ask about their experience (if any) with policy implementation related to educational technologies.
4. Ask about what changes in education policy related to technology do they think are necessary to fully embrace its potential for learning.
5. Ask them to describe briefly the relationship of policy and educational technology with regards to instructional practices.
6. Prompt them to discuss the role of administrators in supporting policy implementation related to educational technology.
7. Ask if considering the COVID-19 pandemic, have they noticed any changes in perceptions of school leaders and other stakeholders with regards to educational technology.

Appendix C

Informed Consent Form

Educational Technology: Assessing Instructional Use in Elementary Classrooms

Researcher(s): Sana Jamil

Faculty of Education, Memorial University of Newfoundland

Tel: [REDACTED], Email: [REDACTED]

Supervisor: Dr. David Gill

Faculty of Education, Memorial University of Newfoundland

Tel: [REDACTED], Email: [REDACTED]

You are invited to take part in a research project entitled “***Educational Technology: Assessing Instructional Use in Elementary Classrooms.***”

This form is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. It also describes your right to withdraw from the study. In order to decide whether you wish to participate in this research study, you should understand enough about its risks and benefits to be able to make an informed decision. This is the informed consent process. Take time to read this carefully and to understand the information given to you. Please contact the researcher, Sana Jamil if you have any questions about the study or would like more information before you consent.

Participation in this study is not a requirement of the NLESD and/or school, and will not be reported to colleagues or superiors. It is entirely up to you to decide whether to take part in this research. If you choose not to take part in this research or if you decide to withdraw from the research once it has started, there will be no negative consequences for you now, or in the future.

Introduction:

My name is Sana Jamil and I am a doctoral candidate in the Faculty of Education at Memorial University of Newfoundland. I am conducting a research project called *Educational Technology: Assessing Instructional Use in Elementary Classrooms*.

Purpose of Study:

The purpose of this study is to understand the process by which teachers integrate educational technology into their instructional practices in elementary classrooms in Newfoundland and Labrador. In Canada, several provinces have invested millions of dollars towards innovative teaching practices. Considering the local context, the provincial government of Newfoundland and Labrador announced \$20 million for the purchase of laptops for all teachers and Chromebooks for students across the K-12 education system (Education and Early Childhood Development, 2020). An important supplement to the introduction of educational technology into classrooms is the professional development activities for teachers through which technology utilization can be facilitated. However, it remains unclear whether teachers are willing or prepared to integrate technology in their day-to-day instruction.

Virtual Protocol

The researcher will adhere to COVID-19 protocols outlined below for conducting research virtually.

- Research will be conducted virtually via a Google Meet URL issued by the District, with privacy settings in place to ensure access by invitees only. Information on the privacy policy of Google Meet can be found here <https://support.google.com/meet/answer/9852160?hl=en>
- Google Meet URLs will not be shared with others other than those required to participate in the virtual meeting.
- Researcher will not comment or share information on teachers participating in virtual meetings.
- Researcher will ensure no other staff from their organization is able to view the virtual meeting other than those identified to participate, and are required to ensure a secure space is used for the meeting with no other viewers in the room.
- Researcher will not record or photograph virtual sessions, unless with written consent of the teacher, parent and or student (as per signed research consent form).

What You Will Do in this Study:

You are invited to participate in an individual interview for this research study. A total of 6 teachers will be contacted for interviews. Teachers for the interview will be invited based on their responses in Section D, after submitting their responses to the questionnaire. The responses to the questionnaire will remain anonymous and the details provided in Section D of the questionnaire will be securely added to a password protected file on the computer which will only be accessible to the researcher. Until COVID-19 guidelines continue to be in place, six teachers of grade 6 from across the province will be contacted for virtual interviews and potential observations. The researcher will continue to follow the latest COVID-19 research guidelines listed above. Interviews will be conducted virtually via a Google Meet URL issued by the District, with privacy settings in place to ensure access by invitees only. The interview will be audio-recorded with your consent. The digital recording of the interview will be transcribed. During the interview, you will be asked such questions as the following: How do you perceive the role of technology in today's classrooms? How do you perceive the role of professional development in helping you integrate technology for instructional purposes? How often do you make use of educational technology for instructional purposes? After the interview, member checks will be conducted by sending initial findings back to you for your comments. Through member checks, you will add credibility to the qualitative study by having a chance to react to the data (Creswell & Miller, 2000).

Participants will include six teachers of grade 6. Research data involving your participation will be gathered in the following manners during and after the project: (1) Questionnaire: A questionnaire will be circulated to all grade 6 teachers under the NLESD elementary school system. (2) **In-service teacher interviews:** Six teachers will participate in an interview related to the main research questions. (3) Classroom observations: Request for classroom observations will be sent to two teachers who also participated in interviews.

Length of Time:

The interview will take approximately 60 minutes of your time and will be scheduled at the participants' convenience.

Withdrawal from the Study:

Your participation in this study is completely voluntary and you have the right to withdraw from the study. If you withdraw during or after the interviews, the interview data will be withdrawn and destroyed. Data cannot be withdrawn after data analysis has begun; I estimate approximately one month after your interview. There are no consequences for withdrawing from the study. If you would like to be withdrawn from the study within the one month timeframe, contact Ms. Jamil and the data from your interview will be removed and destroyed.

Possible Benefits:

There are at least two potential benefits for participants. First, teacher participants may gain new insights related to their personal pedagogies and methodologies related student engagement and collaboration through the integration of educational technologies. Second, teacher participants may gain knowledge of the broader spectrum of the educational technologies and the potential support networks that are already in place to help them move forward in this area.

Possible Risks:

There may be psychological risk /discomfort associated with participation in the study. You are being asked to make a voluntary decision as to whether you wish to participate in this study. If there are any parts of the information that you do not understand, please ask the researcher to explain it.

Confidentiality and Anonymity

The ethical duty of confidentiality includes safeguarding participants' identities, personal information, and data from unauthorized access, use, or disclosure. Anonymity refers to protecting participants' identifying characteristics, such as name or description of physical appearance.

The identities of participants will be accessible only to the researcher(s) authorized to have access to the data. The interview transcriber will also sign a confidentiality agreement. The data (including direct quotes from the interviews) from this research project will be published, however, your identity will be kept confidential by using a pseudonym.

Recording of Data:

With the permission of the participant all interviews will be recorded with a digital audio recording device.

Use, Access, Ownership, and Storage of Data:

Any electronic data collected will be password protected and stored on a password-protected and/or encrypted devices. All print and hard-copy data will be stored at Memorial University Faculty of Education in the locked office of Sana Jamil. Data will be kept for a minimum of five years, as required by Memorial University's policy on Integrity in Scholarly Research and will be confidentially destroyed after that time. Data will be used for peer examination purposes. Lincoln and Guba (1985) define peer examination/debriefing as a "process of exposing oneself to a disinterested peer in a manner paralleling an analytic session and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's mind" (p. 308). Therefore, a colleague who has no stake in the outcome of the research will conduct peer examination to flag any potential confidentiality problems before publication.

Reporting of Results:

Academic articles and other research products such as presentations will be produced based on this research. Upon completion, articles and other research products will be shared with the participating teachers. Participants will be able to contact the researcher directly for information about publications and presentations. Further, my thesis will be publically available online via the QEII thesis collection at <http://collections.mun.ca/cdm/search/collection/theses>, and a summary will be provided in the NLTA newsletter.

Questions:

You are welcome to ask questions before, during, or after your participation in this research. If you would like more information about this study, please contact: Sana Jamil (Principal Investigator), Memorial University Faculty of Education, (sjamil@mun.ca).

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as the way you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at 709-864-2861.

Consent:

Your signature on this form means that:

- You have read the information about the research.
- You have been able to ask questions about this study.
- You are satisfied with the answers to all your questions.
- You understand what the study is about and what you will be doing.
- You understand that you are free to withdraw participation in the study without having to give a reason, and that doing so will not affect you now or in the future.
- You understand that you may skip any questions that you do not wish to answer.
- You understand that if you choose to end participation **during** data collection, any data collected from you up to that **point will be destroyed**.
- You understand that if you choose to withdraw **after** data collection has ended, your data can be removed from the study up to one month after the interview date.

I agree to be audio-recorded Yes No

I agree to the use of direct quotations Yes No

I allow my name to be identified in any publications resulting from this study Yes No

If you answered no to the last question:
The pseudonym I choose for myself is: _____

By signing this form, you do not give up your legal rights and do not release the researchers from their professional responsibilities.

Your Signature Confirms:

I have read what this study is about and understood the risks and benefits. I have had _____ adequate time to think about this and had the opportunity to ask questions and my questions have been answered.

I agree to participate in the research project understanding the risks and contributions of my participation, that my participation is voluntary, and that I may end my participation.

A copy of this Informed Consent Form has been given to me for my records.

Signature of Participant

Date

Researcher's Signature:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

Signature of Principal Investigator

Date