Examining The Use of Digital Technologies to Support Differentiated Instruction

By

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Abstract

Education should enable all students to succeed. In preparation for their future, students must be able to see themselves in resources, materials, and curriculum delivered in any instructional program or classroom. It is the duty of educators to utilize these resources to suit the strengths of the classes they work with, and curate a program that caters to each student to enable their success. Differentiating instruction is necessary to promote student success, and can be achieved by taking an interest in students as individuals. Knowing them individually will allow teachers to cater to their students’ learning style by differentiation the process, product, materials, or environment. With this, teachers must use their professional judgment to incorporate components such as digital technologies to make their programs rich with information, resources, and accessible to all learners. This will help them strive to uphold a program that respects and acknowledges students’ differences, celebrates ability, and supports the academic, social, and emotional growth of the child. Additionally, it prepares students for their futures in a digital age, and consolidates knowledge in a platform that gives students hands-on, practical experience in a variety of subject areas.

This paper will explore how digital technologies are being used by elementary teachers to support differentiated instruction with their students. Further inquiry will be made to explore the benefits and challenges of including digital approaches to differentiated learning in lesson design, as well as considering whether students benefit more from this. A component of this research will also be to study if teachers have noticed students responding to digital technologies instead of other types of learning. Lastly, this paper will also examine the role reflective teaching plays when planning for differentiation in the classroom, in hopes of gaining a comprehensive understanding that contributes to more teachers implementing this in their programs. These questions lead to exploring the need for increased access, hands-on PD for teachers, and teachers that possess an open-mind about using technology in their programs.

Key Words: Differentiated Instruction, Digital Technologies, Strength Based Planning, Universal Designed Learning
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I wish to acknowledge and thank my family, friends, and all those close to me for their ongoing support. I also wish to acknowledge educators that understand how important their role is in preparing students for the future through recognizing their strengths and incorporating them into their programs. This is the truest form of teaching. Educators that praise the diversity of experience and ability among today’s student body give the leaders of tomorrow a forum where they can build their confidence and understand that everyone has a talent worth celebrating. Success comes in many different forms, and applauding this with students is essential when supporting 21st century learners.
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Chapter 1: INTRODUCTION

1.0 Introduction to the Research Study

Class composition and the growing range of needs that exist within the student body in Ontario schools are proving to be an increasing challenge for teachers (McElroy, 2014). Although McElroy (2014) also indicates that smaller class sizes benefit teachers and help address the varying needs of students, difficulty remains in addressing the needs of students with exceptionalities. For this reason, it is imperative that teachers differentiate their instruction in order to create a more inclusive classroom environment that better meets the needs of all students. It is through this that teachers will be able to design lessons that will not only be better suited for all students, but also adapt their lessons to suit diverse learning needs and multiple intelligences.

A fair amount of research has emerged surrounding differentiated instruction, particularly within the past ten to fifteen years (People for Education, 2014). Although much of this research is not explicit in describing how teachers incorporate differentiated instruction into lesson design, it does speak to contributing factors, such as implementation of IEPs, strength-based planning, administrative support for differentiation, and cross-curricular projects (Tomlinson, 2000; Painter, 2009; Weishaar, 2010; Weselby, 2014). The advantages of differentiated classroom instruction stand to benefit all students, regardless of their achievement levels. It allows for a richer engagement to material and facilitates an opportunity where they can build better connections between class lessons and their personal lives (Mills et al., 2014). Some teachers also use digital technologies as a component of differentiated instruction for their students. Technology is having a substantial effect on learning because it allows students to have instant access to information and can alter a great deal of the inquiry process, if not used properly (Prestie & Smith, 2010). Educators must find a way to use it as a supplement to aid learning (MacBeth, 2009), and assist in DI. This can be done by incorporating students’ strengths into the differentiation process, along with digital technologies, to create meaningful learning experiences. Findings by Dede (2000)
reported that encompassing technology when delivering curriculum improves the success for all types of learners and enhances experience for at risk students.

The work of Weishaar (2010) parallels the research interests of this paper, as he advocates for the need to incorporate students’ strengths into the planning process for teachers, and how this applies directly to differentiation in the classroom. The role of an educator is paramount in facilitating student success. As technological competence is found more often in today’s students, it makes perfect sense to account for this in lesson design. Teachers have to make informed choices when choosing how they will differentiate their lessons to suit several student needs with their selected approach while still allowing them to move through ministry expectations. As noted by Morgan (2014), the need for differentiated instruction is more important today than ever before given the rate at which the student community is growing more diverse. The use of digital technologies is a suitable means to personalize learning, especially when differentiating instruction.

1.1 Purpose of the Study

Although enrollment of each primary class is limited to 23 students (Ontario Ministry of Education, 2012), the needs of those students can be strikingly diverse. The potential for a significant number of those students to have unique instructional requirements such as physical or behavioural needs, learning difficulties, individual education plans, or extra time for assessment is becoming more commonplace. Teachers can use a variety of strategies to adapt their instructional style and better meet the needs of a diverse student body. While there is already a vast amount of research surrounding differentiated instruction (Tomlinson, 2000; Edyburn, 2004; Lawrence-Brown, 2004; Bush, 2006; Algozzine & Anderson, 2007), the purpose of this study is to consider how digital technologies are being used in Ontario classrooms and deliberate their suitability to support differentiated instruction. Using digital technologies to adapt instruction and assessment methods, as well as lesson design, may help educators to better connect with their students.

In addition to recent research, this study will consider key findings in educational history, such as Vygotsky’s work (Jaramillo, 1994) on the zone of proximal development (ZPD), an its applicability to the use of technology to support differentiated instruction.
Digital technologies can assist teachers in identifying and instructing in a student’s ZPD and contribute to a better learning experience (Lui, 2012). This paper will aim to contribute to the field of current research surrounding differentiated instruction, examining how digital technologies are being used to support it.

1.2 Research Questions

Discovering strategies to help educators implement differentiated instruction with current resources is crucial in education and student learning. Teachers need to be flexible and aware of what styles of differentiation work for particular learners, and learning styles. Thus, this paper will explore how digital technologies are being used by elementary teachers to support differentiated instruction with their students. Further inquiry will be made to explore the benefits and challenges of including digital approaches to differentiated learning in lesson design, as well as considering whether students benefit more from this. Differentiated learning is a fundamental component of teaching that keeps all students actively engaged and challenged in the curriculum and learning process. The use of digital technologies in differentiated learning can be challenging to implement, and particularly daunting for teachers that lack confidence with these technologies, in certain subject areas, or subscribe to a “one size fits all” approach to learning. A component of this research will be to study if teachers have noticed students responding to digital technologies instead of other types of learning. Lastly, this paper will also examine the role reflective teaching plays when planning for differentiation in the classroom, in hopes of gaining a comprehensive understanding that contributes to more teachers implementing this in their classrooms.

1.3 Background of the Researcher

The theory of multiple intelligences demonstrates that everyone has unique methods of learning and displaying knowledge. Reflecting on my own learning experience, it would be unrealistic to claim that I have always learned in one particular fashion. I have benefitted from different approaches to learning, especially for more traditionally challenging subjects such as math and science. Being restricted to one particular learning style would not have been conducive to my academic success. It would have hindered my ability to attain the knowledge and experience required to achieve my personal and professional goals. For example, I can attest to having a more
favourable learning experience with activities that serve, in some part, to the style of spatial or kinesthetic learners rather than logical or linguistic ones (Gardner, 1993).

Having spent time working with students, particularly those with learning disabilities, I can appreciate the positive impact the use of technology and differentiated instruction has on maximizing student learning, and creating an inclusive learning environment. I have closely observed the need for differentiated instruction watching my sister learn; my sister struggled greatly in school because her teachers were not presenting her with information in a manner that was conducive to her learning style. She found it very difficult to succeed in subjects based heavily around theory, such as math and science, because they were often taught in a way she found difficult to understand. Teachers were delivering subject matter in a verbal/linguistic and interpersonal method, which left her felt uncomfortable and adrift, reflecting poorly on her academic performance. This resulted in frustration for her, our family, and her teachers/school staff. Experiencing this sparked my interest in making learning more accessible to all students, and was my initial inspiration to pursue a career in the field of education.

Building on this, I began to volunteer working with students with disabilities, and in multiple exceptionalities classrooms to gain a deeper understanding of how to connect with students and maximize their learning experience. It was through this experience that I saw what technology could offer a classroom, serving as a means of communication for some non-verbal students, and supporting concept attainment through interactive games and applications for others. Currently pursuing a career in animation and graphic design, my sister is using technology for most of the day and quickly developed an excellent comfort level with it. Reflecting on this makes me wonder how my sister would have benefitted from the use of technology in her classrooms. It has since been an ardent interest of mine to learn more about this issue and examine how digital technologies are being used to support differentiated instruction that I may be an agent of change, helping to create a strong fundamental education that is relatable and attainable by all students.

Centered on a social constructivist framework, my research will be presented through a narrative approach. A narrative method will allow this study to report on what participants said, how they said it, and how they interacted with others (Creswell, 2013). With this in mind, teachers’ experiences with differentiation instruction will be attained
through in person interviews. Differentiation draws upon socio-cultural theory presented by Vygotsky (Jaramillo, 1994). It outlines the student-teacher relationship as being a critical component in being able to teach to a student’s ZPD, which serves as the fundamental basis for differentiated instruction. It is with the ZPD that Vygotsky maintained the importance to assess students’ abilities to solve problems both with and without teacher assistance. Teaching to a student’s ZPD means that the teacher knows what boundaries they are operating within, which allows them to identify and focus on areas where instruction may have to be present.

The basis of data to support this paper will be obtained through participant interviews, as well as a focus on student performance. Testimonials will be drawn from teachers to assess the effect differentiation has on student learning, either advocating or criticizing its effectiveness.

1.4 Overview

Chapter 1 includes the introduction and purpose of the study, the research questions, as well as how I came to be involved in this topic and study. Chapter 2 contains a review of the literature, focusing predominantly on differentiate instruction, universally designed learning, and the implementation of IEPs in classrooms. Chapter 3 provides the methodology and procedure used in this study including information about the sample participants and data collection instruments. Chapter 4 identifies the participants in the study and describes the data as it addresses the research question. Chapter 5 includes limitations of the study, conclusions, recommendations for practice, and further reading and study. References and a list of appendixes follow at the end.
Chapter 2: LITERATURE REVIEW

2.0 Introduction to the Research Study

Current generations of students are faced with a set of very different challenges from those preceding them, as there has been a shift in the field of education from practical to disciplinary knowledge spawned by a digital revolution (Smith & Throne, 2007). The once homogeneous approach to classroom instruction has changed and teachers need to shift their instructional approach to account for variance in learners’ needs and learning styles (Subban, 2006). Educators are no longer teaching to the demand for skilled labour in industrially driven economies as technology spreads through the workforce (Dede, 2000; Subban, 2006; Dixon, Yssel, McConnell & Hardin, 2014). With this, new types of literacies are essential to continue personal, professional, and academic success. There is an ever increasing need to teach students critical thinking skills, media, and digital literacy (People for Education, 2014). Children have exposure to technology from a very early age, and it is often present in their classrooms from kindergarten. The introduction of iPads, SMART boards, computers, and other assistive technologies help to build a comfort level with technology that students can build upon and teachers can cater to, with the right expertise. As students progress through school surrounded by these technologies, they become accustomed to them and develop confidence using them to complete schoolwork, group projects, and communicate ideas (Smith & Throne, 2007).

2.1 Differentiated Instruction

Differentiated instruction (DI) can be defined as an approach to teaching that advocates active planning for student differences in the classroom (Tomlinson & Imbeau, 2010). It is a strategy that helps teachers accommodate the different ways students learn by planning for their learning experience prior to instruction and respond to variance among learners (Bush, 2006; Edyburn, 2004; Tomlinson, 2000). It enhances the learning experience by accommodating the different ways that students learn. A major difference that sets DI apart from other instructional strategies is that it is proactive, not reactive (Bush, 2006), requiring careful planning and knowledge of your students’ interests. It is not a strategy that assists one student on an IEP, or something that is exclusive to high and low achieving students. DI is an instructional strategy that is embraced on a large
scale to enhance all students’ achievement and enable all students to be successful (Edyburn, 2004). DI is difficult to employ at the start of an instructional term, as it requires the educator to know their students’ learning styles and strengths. This takes time to do and requires the teacher to be attentive to the different individuals that exist within their class. One way educators can accomplish this is through reflection. The role of a reflective teacher is paramount to successfully differentiate (Loughran, 2002). Constant reflection is needed to identify the individual needs of the student according to discrete or observed strengths, weaknesses, and abilities and be cognitive to them in lesson design.

Tomlinson (2000) indicated that it can be difficult to implement differentiation in classrooms, and noted that constant reflection is necessary to provide leadership when differentiating. Reflection is something that informs how teachers can better carry out their jobs, and contributes to their continual refinement of their practice. With specific reference to teaching, reflection has been noted as essential for individuals to comprehend their work, and improve upon it (Loughran, 2002). Reflection is also a method through which educators can examine student needs through observing their strengths and weaknesses. Calderhead (1989) found that reflection should be used in practice to help teachers become more proficient in their teaching as well as consider the moral and ethical conventions within them. Through reflection teachers position themselves to consider the ways in which they teach and deliver content, and evaluate its effectiveness for their pupils.

As noted by Morgan (2014), the need for DI is more important today than ever before given the rate at which the student community is growing more diverse. More opportunities are afforded to students of this generation, and this is reflected through the variety of ways they learn (Dede, 2000). Spending a short amount of time in schools one can observe learning opportunities that exist in the classroom (using manipulatives, discussion, experience, and observation) outdoors, through play, or through hands-on learning. There is a vast amount of resources available to educators to help make learning accessible to students. However, the prospect of choosing appropriate resources can be overwhelming (Edyburn, 2004), and teachers need to make an informed decision that will best serve their students. This is recognized in differentiated instruction, as teachers that
subscribe to this approach do so to ensure they are selecting appropriate resources that maximize student experience and potential (Mills et al., 2014). In addition to resource selection, DI can be implemented by varying content, process, product, or sometimes, learning environment.

Differentiation draws upon socio-cultural theory presented by Vygotsky (Jaramillo, 1994). It outlines the student-teacher relationship as being a critical component in being able to teach to a student’s Zone of Proximal Development (ZPD), which serves as the fundamental basis for differentiated instruction. It is with the ZPD that Vygotsky maintained the importance to assess students’ abilities to solve problems both with and without teacher assistance. Teaching to a student’s ZPD means that the teacher knows what boundaries they are operating within, which allows them to identify and focus on areas where instruction may have to be present. Pupils can develop their ZPD by engaging with an informed adult or proficient peers (Subban, 2006). There is a great deal of variance in students within an elementary setting and it is necessary to acknowledge these differences in teaching (Tomlinson, 2000). Thus, differentiation is a necessary method to facilitate the development of the ZPD and maximize the capability of all students.

Teachers can differentiate in a multitude of ways. The most common ways teachers can utilize this method are differentiating the content, process, or product (Bush, 2006; Tomlinson & Imbeau, 2010; Tomlinson, 2000). Differentiating content refers to what the student needs to learn or how they will access information. Through process one can differentiate how the students will master the content, done through small group discussion, modeling, instruction, etc. Lastly, one can differentiate the product they expect students to create to demonstrate what they have learned (Tomlinson, 2000).

Although not as ubiquitous in the research surrounding DI, another variable that is often considered is the learning environment (Algozzine & Anderson, 2007; Tomlinson, 2010). This can be done by setting flexible guidelines for individual and group work (reading individually, small group, with a partner) and using different seating plans such as table groups or individual seating (Tomlinson, 1999). Another key component to differentiation is ongoing assessment tied to instruction (Tomlinson & Imbeau, 2010). Assessment contributes to making informed decisions that work to establishing attainable
learning goals, and making it constant is beneficial to informing the student and parents of the learning goals. Some methods that are useful to support DI are strength based planning, cross-curricular projects, and student led discussion/conferences (Painter, 2009; Weishaar, 2010). These allow for the teacher to plan for student success through recognizing individual strengths and ensure they are feeling respected and comfortable in the classroom environment (Tomlinson, 2000).

DI requires more thought and effort in lesson design, and many teachers struggle to find the time for this in their schedule (Weselby, 2014). It is important to recognize that it DI does not stand to solely benefit one group of students. It is something that helps create an environment where all learners can succeed by accommodating differences and similarities (Lawrence-Brown, 2004; Subban, 2006). DI is an approach to create an engaging learning experience, respecting students and nurturing them to reach their full potential.

2.2 Digital Technologies in Classrooms & Impacts on Learning

Technology is changing how we live our lives at home, work, and school. Advancements in technology are revolutionizing how we perform tasks, as well as deliver, record, and gain information. In light of this, the prevalence of technology in schools is changing the face of education (Rodriguez, Ooms, Montanez, 2008). There is great deal of online resources available to improve instruction in addition to the integration of digital technologies in classrooms (McCoog, 2007). Proficiency in digital literacy is becoming an important part of education, and involves many types of literacies: information literacy (ability to access, use, and manage information), media literacy (ability to analyze media and create media products), and Information and Communication Technologies (ICT) literacy (capability to effectively apply technology) (People for Education, 2014). For the purpose of this study, digital technologies in schools can be defined as educational games, mobile technologies, interactive displays, blogs, wikis, and desktop computers. A study done by People for Education (2014) illustrates the ubiquity of technology in our lives, revealing that 80% of Ontario elementary principals, “…report students start using computers as an integrated part of their learning in kindergarten” (pg. 1). It is essential to adjust to the implications that the presence of technology has for work, home, and school environments and foster positive
workspaces with digital technologies. The ubiquity of technology forces individuals to build a certain comfort level with it, and this has been reflected in classroom settings (McCoog, 2007). There has been a push to incorporate digital technologies into classroom instruction so as to better prepare students for success and competency in future professional environments (People for Education, 2014).

The use of digital technologies in classrooms offers benefits for teaching as it provides an opportunity for new, interactive instruction that can be used to increase student engagement and access to information (Dede, 2000; McCoog, 2007). A study by Rowlands (2014) speaks to the benefits of digital learning environments by using a particular app, Edmodo. Rowland (2014) describes Edmodo as a free online-based digital learning environment accessible from any Internet enabled device, also available to Android and Apple users. Through Edmodo teachers can establish a secure virtual classroom that is “locked” once all students have signed up using an unique access code (Edmodo, 2015). Platforms like this offer teachers and students a digital environment that they can access at any time of day, which allows parties to ask and answer questions at a time of their choosing (Trotter, 1992). This type of technology allows them to immediately access feedback and engages a tech-savvy generation on their own terms, and alleviates some of the clutter associated with the marking process for teachers (Rowlands, 2014).

Although these would be perceived benefits for many students, it is important to note that every student has a different learning preference. Rowlands (2014) found that when students had a meaningful experience with a resource such as Edmodo they submitted more work, assisted each other with their learning, and instructors were able to provide detailed feedback quicker than they normally would. It was noted through personal experience that teachers enjoyed using digital resources (e-texts) because links to supplemental online resources were maintained, accurate, and relevant. It was also noted that using digital resources reduced cost from an administrative perspective. Instead of purchasing new textbook sets, school could simply pay a reduced licensing fee and offer students access to these resources online at any point throughout their school year. This was perceived as a benefit for teachers who supported the use of digital technologies in their classes. It offered students access to information and resources in a
way they were comfortable with, and allowed them to do so outside of the school in a variety of ways (tablets, computers, phones, etc.) (People for Education, 2014). These avenues reflect the technological learning style that many students are taking to (Dede, 2000). An additional benefit of digital technologies is the ability they offer to provide a valuable learning experience for different learners in the classroom (Moore-Hayes, 2011). The selection of appropriate assistive digital technologies can aid in a multitude of aspects such as reading comprehension, reading, writing, and assessment. Through careful and purposeful implementation, teachers can adapt their instruction with digital technologies to address the needs of students who possess this learning style.

There has been some criticism around the role of digital technologies in the classroom. Eristi, Kurt, & Dindar (2000) found that teachers have a desire to use technology to provide students with an unique learning opportunity, but found a lack of support regarding technology use in their courses. Factors such as the limited number of staff providing technological support at schools, inability to provide teachers with instant support, and physical condition are some things that hinder teachers’ effective use of technology in their courses. Trotter (1992) highlights that a balance needs to be struck between the use of technology and printed matter in classroom instruction. Hands-on instruction with manipulatives is a necessary component in education, particularly in fields such as Science and Mathematics. With this, there exists an issue related to teacher efficacy and digital technology integration (Rodriguez, Ooms, Montanez, 2008; Moore-Hayes, 2011). Although there may be a greater level of comfort using technology in one’s personal life, difficulty remains with integrating this into teaching so that it is understood and accessible to all. Research from Rosenfeld & Martinez-Pons (2005) state that this starts with teacher education and professional development, as programs often do not provide candidates with the necessary experiences to effectively use digital technology in their classrooms. Although teachers may consider themselves quite comfortable using their own computer or smartphone, imparting this technology to students remains an area where teachers feel they do not have adequate training and resources. Many educators express that there needs to be a stronger connection between professional development and the resources available to them in schools if they are to appropriately integrate technology into their instruction (Rodriguez, Ooms, Montanez, 2008).
When surveying students on their learning experiences in digital or hybrid environments, Rodriguez, Ooms, Montanez (2008) found that 47% of students reported that digital learning components of courses were less than helpful. There can be a variety of reasons for this, but Moore-Hayes (2011) argues that unfavorable experiences can often be attributed to lack of teacher confidence and preparedness to select and use digital technologies to support teaching and learning. Another factor that undermines the use of digital technologies in classrooms is access to them, and digital divide created by funding (Dede, 2000; People for Education, 2014). Dede stated that implementing new educational approaches that utilize digital technologies has been challenging due to the cost, upkeep, and knowledge required for use. Some boards also reported lacking the appropriate infrastructure and wireless access to support new digital technologies (People for Education, 2014). This creates a digital divide in the education community, as schools that have access to these technologies are likely to use them and build competencies, whereas schools lacking the access will not have these opportunities (Rosenfeld & Martinez-Pons, 2005).

2.3 Connecting Differentiated Instruction with Digital Technologies

Algozzine & Anderson (2007) state that as classroom needs grow with the onset of more diverse learning styles, educators must find different ways to connect with these learners and differentiate their instruction. There is a major gap in the research discussing the use of digital technologies as a means for differentiation. In light of the pros and cons related to the use of digital technologies in classrooms, teachers can try and foster more positive experiences through a variety of ways that engage learners and provide them with significant experiences in the classroom. As mentioned, the prevalence of digital technologies in our society has cultivated a strong sense of comfort within many people (Dede, 2000). Incorporating the same technologies students see and use at home into the classroom, students feel more comfortable within learning their school environment (People for Education, 2014). Technology has put a world of information at our fingertips, thus engaging many people. It also has a strong role in many students’ personal lives through things such as video games, computer use, or mobile technology. The strong sense of comfort many students have with technology make it a perfect mode of differentiation for teachers and allows them to harness this interest to deliver effective
instruction (Smith & Throne, 2007). It is something students are familiar, confident, and comfortable with, and in many cases would create a more positive learning experience. Things such as online discussion communities, reading and speech assistance programs, and interactive classroom technology are all resources that would work to create a positive learning experience with many students. Smith & Throne (2007) describe that primary teachers can use digital technologies to differentiate instruction and cater to a broad range of learning styles, abilities, and curriculum content. They describe an improvement in student performance when using digital technologies directly support curriculum objectives, group work, integrated into typical daily instruction, as well as improving student performance when applications adjust to student ability and prior experience. Using digital technologies to support differentiated instruction also allows teachers to both give and receive feedback quickly, allowing them to implement constant assessment leading to better learning (Smith & Throne, 2007; Rowlands, 2014). Using technology allows teachers to better capture student interest, and provides a useful component to strength based planning, which is a major proponent in successful differentiation (Painter, 2009; Weishaar, 2010). As described by Weishaar (2010), strength based planning entails incorporating students’ strengths into the planning process so that they feel more comfortable with subject matter, and have an avenue to success in the classroom. Spending time in schools, one can note the familiarity many students demonstrate when using technology. It is a resource with which they have appeared quite comfortable and eager to explore. Incorporation of digital technologies in placement experiences has confirmed that its integration into lessons was well received, and encouraged student engagement, participation, and performance. During centre activities in a Grade 1 classroom students quickly gravitated to activities that incorporated iPads. Through consolidation and a class discussion, some students who often demonstrated learning difficulties were able to elicit a deeper understanding of the material and express this very comfortably. The aim of this study is to further study the gap this and examine the positive effects incorporating digital technologies with differentiated instruction would have on student learning.
2.4 Summary

Differentiated instruction is a crucial approach to accommodate for learner variance in the classroom. It ensures teachers are recognizing the needs of the individual student, and supporting their academic and personal growth through specific instruction (Subban, 2006). The prevalence of digital technologies in today’s society is something that has also received much attention in the world of education. Familiarity with digital technologies is a crucial aspect of education as it becomes more dominant both in and out of the classroom. As it becomes more central, students are developing a learning pattern with technology that is often beneficial to their instruction. My belief is that teachers can utilize this resource to support differentiated instruction and make instruction relevant, accessible, and meaningful to their students.

Therefore, this study will explore how digital technologies are being used by elementary teachers to support differentiated instruction with their students. It will explore the benefits and challenges of including digital approaches to differentiated learning in lesson design, as well as considering whether students benefit from this. A component of this research will also be to study if teachers have noticed students responding to digital technologies instead of other types of learning. Lastly, this study will examine the role reflective teaching plays when planning for differentiated instruction, in hopes of gaining a comprehensive understanding that contributes to more teachers implementing this in their classrooms.
Chapter 3: METHODOLOGY

3.0 Introduction

In this chapter I will explain the research methodology of this study. I begin by describing the overall approach, procedure, and data collection instruments, before detailing in more focus the participant sampling and recruitment. I explain data analysis procedures and review the ethical considerations pertinent to the study. I also identify a range of methodological limitations, as well as strengths. I conclude the chapter with a brief summary of the key methodological approaches and my rationale for these decisions, given the research purpose and questions.

3.1 Research Approach & Procedures

This research study will be conducted using a qualitative approach involving a literature review and semi-structured interviews with Ontario teachers. The nature of the research question and objectives for this study are best suited to a narrative approach, and will draw upon existing literature as well as anecdotal accounts taken from interviews with two classroom teachers. This method affords me the opportunity to report participants’ lived experiences and perceptions (Creswell, 2013). A qualitative approach is well suited for this study given its descriptive nature, emphasis on soft data, concern with process, and involvement of the researcher. This method will help me gain an in-depth understanding on how the use of digital technology relates to differentiated instruction based upon the experience of two classroom teachers, coupled with my own research of related literature.

3.2 Instruments of Data Collections

Effective data collection is crucial to the integrity and validity of the study. The study relied on primary data based on first-hand accounts of Ontario primary teachers. As such, the foremost instrument for data collection in the study was the semi-structured interview. Semi-structured interviews provide the opportunity to hear about participants’ lived experiences (Creswell, 2013) and allows them freedom to express their views in their own terms. These interviews are informal in nature and were guided by a series of pre-determined questions to be covered during the conversation. They were conducted face-to-face, recorded and documented using a digital recorder. Cohen and Crabtree (2006) advocate for this, stating that semi-structured interviews be tape-recorded and
later transcribed as this allows the researcher to develop a rapport with the participants that is essential to this type of interview.

The semi-structured format allowed for the interviewer to design and plan an interview that attended to the research focus and questions, while leaving room for the participants to elaborate and even redirect attention to areas previously unforeseen by the interviewer. The value of this is to promote an organic flow of conversation that will lead to obtaining high quality for the purpose of the study. Interview questions were formulated and ordered in a particular fashion that allowed participants to progress once sufficient background information was conferred. This allowed for more specific questions to be asked once a rapport was established.

3.3 Participants

The goal of my research was to find any connection between digital technologies and differentiated instruction, and to investigate if the use of digital technologies aids teachers in differentiating instruction within their classes. To do this, it was most useful for me to find teachers that were familiar with using both digital technologies and differentiated instruction in their classes. Outlined below are the sampling criteria I established for recruitment along with some possible options to encourage participation. Also included is a section where I will introduce each of the participants and provide some information about them as classroom teachers.

3.3.1 Sampling Criteria

Different criteria were used to ensure I selected exemplary candidates for the interviews. Participants for the study were selected based on the following criteria:

1. Have incorporated digital technology and differentiated instruction in the classroom.
2. Demonstrated leadership and/or expertise relating to digital technology and differentiated instruction in the classroom.
3. Minimum of 5 years’ experience as a classroom teacher.
4. Willing to reflect upon their experience as classroom teachers.

Experience incorporating digital technology and differentiated instruction in the classroom was an important factor to ensure that participants have practical knowledge
regarding this area of study. Demonstrating leadership and/or expertise relating to digital technology and differentiated instruction in the classroom was chosen to ensure that I would receive accurate and legitimate accounts, selecting participants that were confident and comfortable discussing the subject matter. Teachers having a minimum of 5 years’ teaching experience was important because it helped select participants that had practice addressing varying student needs. Given how digital technology has taken more of a foothold in education over the past few years (People for Education, 2014), this criterion may help to illustrate the resulting change in pedagogy. Lastly, participants must be willing to reflect upon their own experiences as classroom teachers. This can be a difficult task for some, as may call to memory some occurrences that were particularly stressful for teachers. However, honest recounts that highlight different situations and experience was a driving force for the study and without it, I would be lacking substantial information required to produce a thorough and insightful report.

3.3.2 Sampling Procedures

Being part of a well-recognized community within the University of Toronto aided in my search for participants. As I was working to become a certified teacher at the time of the study and not yet part of a board or school staff, this community provided me a network within which I could discuss ideas and gain insight from professors and mentor teachers with experience in this subject area. This helped me recruit participants by networking and attending professional development workshops hosted by placement schools. I contacted both participants and provided them with an overview of my research study after identifying that they have fulfilled the selection criteria.

Participants were selected using both convenience and purposive sampling. Purposive sampling (sometimes referred to as judgment sampling) allows the researcher to select participants, as opposed to random selection, using their own judgment and selection criteria. Convenience sampling entails selecting the most accessible interview candidates, and is typically employed in research projects with limited resources (Marshall, 1996), such as this one. Using a combination of both these qualitative sampling methods allowed me to select the best suited candidates for the study with limited resources.
3.3.3 Participant Bios

Linda

Linda has been a teacher in Ontario for 23 years. 16 of those years were spent in special programs, such as a multiple exceptionalities classroom, and teacher-librarian role. The remainder of the years were spent in regular, primary and junior classrooms. In her own school, Linda strives to inform her peers on new types of technologies by sharing info with staff, and coordinating Tech Tuesday workshops, where staff have the opportunity to share what they are using digital technologies for with their class. She strives to incorporate a SMART board, iPads, Microsoft Office, Google Apps for Education, Instagram, and the Internet into her classroom program as a means of instruction and communication with students and parents.

Suzette

Suzette has been a teacher in Ontario for 17 years. Beginning in 1999, she spent 5 years in the classroom and 6 years as a math resource teacher. Following this, she transitioned to administration as a teaching vice-principal who spent some time working in a special education program, and is currently the principal of an elementary school. In these roles, she had the opportunity to integrate many different technologies into her instruction. Having completing her Master’s with a focus on assistive technology, she was afforded the opportunity to put her research into practice, and now can facilitate the use of these technologies as an elementary school principal.

3.4 Data Analysis

Data analysis is a major step within the research process. This step allows me to sieve through interview data and interpret it, identifying major and relevant themes to report on. To analyze the data, interviews will be transcribed then individually coded according to themes and subject matter. Research questions were used as guides for this procedure, and coding aided in identifying themes and topics, as well as divergences in the data. An important component of this step was to also look for null data, things that were not said by participants. One of the things this helps to address is any bias of the researcher; was I anticipating the participant to say something that they did not? Does that affect the data, or study, at all?
Following the analysis of individual interviews, the data was looked at as a whole. This allowed for the researcher to synthesize different themes and report on them. The analysis process concluded with identifying what these themes were, and describing how the participants spoke about them and the significance this holds. This will derive meaning from the data, which is integral to ensure validity and ethical obedience in the research process. It is a means to connect the dots from raw data, to interpretation, and finally representation (Creswell, 2013).

3.5 Ethical Review Procedures

The participants that volunteered to be interviewed for this study were given letters of consent, which they were required to read and sign prior to the interview (see Appendix A). This letter outlined the terms of the interview process and informed the participants how the information obtained through their interview would be used. A copy of the letter of consent was given to each participant, and another retained as part of this study. Preceding the interview, participants were prepared with all the necessary information regarding content, consent, and confidentiality. All efforts were made to ensure the participants’ comfort and willingness to participate in the interview, as well as keeping the collected data safe and secure. Transcriptions from interviews were stored on password protected hard drives to ensure safekeeping, and were not shared with anyone other than the participants, my supervisor, and myself. Participants were assigned pseudonyms to ensure confidentiality and protect their identity.

At the beginning of the interview, I reviewed my research topic with the participant. I informed participants that they could choose to refrain from commenting on any question, review or revise their answers, and that they could change their mind about the use of their data at any point in the research process.

3.6 Methodological Limitations and Strengths

While every effort was made to compose a complete, cohesive study, some aspects of its design and methodology hinder the scope. The nature of convenience sampling is less effective than other techniques available to qualitative research. However, the timeline for completion and available resources made it difficult to have a larger sample size, or be more stringent when selecting participants. Purposive sampling can also pose some issues regarding inaccuracy given its reliance on the researcher’s criteria.
and subsequent sample selection (Jacobs, 2005). Also related to sampling, the limitation of only interviewing teachers was another factor that limited the scope and generalizability of the study and its findings. This study accurately depicts how digital technologies support differentiated instruction based on the accounts of two teachers, and two alone. Opinions regarding this research, as with many subjects, are not unanimous, and would differ greatly among such a large and diverse field, especially when the sample size of which these findings are derived is so small. The inability to incorporate data obtained through classroom observation, questionnaires, or interviews with parents and students would have added a wonderful component to the research.

Despite the limitations discussed, there were several strengths in the research process. Perhaps the strongest aspect of this research process was the semi-structured interview. This method allowed the researcher to build a solid rapport with the participants and have an in-depth discussion regarding the topic and provide a first-hand, personal account in their own words. Interviewing teachers afforded them an opportunity to speak freely about what matters most to them surrounded the research topic (Cohen and Crabtree, 2006). Through practice teaching and delivering content, a key takeaway from teaching is that experience is invaluable. It is not something you can adopt as your own, you have to live it, and if you have not, you stand to gain a great deal studying the experiences of others. In person interviews provided the opportunity to do just that. Another strength of the research was that it gave teachers the chance to reflect on their own experience and explain their rationale for certain pedagogical decisions, building towards a deeper understanding of the topic.

3.7 Conclusion

This chapter has provided an outline that describes how the components of the study work collectively to address digital technology’s support for differentiated instruction. The use of qualitative research methods in the study allows for an inductive approach to tackle the research question, and uses the research as an integral part of collecting data from participants.

Several topics were addressed, beginning with the approach to research, procedures, and data collection. I then discussed my selection criteria for participants, sampling, and recruitment before explaining the data analysis and ethical review.
procedures. Careful consideration was given to ensure confidentiality and the utmost respect for participants and their identity. I concluded by discussing different strengths and limitations found within the methodology.

The following chapter provides a report of the research findings. It will present data analyzed and obtained through the semi-structured interviews with the two participants.
Chapter 4: FINDINGS

4.0 Introduction

Differentiated instruction and digital technologies are two significant topics in the field of education. Interviews conducted for the purpose of this study aimed to harness key components in both fields of research, based on participants’ lived experiences, to examine the interconnectedness of these two topics. In this chapter, I will present and analyze the data obtained through semi-structured interviews with two participants in this study. Participant statements will be organized using four major themes: differentiated instruction to address students’ needs, using digital technologies to enhance learning, implications of differentiated instruction and digital technologies on teacher instruction, and the interconnectedness between the two fields.

Most of the themes materialized naturally throughout the course of participants’ discussions. However, some themes were developed if they appeared integral to understanding the significance of differentiated instruction and digital technologies in Ontario public schools. Information was considered to be significant if it corresponded with other participants’ responses regarding a similar concept or belief. The transcripts for both interviews were coded for commonalities and differences, and the most relevant statements were collated, compared against each other, and grouped according to the four major themes identified from the coding process.

This chapter is comprised solely of findings developed from the interview data. Discussion surrounding the significance of participants’ statements as they relate to the research questions and existing literature on differentiated instruction and digital technologies will be explored in Chapter 5.

4.1 Differentiated Instruction (DI) to Address Students’ Needs

This section describes the participants’ beliefs regarding the usefulness of DI to address students’ needs in their classrooms. This is further explored in four sub themes: benefits of DI, drawbacks of DI, how DI meets the needs of students, and what DI offers to the learning process.

4.1.1 Benefits of DI

In order to understand their perceived benefits of DI, participants were asked to give their definition of the concept. Suzette stated that, “it’s finding out how your
students learn, and hone in on how they learn best. You know, do they learn better visually, auditory, how do they learn best?” In addition to this, Linda said:

Um, so when you are taking a look sort of at their… it’s the things that you do in the classroom to have accessibility for kids so it could be looking at the types of assignments, or assessments. Groupings and all those things that you are doing to gain accessibility so you are looking at the readiness, the learning styles, the interests and then you are taking all of these things into consideration.

These definitions coincided with Tomlinson & Imbeau’s (2010) definition that explains differentiated instruction as an approach to teaching that advocates active planning for student differences in the classroom.

As expressed by Suzette and Linda, the need for teachers to make curriculum accessible to their students is of the utmost importance now more than ever. In each interview participants expressed the stress students face to be successful in school. An increase in learning differences and exceptionalities among the student body make more it difficult to do this. In the vast amount of literature DI is regarded as a fundamental instructional practice necessary to address the variance in students’ readiness to learn, learning styles, and help promote a high level of achievement (Morgan, 2014; Bush, 2006; Subban 2006; Edyburn, 2004; Tomlinson, 2000). Suzette mentioned:

I really try to set the tone in the class that, we’re all here to learn, we all learn differently, and we can all make mistakes, even then I make mistakes. So I think creating that safe environment is important too, is having the kids feel safe and that if they need to come and use, um, some manipulatives, or they need extra assistance, it’s there. And there’s not judgment from the other kids. I think starting that off at a really young age will help hopefully build that self-esteem.

This is an important point that is key to effective differentiation. Teachers must make students feel comfortable in their classroom environment in order to provide effective instruction.
4.1.2 Drawbacks of DI

Although participants spoke very highly of DI, they also outlined some drawbacks to this concept. Linda mentioned:

In terms of DI you need a lot of time, but it’s really that backwards design and knowing your class profile…I think sometimes a lot of the stuff after the fact comes to create that accessibility and then it seems like a lot more work. People think DI is time consuming, but you have to go slow to go fast kind of thing.

This was a valuable contribution to understanding teachers’ perspective, and was later reinforced by Suzette:

I haven’t had a chance to do it yet with my grade 3/4s, DI takes a lot of time, but what I’d like to do, is have them do an assessment. Of, you know, do I learn better visually, auditory, how do I learn and then…kind of like the multiple intelligences. This takes a lot of time, but it pays off later in the year.

The points outlined by Suzette and Linda parallel those found in the research (Weselby, 2014; Subban, 2006; Edyburn, 2004; Tomlinson, 2000). The amount of time it takes teachers to inventory students’ learning preferences leaves little time to cover the curriculum during the beginning of the school year. However, it is important to mention that in both participants’ responses, they still referred to it as a worthwhile strategy. As Suzette outlined, “I don’t think there’s anything that should stop you from using differentiated instruction.” This sentiment illustrates how vital DI is to connect with students and tailor instructional to meet their personal needs.

4.1.3 How DI Meets the Needs of Students

As Loughran (2002) and Calderhead (1989) explain, teaching is a unique profession where educators have the opportunity to develop a special bond with students, and should use this to adapt their instruction according to the students in their class. Subban (2006), as well as the participants in the study, mention that differentiated instruction is an integral component of teaching that helps teachers deliver curriculum to diverse pupils and empower all students to be successful. When describing how DI meets the needs of students, Linda asserted:

I think if you didn’t use it, you wouldn’t be meeting the needs of your kids to be honest. So I think even something as simple as taking their interests into
consideration so you are in a particular community and crickets, you use that. So it isn’t just a curriculum thing that you have, but it’s the hook – it is the content. What are you having that is going to be meaningful to that community? If I had a particular grouping what would be the grouping that is effective? How would you put the students together so that it would maximize the experience?

Suzette offered a similar contribution and provided some context for differentiating the content and process:

Yeah. I mean, the most recent thing I can think of is, um, we were doing a math lesson on counting money, so some kids can’t visually see what they’re doing, so I use the SMART board as an interactive tool to have the money symbols up there. And they’ll come to drag and drop the money to create those values, or even just play money. I had to have one child sit beside me and use the play money to actually count out their values. So, I understood then, that she understood and got the concept of counting money, but she needed the manipulatives. If she didn’t have that, I would’ve thought, well, she doesn’t understand the concept. So, pulling those “archaic” manipulatives.

As mentioned by the participants, specifically Suzette, DI clearly helped her understand which student needed the help of manipulatives to show their understanding of a concept. With this information she is able to modify her instruction so this support is always available for this student, but also for the rest of the class. When consistently used, this can help student take ownership over their learning by having confidence in their abilities and knowing what they need to succeed (Painter, 2009).

4.1.4 What DI Offers the Learning Process

Differentiation draws upon socio-cultural theory presented by Vygotsky (Jaramillo, 1994). It outlines the student-teacher relationship as being a critical component in being able to teach to a student’s Zone of Proximal Development (ZPD), which serves as the fundamental basis for differentiated instruction. It is with the ZPD that Vygotsky maintained the importance to assess students’ abilities to solve problems both with and without teacher assistance. Teaching to a student’s ZPD means that the teacher knows what boundaries they are operating within, which allows them to identify and focus on areas where instruction may have to be present. Pupils can develop their
ZPD by engaging with an informed adult or proficient peers (Subban, 2006). There is a great deal of variance in students within an elementary setting and it is necessary to acknowledge these differences in teaching (Tomlinson, 2000). Thus, differentiation is a necessary method to facilitate the development of the ZPD and maximize the capability of all students.

Much of the research examining DI clearly illustrates that it is a method with which teachers collect valuable information pertaining to planning, instructing, and assessing students (Weselby, 2014; Subban, 2006; Edyburn, 2004; Tomlinson, 2000). Many components of a lesson, or classroom, can be differentiated. Teachers can differentiate in a multitude of ways. The most common ways teachers can utilize this method are differentiating the content, process, product, or learning environment (Bush, 2006; Tomlinson & Imbeau, 2010; Tomlinson, 2000). Linda also articulated this assertion:

It’s really that backwards design and knowing your class profile. You’re trying to plan for 26 kids, it’s not 26 kids, profile your class so you know who you have and what your main groupings are so you know what their main needs are in reading, or math. If you think of that kid, you’re going to hit those 7 kids there, or if you think of this kid you’ll hit those 5 kids. And if you’re doing it with backwards design you’re doing it right from the get-go. You are looking at the process, the product and the content…So they can be accommodations, they can be modifications… it is basically what are you doing to allow kids to have that accessibility to the curriculum.

DI offers a holistic approach to learning that is rooted in a strong student-teacher relationship. It is a method that teachers can use to connect with students and thoroughly understand what they need to be achieve personal and academic success. As Linda mentioned, it addresses what you as a teacher are doing to give students access to the curriculum in a way that works best for them. It does not mean that as a teacher you are always addressing students’ needs on an individual basis. It allows you to facilitate your instruction by identifying the needs of the class as a whole, and incorporating those into your teaching for individual success.
4.2 Using Digital Technologies (DT) to Enhance Learning

This section describes the participants’ beliefs regarding the use of DT to enhance learning in their classrooms. This is further explored in three sub themes: benefits of DT, drawbacks of DT, and how DT meets the needs of students.

4.2.1 Benefits of DT

The use of digital technologies in classrooms offers benefits for teaching as it provides an opportunity for new, interactive instruction that can be used to increase student engagement and access to information (Dede, 2000; McCoog, 2007). In order to understand their perceived benefits of DT, participants were asked to give their definition of the concept. Linda stated:

Sort of that electronic computer component, you know, it can be fairly simple things that you’ve got or right up until computers...so it could be programs and things for accessibility or different stuff like that used for different reasons.

While Suzette defined DT as “anything that’s electronic. iPads, iPods, netbooks, iMacs. As young as grade 3, students already know what digital technologies are, and they’re quite in tune to it and knowledgeable about the different types.”

The role of digital technologies in education, as well as our lives, has become increasing prevalent. With this, proficiency in digital literacy is becoming an important part of education, and involves many types of literacies: information literacy (ability to access, use, and manage information), media literacy (ability to analyze media and create media products), and Information and Communication Technologies (ICT) literacy (capability to effectively apply technology) (People for Education, 2014). It offers students access to information and resources in a way they were comfortable with, and allowed them to do so outside of the school in a variety of ways (tablets, computers, phones, etc.). These avenues reflect the technological learning style that many students are taking to (Dede, 2000). Linda also expressed:

I think it is one of those things, kind of universal design for necessary purposes for some. So then you are not the only kid in the class that is using Premier…funny enough it actually really helped with note taking, and things like that. So it wasn’t such a big deal then, I think just kind of promoting it, well kids like it because now all of a sudden it is unlocking doors. There is greater
engagement, because they are having greater success, so now they can access the curriculum. (Linda)

As the research, and participants described, there is a growing need for digital technologies in classrooms as it becomes more prevalent in young peoples’ lives. It is improving engagement, and augmenting the way things are being done, and teachers have an obligation to prepare students with this if they are to be effective global citizens in the 21st century.

4.2.2 Drawbacks of DT

Rowlands (2014) found that many teachers do not see the perceived added value of technology to education. There has been some criticism around the role of digital technologies in the classroom, as outlined by Eristi, Kurt, & Dindar (2000). Factors such as the limited number of staff providing technological support at schools, inability to provide teachers with instant support, and physical condition are some things that hinder teachers’ effective use of technology in their courses (Moore-Hayes, 2011). Instantaneous access to information through technology can also have a substantial effect on learning, if not used properly, by impeading the inquiry process (Prestie & Smith, 2010). Although there may be a greater level of comfort using technology in one’s personal life, difficulty remains with integrating this into teaching so that it is understood and accessible to all.

Participants spoke to these, and other drawbacks, regarding the use of digital technologies in the classroom. Linda identified:

I think there’s a perception that technology is better, but I’ve seen horrible lessons where the lesson was bad to begin with and technology took it to new levels of being awful. So what’s the purpose of that other than the fact that you were “using” the technology. It really didn’t add anything; in fact, I think it made it worse in some cases.

This is related to what Suzette shared, focusing on the access around DT:

With digital technology, again, it’s the access. If that’s okay, then there shouldn’t be a problem. But you need the access, and you need to know how to use it properly. Without that, it can be very frustrating.

As explained by the participants, there are drawbacks with DT. However, these can be avoided if technologies are used properly and purposefully. Access to technology
and appropriate training was also mentioned, but will be further discussed towards the end of this chapter. As Linda and Suzette outlined, the drawbacks speak more to when DT is used inappropriately rather than the technology itself, when used correctly. Suzette also explained the crucial role digital citizenship plays in the effective use of digital technologies:

So they’re, there’s definitely a digital citizenship component and, if they’re not using it appropriately, then they know that there’s a consequence and there’s a possibility that they won’t be allowed to bring it to school.

This is an increasingly important component to explain when using technology as our online presence becomes more prominent in social interactions, the workplace, and school.

4.2.3 How DT Meets the Needs of Students

Algozzine & Anderson (2007) stated that as classroom needs grow with the onset of more diverse learning styles, educators must find different ways to connect with these learners. The prevalence of digital technologies in our society has cultivated a strong sense of comfort within many people (Dede, 2000). The use of DT has given teachers a wealth of information to facilitate learning with their students. It offers new resources, manipulatives, and methods of assistance to meet the academic, social, and communication needs of the student body, as discussed by Suzette:

I think it keeps a lot of them more focused. For those kids that need that kind of instruction, it’s really working well. Like with SMART board lessons, having those manipulatives with the money, that’s valuable too. And depending on, again, the child’s need…as simple as, if the child is having trouble writing things, teach him how to keyboard properly. Bring that technology in so that he can…better perfect that skill, and then that will help him with his writing.

And echoed by Linda:

And I think for some kids if you don’t have it they will not gain access. Actually that is a lot of the stuff that I am doing now, so for example if you are identified as LD and you can get all your textbooks through arrow and now I can have all my books on memory key, and they are at home. I could have Curswell or Premier…everything could be read; you know all the EQAO questions can be
read any math or whatever. Now I am gaining accessibility. I am unlocking the internet. I am unlocking PDF documents. I have things that I can’t decode this, but I can comprehend this. I am gaining an accessibility that I didn’t have before. The progress that technology has made allow it to be the focal point of a lesson, or a small assistive component, as mentioned by Linda. Some of their needs could require assistive communication technology such as a microphone, or some could require a keyboard to type their answers and be assessed fairly. Incorporating the same technologies students see and use at home into the classroom, students feel more comfortable within learning their school environment (People for Education, 2014). Technology has put a world of information at our fingertips, thus engaging many people. As Smith & Throne (2007) discuss, the strong sense of comfort many students have with technology make it a perfect mode of differentiation for teachers and allows them to harness this interest to deliver effective instruction.

4.3 Implications of DI and DT on Teacher Instruction

This section explains the implications of DI and DT on teacher instruction based on the participants’ experiences. This is further explored in three sub themes: the need for hands-on professional development, teacher efficacy and interest, and access affecting the usage of DT in classrooms.

4.3.1 Need for Hands-On Professional Development

Although teachers may consider themselves quite comfortable using their own computer or smartphone, imparting this technology to students remains an area where teachers feel they do not have adequate training and resources. Many educators express that there needs to be a stronger connection between professional development and the resources available to them in schools if they are to appropriately integrate technology into their instruction (Rodriguez, Ooms, Montanez, 2008). Research from Rosenfeld & Martinez-Pons (2005) state that this starts with teacher education and professional development, as programs often do not provide candidates with the necessary experiences to effectively use digital technology in their classrooms. This sentiment was shared by both participants, and was described to be a significant drawback to using technology appropriately. Suzette closely parallels this when asked about the impacts of professional development (PD) on using DT:
In my role as a teacher-librarian, every workshop that was available, I signed up for, and it’s helping me as a teacher. We need good PD. Sometimes the PD isn’t... what’s the word I’m looking for... authentic. It’s all up here in the sky, and it’s not manageable, and how do we implement it into our classroom? Yes, you’re teaching me all of this, but what if I don’t have access? Sort of, to work out, how does, you know, how does it – how will it best suit me? In some schools, they don’t have the technology to back up the PD. So that’s where it becomes problematic. Creating a link between the two, and having those resources. You know, if we don’t have enough resources, if I ask the kids to bring in their resources, for the most part they have the technology to bring in to assist in their learning. Other communities don’t. We don’t have enough time to play with the technology they’re teaching us.

This sentiment was also found in the research, and describes what I have seen in practice regarding teachers’ views on PD and DT. There is a disconnect between the PD offered and how that technology would be implemented in the classroom that often frustrates teachers. Linda also speaks to this, specifically the need for purposeful PD that is applicable to teachers’ practice, “nothing happens unless you have the training. Every classroom in our school here has a SMART board, but not everyone uses it to the full capacity, or the way it’s intended to be used.”

With more purposeful PD that creates a link between theory and practice, teachers can feel more satisfied in the abilities to prepare students to be global citizens in the 21st century, and expose them to technologies they will need to use in the personal and professional lives.

4.3.2 Teacher Efficacy and Interest

Drawing on participants’ experiences, it is suggested that the PD teachers participate in is influenced by their role. Moore-Hayes (2011) discusses technology integration preparedness and influence on teacher efficacy, and integrating this into teaching so that it is understood and accessible to all. With special education teachers and teacher librarians attending more PD regarding DT as this closely ties in with their responsibilities. Linda suggested that the same cannot always be said for classroom teachers. Teachers may not take interest in PD unless it is specifically required for them
to succeed in their role. In a digital age, it is important that participate in some technology based activities with their students. Linda suggested that PD has to be meaningful to the teacher in their role to generate interest and improve efficacy:

I think you need to see the possibility with stuff, if you have access to stuff, and you see the possibility, then there’s more likelihood that it’s going to happen. A lot of it is time, and seeing that realm of possibility that’s there. But training, absolutely, I think unless you’re saying “this is important for your practice”, it may not be done…What are you actually doing with it and what are you getting out of it? Greater sensibility, making more work to do something that was exactly the same on a piece of paper or activity or something that they did. What’s the benefit of it? I think you have to have that critical eye when you’re looking at stuff. Just because it’s technology, doesn’t mean that it’s better.

With this example, it is clear that purposeful PD will contribute to purposeful use of DT in the classroom, and help identify worthwhile uses of technology. Suzette explained that, “the classroom teacher’s mindset has to be, um, a positive one. Willing to try new things for the students”. She also went on to state that “definitely the parents’ mindset too, and how they feel with regards to having their kids having access to too much technology, because I think, again you need a balance.” This is an important point, as parents’ opinions can affect a teacher’s program and how it is delivered. Additionally, both Suzette and Linda state that it is important to build a network among staff to support the use of DT in various settings, as well as compile strong resources. This can help build efficacy and interest because teachers will learn from each other and see first hand how it is being used in their school environment, by people with the same access as them.

4.3.3 Access Affecting the Usage of DT in Classrooms

Access to DT was a recurring theme in the research and participant interviews. Access to DT has greatly improved over the past 10 years (People for Education, 2014). However, it is still a factor that greatly undermines the use of DT in classrooms (Dede, 2000). Funding can also cause a digital divide as not all boards, and schools, are able to develop their technological infrastructure for things such as wireless networks and updated software.

Suzette speaks to this, “here at our school, because the type of school it is and the community it is, sometimes there’s an overabundance of technology, whereas some
schools don’t have enough to go around.” She mentions that it is frustrating not having access to the same types of technologies she learned about in her PD, and that this has a negative effect on her interest in DT. She mentions that she does not have a problem using DT in a variety of ways, as long has she has access to it. Linda confirmed this, and mentioned that sharing the technology between those that need it and those that would benefit from it can be challenging, “some places I had minimal technology. Although there was always something, sometimes you had students who had special needs, and if they did have SEA equipment it was so much of an issue”. This further illustrates the need for greater access to DT in schools, so that teachers may effectively address the needs, and interests, of students.

4.4 Interconnectedness Between Differentiated Instruction (DI) and Digital Technologies (DT)

This section describes the participants’ beliefs regarding the interconnectedness of DI and DT. This is further explored in three sub themes: what is necessary for DI and DT to work together, how can supports be implemented in the classroom, and teachers’ comfort using DI and DT simultaneously.

4.4.1 What is Necessary for DI and DT to Work Together

Digital technologies are something students are familiar, confident, and comfortable with, and in many cases would create a more positive learning experience. Things such as online discussion communities, reading and speech assistance programs, and interactive classroom technology are all resources that would work to create a positive learning experience with many students. Using digital technologies to support differentiated instruction also allows teachers to both give and receive feedback quickly, allowing them to implement constant assessment leading to better learning (Smith & Throne, 2007; Rowlands, 2014). Increased access and purposeful PD will contribute to greater teacher efficacy, and is necessary for DI and DT to work together. As Linda explained:

I don’t think technology is necessarily the answer for everything. The same way I don’t think that there’s any one resource that is answer to everything. I think it depends, is this general technology of something that you’re using with the class, or is it something that is a little bit more specialized, to really more of the DI thing
that you’ve got there. You need to have a balance of both. Maybe you’re using Edmodo or D2L, Class Dojo, what are you using and why are you using it.

In addition to this, Suzette offered that a positive mindset is instrumental to implement these two strategies. Being adaptable, flexible, and open to feedback will assist in ensuring that instruction using DT is purposeful for the students and teacher alike.

4.4.2 How Can Supports Be Implemented in the Classroom

Choosing appropriate resources is key to the effective use of technology, and differentiation in the classroom. As Linda mentioned, “you could go onto the ministry banks and stuff like that, but just because it’s there doesn’t mean it’s good. Your junk detector has to be out to filter that stuff”. Suzette confirmed this, and spoke to the importance of having clear, effective instruction as a fundamental support for using DT in the classroom. When asked if students could find it difficult to use technology as part of DI, she replied:

If you don’t prepare them properly, yes. When I mentioned to the class we were doing a PowerPoint, some kids looked at me like, “Oh my God we’re doing PowerPoint, I don’t know how to do it”, and it’s like, ok, we’re going to teach you the steps on how to do it. I think definitely having good instruction on how to follow the steps of whatever you’re doing, and then letting them go, and having those supports in place.

Using technology allows teachers to better capture student interest, and provides a useful component to strength based planning, which is a major proponent in successful differentiation (Painter, 2009; Weishaar, 2010). Smith & Throne (2007) describe that primary teachers can use digital technologies to differentiate instruction and cater to a broad range of learning styles, abilities, and curriculum content. They describe an improvement in student performance when digital technologies are used to support curriculum objectives, group work and integrated into typical daily instruction, as well as, improve student performance when applications adjust to student ability and prior experience. These two areas can be supported in the classroom by implementing centres. Centres can be based around students’ learning preferences, one of which can be digital technologies. This can take on the form of several netbooks that students can use
to research topics and share it with the teacher via Google Drive, or a blogging website, or even using an interactive whiteboard to explore geography using satellite imagery. There are endless opportunities to connect these two areas in the classroom, and repertoire can be expanded so that student understanding grows through experimentation.

4.4.3 Teachers’ Comfort Using DI and DT Simultaneously

Based on observations during practicum and participants’ responses, teachers’ comfort level using DI and DT simultaneously is mixed. As Suzette mentions, in her role as a teacher-librarian she, “had exceptional access and was handling the technology all the time, so I was very comfortable. But not all teachers have this experience”. Linda also mentioned that comfort, “depends on what you’re doing and the background you have with it. The extent of some teachers’ comfort level using technology is word processing, excel, stuff like that.” She offers that a network has to be built amongst teachers to build upon that experience with comfortable forms of technology to take some risks, “nothing is perfect, sometimes it doesn’t work, so you don’t want to be so dependant on it”. This is where purposeful PD is important to build efficacy so that teachers are comfortable using DT to varying extents through the differentiation process.

The introduction of iPads, SMART boards, computers, and other assistive technologies help to build a comfort level with technology that students can build upon and teachers can cater to, with the right expertise. As students progress through school surrounded by these technologies, they become accustomed to them and develop confidence using them to complete schoolwork, group projects, and communicate ideas, the same can be said for teachers as they open themselves up to learning about technology (Smith & Throne, 2007).

4.5 Conclusion

This chapter demonstrates how the major findings of the research project support one another in articulating how digital technologies support differentiated instruction. This study uses qualitative research methods in order to gain diverse perspectives, insights, and experiences of individual participants, as well as perform a deep analysis of both digital technologies, and differentiated instruction.

This chapter began with a review of the broad themes of differentiated instruction to address students’ needs, before moving to discussing the use of digital technologies to
enhance learning. Moving to the implications of differentiated instruction and digital technologies on teacher instruction, I subsequently discussed the interconnectedness between the two fields. Both participants expressed the need to address issues regarding access, professional development, and efficacy of digital technologies. The next chapter will connect the literature review and data collected to discuss implications, recommendations, and suggestions for further research.
Chapter 5: IMPLICATIONS

5.0 Introduction

This chapter highlights the research findings and their significance in relation to the literature. Implications of these findings and research will be discussed for the education community, as well as my own practice as an educator. Recommendations resulting from these findings encourage the application of DT as a support for DI within an educational context. A concluding discussion highlights areas for additional research to further examine DT as a support for learning in today’s elementary classrooms.

5.1 Overview of Key Findings and Their Significance

The study was designed to investigate how digital technologies are being used in Ontario classrooms and to consider their suitability in supporting differentiated instruction. Using digital technologies to adapt instruction and assessment methods, as well as lesson design, may help educators to better connect with their students. Pursuant to interviews with two educators who have experience implementing both DI and DT in their practice, analysis revealed four major themes supported by several sub-themes within the data: (1) DI to address students’ needs, (2) using DT to enhance learning, (3) implications of DI and DT on teacher instruction, and (4) the interconnectedness between DI and DT.

The first theme demonstrated how DI is used to address students’ needs in the classroom and what it can offer the learning process. Exploring this theme, it was evident that teachers who take the time to get to know their students, learning preferences, areas of strengths and weaknesses, and interests are better equipped to meet the needs of their students. They are more likely to use this information to inform their practice and foster a learning environment where all students can succeed. This information allows teachers to give students choice and voice in products, materials, processes, and learning environments to support their academic, personal, and social growth. It empowers students and gives them ownership over their learning by making the curriculum more accessible to students. Establishing DI as a means to address students’ needs set a framework within which DT was examined as an avenue to enhance student learning.

Pursuant to this emerged a theme suggesting that using DT enhances student learning. This was very clear in both participants’ responses, and communicated as a
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clear modality that enhanced student learning by providing alternative avenues to established learning goals concept attainment. DT provides an opportunity for new, interactive instruction that can be used to increase student engagement and access to information. Teachers who implement this into their practice are building their students’ information, media, digital literacy and preparing them for success in the 21st century. Barring issues to access, participants expressed that DT has given teachers new, and consistently current, resources, manipulatives, and methods of assistance to meet the academic, social, and communication needs of an increasingly diverse student body. The use of DT and DI each has implications on teacher instruction that were explored in the next theme.

Exploration of both DI and DT revealed implications for teacher instruction. Both participants expressed a significant implication was the need for hands-on professional development. Access to DT and embedding it into teacher education to build teacher efficacy was also deemed as integral to the effective integration of DT and DI as teaching strategies. Implementing authentic hands-on professional development with a clear, practical connection to practice would benefit teachers interested implementing this in their practice. The same can be said for DI, as it was clear that many educators have expressed confusion over how to differentiate throughout different stages of the learning process (process, materials, product, environment). Both participants clearly expressed that if professional development is not clearly connected to their role as a teacher, there is less interest in participating in training. For example, participants communicated that professional development in technology is strongly recommended for special education teachers so that they may use assistive technologies to improve their programs for students with different exceptionalities, whereas teachers of ‘normal’ classrooms do not see the same benefit in this training. Therefore, teachers participate in training that offers clear benefits to their role within the school (assistive technology, communication, interaction with students). In order to engage more educators, the practicality of DT must be communicated so that all teachers can see its benefits to their program and cultivate interest among professionals.

Illustrating the practical benefits of DT to teachers led to the development of the final theme, which highlighted the interconnectedness between DI and DT. This theme
explored DT as a familiar, and in many cases, comfortable, learning tool for students. It bridges students’ interests and harnesses this in a supportive learning environment that allows students to express and receive knowledge in a mode that they are comfortable with. The use of DT can support DI if it is purposefully integrated with the help of purposefully professional development (PD) and increased access. Increased hands-on PD will encourage teachers implement DI and DT to connect with their students and create student centred programs that stimulate inquiry based learning.

5.2 Implications

The findings of this study draw attention to important implications for teacher education and educational reform. This study should serve as a reminder to educators and stakeholders at the board, school, and class level, that teachers must integrate DT in their instruction so students can garner the necessary skills to exceed in the 21st century. Establishing a teaching practice that caters to students’ needs through DI can be supported, and enriched, through the purposeful planning and integration of DT into lessons. Consistent with the findings of Dede (2000), Tomlinson (2010), and Eristi, Kurt & Dindar (2012), the participants believe that DT are an effective support for DI, and one that offers abundant means that cater to the needs of a wide range of learners. Stakeholders from the board to the school level must be mindful of these implications in order to support DT and DI in policy and practice.

This study affords three implications to the educational community. Firstly, the lack of teacher knowledge and willingness to differentiate instruction to suit students’ needs, which results in poor student performance. This performance is not a reflection of the students’ ability or willingness to learn, but rather the ability of the teacher to connect with children and provide them with the skills and resources they need to succeed. This is consistent with findings presented but Subban (2006) and Tomlinson (2000) who stress the power of DI to support a wide range of learners with personal pathways to success. Participants in the study maintain that in order to be effective instructors, teachers must work to connect with students and appreciate their strengths, weaknesses, habits, and interests.

Secondly, educators who do not incorporate DT into their instruction are doing their students an extraordinary disservice. Many teachers forget that their role is to impart
knowledge on students that help them grow and succeed in society. The landscape has changed, and success in today’s economy is largely contingent upon one’s ability to use technology (Rowlands, 2014). Methods of research, collaboration, communication, and reporting are vastly different today in comparison to 10+ years ago. If schools do not reflect this change, where, and when, will students be exposed to it? The lack of involvement of many staff, and administrators, to support this growth is detrimental to the educational community, along with students’ learning. Participants underscored that teachers must seek out opportunities to inform themselves, so they can expose their students to more digital modes of learning in preparation for their futures.

Finally, the study reveals that teachers who do not practice DI or DT simultaneously are missing an opportunity to differentiate and tailor their instruction to students’ needs. Research by Prestie & Smith (2010) coincides with participants’ conclusions that those who implement both DI and DT in their practice are using an area of interest among many students (DT) to support their efforts to personalize instruction (DI). This leads to greater achievement, enjoyment, and a positive mindset towards learning. Teaching is focused around students’ interests and they are able to easily apply knowledge gained to areas outside the classroom when it is communicated in a way that is comfortable to them.

5.3 Recommendations

The implications of this study present several recommendations for teachers, school administrators, and teacher education through professional development. Three recommendations are outlined below:

1. Teachers must demonstrate a willingness to learn about technology in order to incorporate it into their programs. They are regarded as professionals in the field of education who are tasked with support their students’ future success. A large part of this includes connecting with the class in a student friendly way, regardless if this encompasses the teacher’s own strengths. If they remain closed-minded to the benefits technology has on learning in society, they simply will not seek out PD opportunities. Regardless of their role in the school, age, or background with technology, all staff must attend PD sessions (as an in-service by a fellow staff
member, or workshop) that inform them on how to implement DT in their classrooms, particularly as a form of DI.

2. Ministries of Education and school boards should direct funding to improve access to technologies (such as iPads and Chromebooks) will allow teachers to use them in an environment they are comfortable with, such as their classroom. This will help build efficacy that supports purposeful use of DT and student learning for the 21st century. Building, and maintaining, strong education groups in schools is also essential to support teacher use of DT in classes. Staff in the school can serve as subject matter experts to inform colleagues on specific uses of various technologies. This also provides a forum where staff can share technologies and their many uses with each other, building a collaborative learning environment that will offer hands-on, practical, and authentic instruction.

3. Ministries of Education should mandate that a greater emphasis be placed on delivering practical PD that allows teachers to explore technology in the same fashion they would expect of their students. Authentic PD is imperative to demonstrate the purposeful use of technology across all subject areas, and as a means of differentiating for students. Students must see DT as a cross-curricular support, or mode, for learning and understand how to interact with it in a manner that projects success. Teacher education programs must also incorporate a compulsory module that educates and informs candidates on the different types of DT available to them as teachers, and demonstrates how to effectively implement this into their instruction to foster a rich educational program.

5.4 Areas for Further Research

This study has expanded on research in the areas of DT and DI, as well as, highlighted the need for further integration of DT and DI into learning environments. It also explored the benefits and challenges associated with implementing DT and DI in classroom environments. In future practice, it is recommended that research be directed to exploring the legitimacy of digital learning as a ninth form of multiple intelligence. Both participants spoke of digital learning and supports in the classroom as a mode of learning students gravitated towards just as they do kinaesthetically, musically, spatially, intrapersonally, naturalistically, logically, linguistically, or interpersonally. With the
ubiquity of technology in our personal and professional lives it will undoubtedly be a mode of learning further explored in schools, and, as such, a preferred mode of learning for children in elementary settings.

Furthermore, it would be beneficial to conduct research that investigates blending technology with a traditional teaching approach. Looking into incorporating technology into all aspects of the curriculum would help teachers to better understand how to implement this in their practice, without making it the sole focus of their program. This would help cultivate technological learners that still comprehend a traditional approach to research, communication, and reporting.

5.5 Conclusion

The present study is valuable because it reinforces the importance of understanding and acknowledging the significant role digital technologies play in supporting differentiated instruction. The participants in the study recognize the importance that DI plays in accompanying student success, and the benefits DT present to support this. There is precedent to further examine and investigate strategies that support teacher efficacy in both fields by improving teacher mindset, improving access to DT, and employing authentic, practical PD for teachers.

The findings within this study are beneficial to various stakeholders within the field of education, such as, teachers, administration and policy makers. It is crucial that teachers and administrators uphold a positive mindset surrounding the use of technology, and implement it in purposefully to support students as 21st century learners. The data indicates that DI is an extremely effective method to make learning accessible to all and support student learning. Additionally, it is essential that teachers seek out PD related to DT and DI to effectively implement this into their practice. DI can be supported by DT, and the two work harmoniously to support student learning and stimulate all students to achieve success. Teachers are trusted with arguably one of the most important jobs in society. They impart knowledge on children and curate a program aimed, ultimately, to develop academic, social, and communication skills of students. If used purposefully, digital technologies can support this through differentiated instruction, and assist teachers reach every student through engaging programs that cultivate success.
Date: July 23, 2015

Dear Participant,

My name is Stefano Giorgio and I am a graduate student in the Master of Teaching program at the Ontario Institute for Studies in Education (OISE/UT). A component of this degree program involves conducting a small-scale qualitative research study. My research will focus on the use of digital technologies to support differentiated instruction. I believe that your knowledge and experience will provide insights into this topic.

Your participation in this research will involve one 45-minute, which will be audio-recorded and transcribed. I would be grateful if you would allow me to interview you at a time and place convenient for you. The contents of this interview will be used for my research project, which will include a final paper, as well as informal presentations to my classmates and/or potentially at a research conference or publication. You will be assigned a pseudonym to maintain your anonymity and I will not use your name or any other content that might identify you in my written work, oral presentations, or publications. This information will remain confidential. This data will be stored on my password-protected computer and the only people who will have access to the research data will be my course instructor, Dr. Ken McNeilly. You are free to change your mind about your participation at any time, and to withdraw even after you have consented to participate. You may also choose to decline to answer any specific question. I will destroy the audio recording after the paper has been presented and/or published, which may take up to a maximum of five years after the data has been collected. There are no known risks or benefits to participation, and I will share with you a copy of the transcript to ensure accuracy.

Please sign the attached form, if you agree to be interviewed. The second copy is for your records. I am very grateful for your participation.

Sincerely,

Stefano Giorgio
Master of Teaching Candidate, OISE/UT
Phone: (647) 504-3123
Email: stefano.giorgio@mail.utoronto.ca
Course Instructor: Dr. Ken McNeilly
Contact Information: kenneth.mcneilly@utoronto.ca
Consent Form

I acknowledge that the topic of this interview has been explained to me and that any questions that I have asked have been answered to my satisfaction. I understand that I can withdraw at any time without penalty.

I have read the letter provided to me by Stefano Giorgio and agree to participate in an interview for the purposes described.

Signature: ______________________________________

Name (printed): ___________________________________

Date: ______________________
Appendix B: Interview Protocol

1. How would you define Differentiated Instruction (DI)?
2. To what extent do you find yourself using DI in your class? If so, how? Can you provide examples?
3. Based on your experience, do you notice DI to have benefits when you’ve used it with your students? How/how not?
4. Some teachers use Digital Technologies (DT) as one form of differentiated instruction. How would you define DT? [Probe if necessary: Can you give an example of that?]
5. How do you feel about using DT to support student learning? To what extent do you feel that you’ve been trained in the use of DT?
6. Do you use DT in your class, and, if so, can you provide some examples?
   a. How do students respond when you use DT? Do you find it worthwhile in promoting student learning and engagement? Why or why not?
7. What percentage of your colleagues do you believe to integrate DT?
   a. Do you think many teachers are comfortable using DT with their class?
   b. How do you see DT being most useful?
   c. Would increased professional development in DT benefit instruction and enhance student learning?
8. To what extent has DT changed in the last 5 years?
9. Do you see DT as an opportunity to differentiate? Why/not?
10. Do you think students find it difficult to use technology as part of differentiated instruction?
11. Do you find it difficult to use DT as part of differentiated instruction?
12. What conditions do you think contribute to the successful use of technology in the classroom?
13. Could you identify any obstacles that make it difficult to use DI or DT?
References


