Dangling the Carrot: Teachers' Experiences and Practices Integrating Assistive Technology in the Upper Elementary Classroom

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This thesis is accepted in its present form by the Division of Research and Graduate Studies as satisfying the thesis requirements for the degree Master of Education (Inclusive Education)

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Abstract.....vi

Acknowledgements.....vii

Chapter 1: Meeting Michael.....1

The Problem.....8

The Research Plan.....10

Chapter Summaries.....11

Chapter 2- Learning Disabilities, Literacy, Assistive Technology: Connections to Inclusive Education.....13

Inclusive Education.....13

Students with Learning Disabilities.....16

(i)Labelling a Student with a Learning Disability.....16

(ii)Contexts of Education for Students with Learning Disabilities.....17

(iii)Teacher's Role in the Inclusion of Students with Learning Disabilities.....19

(iv)Experiences of Students with Learning Disabilities in School.....22

Literacy and Learning Disabilities.....24

(i)Literacy Practices in Nova Scotia.....26

Assistive Technology and Schooling in Canada.....29

(i)Assistive Technology for Students with Learning Disabilities.....34

(ii)Teachers' Experiences Integrating Assistive Technology.....36

Chapter 3: Methodology.....43

A Social Constructivist Lens.....43

Research Question.....47

The Case Study.....47

Recruitment of Participants.....49

The Participants and their School Contexts.....50

Data Generation.....52

Data Analysis.....54

Chapter 4: Teachers' Experiences with Assistive Technology in Upper Elementary Classrooms.....57

Assistive Technology for Independence.....58

Assistive Technology as a Literacy Practice.....63

Professional Collaboration.....67

Sustainability.....74

i) Time Commitment.....74

ii) Access to technology.....77

iii) Collegial Acceptance.....79

Chapter 5: Implications and Conclusions.....82

Assistive Technology as Tools for Universal Design for Learning.....83

Professional Resources and Supports for the Implementation of Assistive Technology…88
Collegial Resistance to Assistive Technology 90
Conclusion.....93
***References*.....95**
***Appendix A*.....111**
Interview Questions.....111
***Appendix B*.....112**
Introductory Letter.....112
***Appendix C*.....113**
Formal Explanation Letter.....113
***Appendix D*.....116**
Informed Consent.....116

Abstract

The aim of the study was to examine the experiences and practices of upper elementary teachers using assistive technology for their students with Learning Disabilities in the classroom. Data for this study was generated through observations and interviews with five teachers, all employed with the District 7 School Board in Nova Scotia. Four themes emerged from the data. These include the use of assistive technology for fostering independence, its use as a literacy practice, the role of professional collaboration in implementation of assistive technology and questions regarding its sustainability. There are several implications of the findings. There is a need for educators to become more familiar with Universal Design for Learning framework as a method for planning. Also, to use assistive technology in the classroom, additional resources and supports need to be put in place. Finally, the definition of literacy needs to be re-examined at a provincial level to reflect the various ways possible to achieve literacy.

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To Michael, you have taught me more than you will ever know. I feel honoured to have been your teacher. Thank you for sharing with me your experiences. I hope I have helped you along your way.

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Chapter 1: Meeting Michael

I completed my public education after inclusive education had been introduced. However, I was a student in a late French Immersion program which limited enrolment to students meeting specific criteria- there were no students in my class who struggled academically. Without experiencing an inclusive class climate, I believed all students in school just "got it" when it came to learning and if they did not I had no idea what happened.

In an undergraduate course in childhood psychopathology, I had some exposure to definitions of learning disabilities and their potential impact. However, upon reflection, my knowledge was at a clinical categorical level and did not take into account the impact a learning disability would have on a person when it came to academics or in real world contexts. My true understanding of learning disabilities developed during my teacher education program, as I had students' with learning disabilities in my own classes and in my practicum placements. It was through conversations with my peers who were Learning Disabled that I was first exposed to assistive technology for students with learning disabilities. These first experiences with assistive technology use in a post-secondary classroom made me wonder about several key elements of what constitutes an education, such as completing assignments and assessments.

I gained a deeper knowledge of the interconnections between assistive technology, the label of learning disability and what constitutes literacy when I started my teaching career and met an elementary student named Michael. The summer before I began working with Michael as his Resource teacher, I reviewed his cumulative and other confidential files in order to gain an understanding of his learning needs. His school

records indicated he was very bright, extremely articulate and had an extensive general knowledge base. In addition, he was eager to share information and participate in class.

However, all teachers noted that he was easily frustrated when presented with work requiring reading and writing. Activities demanding reading and writing frequently triggered outbursts, including the throwing of a computer screen in grade one and running away from school in grade two. Michael experienced high levels of anxiety requiring therapy sessions from first grade on. He received pull-out remedial instruction in school starting in grade Primary, including weekly speech therapy and daily resource teacher support.

Since Michael's diagnosis with a Learning Disability, he has received private tutoring for phonological awareness skills which required him to leave school daily between recess and lunch. All of these interventions meant that he was missing both his recess and lunch playtime along with his class time for Language Arts. In addition to the private tutoring, there were reports from a variety of other programs and services that his family had sought outside of public school time to assist Michael in developing literacy skills.

Michael's Psycho-educational Assessment completed at age seven was one of the most revealing pieces of information for me, not so much for the diagnosis or the profile of his strengths and weaknesses but because of the notes regarding Michael's comprehension of his abilities. Michael explained his learning in the report as "I have a very big brain, but it's malfunctioning for reading; have to get in there and fix it…needs screws or a new hard drive." He referred to the need to fix the problem again during the testing. "I think there is something wrong with the software in my head, need a

screwdriver to get in there and fix it or something". The psychologist also noted that Michael said several times during testing "I can't read." and "I can't write real words." It was these words indicating his own view of his academic abilities that made me begin to question if we (as a school community) were meeting his needs and providing him with the right supports and if the education system as a whole was structured properly to meet the needs of students with learning disabilities.

The year I began working with Michael he entered a multi-grade classroom to begin fourth grade. His teacher quickly reported Michael was not completing work in a timely manner and was resistant to completing all assignments. Similarly, during Resource time I noticed he was ready with responses orally. However, handing him a pencil resulted in him shutting down. I felt I was making very little progress and began using the Resource time to develop a rapport with him and to gain further understanding of his situation and experiences, rather than pushing remediation strategies. Through our discussions, Michael began to open up about his frustrations with school and the pressure he was feeling to 'fix' his learning differences, both at home and at school.

After discussions with his classroom teacher and parents, we developed Individual Adaptations to support his learning. These included assistive technology programs to scaffold his reading and writing. The use of assistive technology was based on recommendations from the school board's Assistive Technology Specialist. Assistive technology as an adaptation is defined as any tool which supports student learning for either compensation or remediation of a particular task or skill set (Nova Scotia Department of Education, 2006).

Michael's assistive technology recommendations included the use of remediation software programs such as *Simon Sounds It* and *WordMaker,* along with compensation programs such as *Draftbuilder, Co-Writer, Kurzweil* and *Start to Finish Books*. The programs recommended supported both reading and writing in the classroom environment. As a school-based planning team, we decided to focus on instructional accommodations that would help Michael achieve across all areas of the curriculum. His parents understood assistive technology and were eager to support its use. However they also were still searching for ways to remediate his learning differences including special filter glasses along with extensive and costly tutoring programs that consumed his evenings, weekends and vacation time.

The plan of action within school was for me as the Resource teacher to introduce the literacy support technology programs and have him gain confidence in using them before they were integrated into all subjects, including Language Arts. The reality of implementing the agreed plan, however, was much more challenging. Michael quickly gained confidence with the literacy support programs and was keen to use them. However, the classroom teacher refused to have the literacy support software programs used in her room and would not assess any assignments completed using assistive technology for Language Arts. In my conversations with the teacher, she expressed concern the assessments would not accurately reflect his abilities, since assistive technology was used. Michael's teacher found it difficult to accept the role that the computer technologies were playing in his literacy development. I could not comprehend her perspective on the contribution of assistive technology because, in my opinion,

Language Arts was about all facets of literacy, not just isolated skills like decoding or standard spelling.

The tension between Michael and the classroom teacher became extremely high. He experienced success using assistive technology during Resource time, but was not permitted to use it with his 'real' work. Also, the 'fix' programs his parents were accessing were providing him with limited gains. As Michael's classroom outbursts and referrals to see the administration of the school about his behaviour accumulated and my discussions with the teacher made little progress, I began to question how a school system could sustain such a discrepancy between stated Department of Education policies that promoted a role for assistive technology in literacy and the current practice of teachers refusing to consider the use of assistive technology as a legitimate pathway to literacy. What supports would need to be in place for teachers to be willing and able to effectively support students with learning disabilities using assistive technology in elementary classrooms? When Michael's fourth grade year ended, his report card showed no signs of growth according to his classroom teacher in Language Arts and notable declines across all other subject areas. A different reality was shown by the work he completed in the resource room and my assessments. According to my records, Michael had made huge gains and had displayed phenomenal growth across all academic areas using his literacy software supports. Unfortunately, this work and growth did not count in the eyes of his teacher, which made me question who's account of growth should really count.

It was during his grade four year that Michael read his first 'real' chapter book, "Tales of the Fourth Grade Nothing", using a text-to- audio software program which

converted a scanned copy to the book into audio format and read it to him while he followed along the highlighted words on the computer screen. When reading the book he would laugh out loud at different situations and was very eager to share the events of the book with me and his parents, often pausing while reading because he just had to tell what was happening. He was extremely proud of his accomplishment and went on to read the rest of the series, along with several other books his peers recommended to him, using his literacy software supports. At the end of the year, Michael asked to have several books scanned and stored on his mp3 player to read over the summer. When he returned in the fall, he had read nine books and had a list of several more he wanted to read. His mother was very proud and reported that for the first time ever Michael had asked to purchase novels. His change in attitude toward reading and his successes using the assistive technology prompted his parents to purchase assistive technology software for literacy support at home and to stop the additional remediation programs at the beginning of grade five.

Michael's fifth grade experience was drastically different from his fourth grade one. I became his classroom teacher and a computer with the assistive technology literacy software entered the classroom and became a part of the technology in the room. Audiobooks and mp3 players became part of the norm in the room and were available to everyone. Michael used various assistive technology tools for literacy support throughout the year. Michael had no office referrals and very few outbursts. His confidence had noticeably improved as he was eager to participate and complete assignments and activities in class. His report cards for fifth grade noted a strong progression in skill development, along with excellent progress across subjects.

In sixth grade, Michael continued to have me as his reading teacher while two other teachers covered the core curriculum areas, including writing. While he did use assistive technology for reading, the use of the assistive technology for literacy support across the other areas did not occur. His writing teacher described him as "lazy and uncooperative". Michael became frustrated with the discrepancy between what he knew he could do and what he was able to produce without literacy support tools. Michael's success with assistive technology as a literacy support tool in the classroom in fifth grade and the Resource room left me wondering what an inclusive classroom would be like for students with learning disabilities in regards to literacy practices. Also, I wanted to know what further roles assistive technology could play in the development of all-embracing literacy practices for students with learning disabilities.

Based on my experiences with Michael, I have come to believe that the level of responsibility and engagement demonstrated by classroom teachers is a critical variable in the successful integration of assistive technology in the classroom. As such, in my job as a Resource teacher, I work with both students and their classroom teachers to ensure successful technology integration for both the students and educators. I have experienced varying degrees of success and resistance with assistive technology implementation amongst my colleagues. This has led me to question: 1) Why do some teachers resist using assistive technology for activities involving literacy for students with learning disabilities? 2) What can the educational system do to support and promote assistive technology use for students with learning disabilities? 3) Are students with learning disabilities being given access to education in the ways that are the most effective for

them? 4) What are the effective practices of teachers successfully using assistive technology for students with learning disabilities?

With these questions in mind, I began to formulate a problem for a research study which would address and respond to my questions in hopes of developing a sense of why assistive technology is used only by some teachers and resisted by others.

The Problem

Inclusion means having access to education in ways that work for all students and although policies and best practices have advocated inclusion for over two decades, the reality is that many classrooms are not accepting of the needs of all students, due to the practices and beliefs of the classroom teacher for a variety of reasons (Loreman, 2010; Thomazet, 2009). One group who experience barriers to learning in a classroom are students with learning disabilities (Whitley, Lupart & Beran, 2007). Students with learning disabilities do not usually have visible differences, nor do they tend to have significant behavioural needs and as a result they are frequently overlooked by classroom teachers when they are developing and implementing programming for their classroom (McGhie-Richmond, Underwood & Jordan, 2007). Many classroom teachers justify their lack of programming to meet the needs of students with learning disabilities by noting that the students do well in some subjects or that the student's limited success is due to their lack of effort or ability rather than the teacher's practices of and for learning (Almog, 2008). My experiences working with some of Michael's teachers highlight how some teachers overlook students with learning disabilities or use of assistive technology to justify their programming decisions.

Reading and writing are the two core components of a Language Arts classroom and are frequent barriers for students with learning disabilities. Teachers generate definitions and measures of literacy which guide how material is presented and assessed within their classroom. Michael experienced rigid definitions in both fourth and sixth grade when teachers limited his literacy development to what he could do independently and in isolation. However, not all classroom teachers are employing such traditional and rigid definitions of literacy. Teachers with more flexible or progressive definitions of literacy, those that encompasse the use of technology in the reading and/or writing process, need a voice in the academic literature.

The diversity of assistive technology available to students with learning disabilities has ballooned over the last decade. However, its effective use within the inclusive classroom has received little attention in the research literature (Alexander & Slinger-Constant, 2004; Edyburn, 2003). While the majority of today's classrooms have several computers available that are frequently used for learning activities, the use of specialized programs for students with learning disabilities is still a separate sphere and this instructional separation may be a barrier in itself to learning for both the students and teachers. The experience of my student Michael throughout upper elementary school highlights the struggle for consistent assistive technology implementation. Finding effective ways to integrate assistive technology into an inclusive classroom for students with learning disabilities is a challenge for classroom teachers. Further investigation is required because assistive technology implementation is interconnected with the overall students' learning experience and the degree of literacy success they may achieve both in school and the 'real' world (Alexander & Slinger-Constant, 2004; Sze, 2009).

Gaining insight into the relationship between definitions of literacy and inclusive classroom practices could be significant to understanding why some teachers are more willing to implement adaptations which involve assistive technology for students with learning disabilities and others are not.

My study focuses on how classroom teachers' experience of and practices with integrating assistive technology in their upper elementary Language Arts classrooms relate to their definitions and practices of inclusive education in the District 7 School Board. This particular school board was chosen because it is known within the province as a leader in assistive technology and has an Assistive Technology Centre that employs a specialist with numerous awards for innovation within the assistive technology field.

The Research Plan

There are a relatively low number of studies which examine teachers' experiences integrating any form of assistive technology in a classroom. There has been a great deal of literature devoted to measuring the efficacy of various assistive technology programs for students with learning disabilities. However, there is a gap in the research between studies of the efficacy of assistive technology programs and studies that document the actual experiences of teachers implementing assistive technology programs. I hope to bring to the forefront of discussions practices being used by teachers to integrate assistive technology in an inclusive environment and create a dialogue that shares elementary teachers' experiences.

In order to examine the role of the classroom teacher in integrating assistive technology for students with learning disabilities in a specific school board in Nova Scotia, I first reviewed assistive technology guidelines from the Nova Scotia Department

of Education. I then compared each school board's practices and policies related to assistive technology and, where available, documented assistive technology practices for students with learning disabilities. I examined these practices and policies to become more knowledgeable of the assistive technology contexts for students with learning disabilities at all levels in the public education system of Nova Scotia. I then conducted classroom observations and interviews with five elementary Language Arts classroom teachers in a specific school board. Classroom observations with each participant were conducted by the researcher during Language Arts periods, with field notes taken. In the interviews, the classroom teachers were asked about their own experiences integrating assistive technology, their exposure to educational opportunities for assistive technology, and their concerns regarding assistive technology for students with learning disabilities.

Chapter Summaries

The experiences and practices of teachers implementing assistive technology for students with learning disabilities at the elementary level is explored and discussed in the following order:

Chapter 2 examines the experiences and contexts of education for students with learning disabilities in current research literature. In addition, key findings and current issues related to literacy practices and assistive technology are explored.

Chapter 3 presents the social constructivist methodology as the framework for the research study undertaken, including its design, questions and participant selection. In addition data analysis procedures are described.

Chapter 4 summarizes and analyzes the data generated through the presentation of emergent themes.

Chapter 5 provides a discussion of the data analysis in relation to current literature findings and draws a conclusion to my research question through a reflection of the findings of this research in conjunction with the current literature.

Chapter 2- Learning Disabilities, Literacy, Assistive Technology: Connections to Inclusive Education

Inclusive Education

Grasping the context of assistive technology use within the Nova Scotia school system requires a brief review of the history of inclusive education in Canada, and specifically Nova Scotia. The strategies and practices employed for educating all students have changed over the course of public schooling and consist of phases of exclusion, institutionalization, categorization/integration, mainstreaming and inclusion (Thomazet, 2009). The term inclusion, which emerged in the mid-1980's to mean the integration of students with special needs into general education classrooms with limited to non-existent remedial teaching outside the main classroom, began to gain support as a practice in the 1990's (Thomazet, 2009). The declaration from the World Conference of Special Education in 1994 which called for inclusion (in terms of student program and placement) to become the norm increased support and policy development of inclusive practices in Canada (Winzor & Mazurek, 2011).

In Nova Scotia, the Special Education Policy was introduced in 1996 to legislate the full inclusion of all students in the regular classroom with an emphasis placed on the philosophy of "only as special as necessary". The "only as special as necessary" philosophy shifted how educators addressed meeting the needs of all students by having teachers find the most minimal but effective support to meet the needs of each student's potential. Further evidence of Nova Scotia's commitment to all encompassing practices is provided in the goals of inclusion found in The Nova Scotia Special Education Policy (2008), which states:

> To facilitate the membership, participation, and learning of all students in school programs and activities. The support services that are designed to meet students' diverse educational needs should be coordinated within the neighbourhood school and to the extent possible, within grade level/subject area classrooms. (p. 5)

In addition, school boards in the province have developed further policies and philosophies related to inclusive practices. For example, District 7 School Board states their philosophy regarding inclusion:

> The [District 7 School Board] is committed to the philosophy that every student, regardless of individual differences, has the right to an appropriate public education which aims to develop to the fullest extent possible, each individual's abilities, talents and skills. To this end, the school shall attend to the cognitive, emotional, social, and physical development of each student, believing that every person is a contributing member of the larger community. The District 7 School Board believes and recognizes that students differ in their learning needs, and endorses that all students have the right to have those needs met in the most inclusive educational environment appropriate to the needs of the student.

Although the Nova Scotia Department of Education, along with each school board, has emphasized the main principles of inclusive practice in policies and philosophy statements, Special Education services for students with disabilities in Nova Scotia have not disappeared. Strategies employed to meet students' needs have become more diverse and reflect the need to have the most appropriate environment for the student. Strategies and practices schools employ consist of individualized and small-group pull-out by a variety of professionals such as Resource teachers, Speech-Language

Therapists and Severe Learning Disabilities Specialists. There is an integration of paraprofessionals (Teacher Assistants) in the classroom and the introduction and integration of specialized equipment, such as assistive technology, in the classroom (Little & Weber, 1991).

Along with the changes in special education services, the roles and responsibilities of educators involved with students with special needs have evolved. Now, not only the resource teacher (formally titled the special education teacher), but also the classroom teacher and administration of the school, have taken on responsibilities to educate all students. The shift in student-focused programming and outcomes reflects the principles of inclusion and are highlighted in the District 7 School Board's policy, which describes all members of the student's team as having a role including classroom teachers, resource teachers and administration.

Although the term "inclusion" is now commonplace in Nova Scotia schools, the question remains regarding the educational experience of students with learning disabilities and the degree to which they experience full participation in the classroom. What follows is an examination and discussion of current literature in relation to labelling a student with a Learning Disability, the context in which they receive their education, the teacher's role in the inclusion process, and most importantly the documented schooling experiences of students with learning disabilities. An argument will be developed regarding the current practices and experiences of teachers and students with learning disabilities.

Students with Learning Disabilities

(i)Labelling a Student with a Learning Disability

The research descriptions of students with learning disabilities utilize various terms to detail their learning profile. Commonly, the students are categorized as having unexpected underachievement along with learning and behaviour patterns that do not correspond to expected achievement based on measured intelligence (Kavale, Spaulding & Beam, 2009). Researchers in the field of medicine, psychology and education constructed the categorical label of "Learning Disability" and the origin of the term was attributed to a conference presentation given by Dr. Samuel Kirk in 1963 (Danforth, 2009). According to Danforth (2009), a solid foundation of research established the field of learning disabilities as being a deficit focus on psycholinguistics, sensorimotor and perceptual skills within the central nervous system. A learning disability was defined in the beginning as a psychological disorder. Today, the variation in definitions can be noted between various stakeholders such as clinicians, advocacy groups and government departments such as education.

In Canada, there is not a nationally agreed upon definition of what constitutes a learning disability within educational contexts. Instead, each province determines its own definition. The purposes of the definitions are to assist in the identification of students with learning disabilities and the allocation of specialized resources within the education system (Kozey & Siegel, 2008). Since provinces and territories are each responsible for their own education system, definitions employed vary greatly throughout Canada (Klassen, 2002; Kozey & Siegel, 2008; Wiener & Siegel, 1992). In Nova Scotia, the definition of what constitutes a learning disability is being revised to contain

reference to the Learning Disabilities Association of Canada's definition presently being used by all school psychologists across the province (Baerts, Personal Correspondence 8 Feb., 2011). Under the Learning Disabilities Association of Canada's (2002) definition, a learning disability is a "result[s] from impairments in one or more processes related to perceiving, thinking, remembering or learning" (Online). Furthermore, the definition emphasizes a learning disability as being lifelong, with variations in how it can be expressed based on the environmental demands.

The identification and labelling of a learning disability for a student, however, does not mean the same educational experience for students with learning disability label will occur, rather, it means that each student will still have unique interactions and experiences filtered through their diagnosis and application of policy by their teachers. How students with learning disabilities are involved in the learning process is reflected through examining the contexts of education found in policies and academic research literature.

(ii)Contexts of Education for Students with Learning Disabilities

The context of the education of students with learning disabilities has changed over the decades as the movement towards inclusive practices has gained strength throughout North America. In the United States, the shift to inclusive practices is found in the Individuals with Disabilities Act (IDEA) under the provision of being educated in the least restrictive environment. However, this provision has been described as an illusion, as many students with learning disabilities continue to be educated in special classrooms or programs across the United States (McLeskey, Hoppey, Williamson & Rentz, 2004). In Canada, there are no federal regulations related to educational practices

for students with learning disabilities; however, the Canadian Charter of Rights and Freedoms does protect all citizens and their right to equitable education through Section 15, which promotes the provision of all services available to all Canadians regardless of disability (Government of Canada, 1982).

Kozey and Siegel's (2008) review of provincial policies regarding learning disabilities noted that only Ontario and Quebec have actual legislation regarding learning disabilities' definition within their Education Acts. Other provinces have policies related to learning disabilities through various documents issued through their respective Ministries of Education, which are interpreted by each board or district regarding how services are implemented (Kozey and Siegel, 2008). Nova Scotia's response to providing programming for students with learning disabilities has largely relied on development of the Severe Learning Disabilities Program. The Severe Learning Disabilities Program has specific criteria in place for eligibility and the eligibility is interpreted by each school board differently, with the result that the student supports are implemented in a variety of ways across the province. For example, the South Shore Regional School Board Severe Learning Disabilities program provides direct service for one year at the middle school level and works on a consultative basis at the elementary and senior high school levels (South Shore Regional School Board Student Services Department, 2010).

Research supports the need for students with learning disabilities to be educated within the classroom with pullout time provided for intense intervention for limited times (McLeskey et al. 2004). The format described is used to various degrees across Canada and is a key component of the Severe Learning Disabilities Program in Nova Scotia, which places emphasis on students with learning disabilities, especially at the elementary

level, being placed in an inclusive classroom environment for the majority of their day. The value of students with learning disabilities being in an inclusive environment has been greatly explored in the literature over the last two decades; however, there are no clear conclusions to be drawn from the research (Chmiliar, 2009).

Provincial policies and research provide the framework for the experience of students with learning disabilities in the classroom. However, the actual experiences of students with learning disabilities are greatly influenced by the educators responsible for their education.

(iii)Teacher's Role in the Inclusion of Students with Learning Disabilities

As provinces and school boards across Canada have adapted to a more inclusive approach to education, the numbers of students with learning disabilities present in elementary and middle school classrooms is increasing. However, information regarding the experiences and attitudes of educators who are teaching students with special needs, and in particular students with learning disabilities, is limited in the literature. Whitley et al.'s (2007) examination of the teachers' perceptions of students with learning disabilities revealed a significant difference in comparison to their perceptions of their non-Learning Disabled students. Teachers reported having lower educational aspirations for students with learning disabilities. They also believed students with learning disabilities put forth less effort in their work, and had parents who were less involved in their school experience. These perceptions of teachers may lead to the exclusion of students with learning disabilities.

A clear definition of inclusion is based on principles that "value diversity and recognize the right of every pupil to study and experience a sense of belonging" (Almog,

2008, p. 37). However, for the spirit of inclusion to actualize and be effective, it is the role and attitudes of the educator in the classroom that must be closely examined. Edmunds (2003) found classroom teachers to have positive attitudes toward inclusion. Additional research suggests that teachers tend to be more supportive of including students with physical and sensory disabilities over those with learning difficulties (Lindsay, 2007). The preference is echoed in classroom teachers' description of having students with learning difficulties in their classroom as challenging due to a variety of issues, such as a lack of resource support, the prevailing community culture, along with the teacher's own general preparedness and training to educate a student with learning difficulties (Whitley, 2010).

Teacher efficacy is consistently attributed as having a role in the degree a teacher embraces and influences an inclusive classroom. Teacher efficacy is defined by Whitley (2010) as being how the teachers perceive their competency in regards to classroom management and facilitating academic growth by all their students, with a higher measure corresponding to more inclusive and effective approach to education.

Over the last decade, several investigations have been undertaken to examine characteristics and skill sets found in teachers successfully practicing in inclusive educational settings (Edmunds, 2003; Loreman, 2010; Titone, 2005). Loreman's (2010) review of the literature describes nine key areas which are essential for successful implementation of an inclusive model by an educator. The nine skills and their respective subskills are: knowledge of inclusion and respect for diversity, collaboration skills with colleagues and parents, fostering of a positive environment, planning and conducting lessons in an inclusive manner, and engaging in meaningful assessment and lifelong

learning. Although these skills are noted as being required for successful implementation of inclusive practices, there is a "gap between the desirable and the feasible in all that is connect[ed] to teaching included pupils" (Almog, 2008, p. 51). Almog (2008) notes in his review of the literature that implementing adaptations for students with learning disabilities is generally accepted. However the reality is that teachers tend to actually implement adaptations which require little preparation or change in practice. Further evidence of teacher's hesitancy to make adaptations for an inclusive environment for students with learning disabilities is reflected in pre-service teacher's, reports of their experiences with practicing teachers during their work placements. Pre-service teachers reported that many of them did not make modifications to the curriculum and expressed the view that they did not have the knowledge to meet the needs of a student with learning disabilities (Woloshyn et al., 2003). The disconnect between best and common practice leads to many teachers feeling frustrated and reporting lower self-efficacy scores, which further results in less inclusive practices for students with learning disabilities (Almog, 2008; Whitley, 2010).

The role of teachers in creating the learning environment for all students, and especially those with learning disabilities, is complex. Teachers create the classroom climate, select the presentation of material and determine how students will be assessed. Through the process of educating students, teachers also bring their own personal beliefs and biases. The interaction of the specific classroom contexts and teacher practices directly influences the schooling experiences of students with learning disabilities.

(iv)Experiences of Students with Learning Disabilities in School

Many students with learning disabilities struggle with developing and maintaining social relationships due, to their inabilities to recognize and manage their own emotions and recognize strengths and areas of need in a relationship (Bryan, Burstein & Ergul., 2004; Elias, 2004). Although research suggests that specific interventions may moderate the degree of socio-emotional difficulties experienced by children with learning disabilities, a common experience for these children with learning disabilities is to have a limited number of positive sustained social relationships (Elksnin & Elksnin, 2004; Estell, Jones, Pearl, & Van Acker, 2009). Teachers' ratings of social skills for students with learning disabilities are significantly lower than non-Learning Disabled students and contrast with scores of students with learning disabilities perceptions of their own abilities (Whitley et al., 2008). Within the school setting, social relationships at the elementary level have been directly linked to positive academic achievement, meaning it is important for students with learning disabilities to have early and effective explicit interventions to teach relationship building skills (Walker & Nabuzoka, 2007). The reality is that students with learning disabilities frequently do not receive socio-emotional interventions at the elementary level because the priorities of teachers are on developing compliance skills to assist with classroom management, rather than each individual's socio-emotional skills, which points to the need for school counsellors to be involved at part of a team approach for students with learning disabilities (Bryan, 2005).

Children with learning disabilities experience more behavioural problems both within the academic and real-world contexts, in comparison to their peers (Yu, Bucka, McCormick, Fitzmaurice & Indurkhya, 2006). However, the degree of behavioural challenges varies greatly based on the type of learning disabilities, interventions

experienced and comorbidity of learning disabilities with other conditions (Yu et al, 2006). Greenham's (1999) review of research notes that few studies have been completed to clearly explain the links between behavioural problems and learning disabilities. Many researchers, school psychologists and counsellors have attributed behavioural issues in the school setting to the frustration students feel toward the successful completion of tasks in the classroom and their struggles with understanding socio-emotional contexts of the school as a social system (Greenham, 1999).

The academic experience of children with learning disabilities has been well documented in the literature over the last several decades (Karande, Mahajan & Kulkarni, 2009; Whitley et al., 2007). Frequently, research suggests children with learning disabilities have similar attitudes toward academics as their peers throughout elementary school; however, their experiences are often described as being negative due to the academic demands and the environment in which the tasks are presented (Lazarus & Callahan, 2000; Specht, Howell & Young, 2000; Whitley et al., 2007). Lackaye and Margalit (2008) explored the experiences of students with learning disabilities in comparison to their non Learning Disabled peers in both middle and high school and found that students with learning disabilities reported higher levels of loneliness and stress beginning in the middle school years, due to the transition to a more demanding academic environment. Similar levels were also reported at the high school level for these students. The disconnect between attitudes towards school and experiences within the setting results in adolescents with learning disabilities frequently reporting higher levels of dissatisfaction with their schooling experiences and having a higher drop-out rates, both in Canada and the United States (Scanlon & Mellard, 2002, Whitley et al.,

2007). Further examination of the classroom experiences of students with learning disabilities reveals themes of both positive and negative influences from teachers. Students with learning disabilities report the most positive influences on their academic experience being teachers who were willing to explain and implement their accommodations and encourage them (Karande et al, 2009). In contrast, students with learning disabilities noted negative experiences with schooling when teachers did not implement their accommodations or seemed not to know their disability (Karande et al., 2009).

The cognitive functioning of children with learning disabilities has been consistently found to be different from typically developing peers (Johnson, Humphrey, Mellard, Woods & Swanson, 2010). Students with learning disabilities related to literacy are frequently assessed as having deficits with phonological processing, processing speed, verbal working memory and executive functioning (Johnson et al., 2010). These deficits can directly impact students' abilities to complete academic demands and place a great stress on the student, requiring accommodations or adaptations to be made in order for success in the classroom to be achieved. The deficits described are directly linked to core literacy skills. The link between the common profile (strengths and challenges) of students with learning disabilities and the requirements to achieve functional and effective literacy skills raises many questions about how literacy is currently defined and measured.

Literacy and Learning Disabilities

The goal of any educational system is to produce literate students. Although there is no universal definition or measure of what literacy is, a definition of literacy adopted

by the Canadian Literacy and Learning Network (CLLN) and based on the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2011) definition is:

> Literacy is the ability to identify, understand, interpret, create, communicate, compute and use printed and written materials associated with varying contexts. Literacy involves a continuum of learning to enable an individual to achieve his or her goals, to develop his or her knowledge and potential, and to participate fully in the wider society (Online).

In addition, the CLLN (2011) has also adapted from UNESCO nine essential skills required to achieve literacy. The nine essential skills are: reading text, using computers, writing, numeracy, document use, oral communication, working with others, thinking skills and continuous learning. For students with learning disabilities, deficits related to literacy one or more of the nine essential skills could result in them not meeting the criteria of being literate.

The essential skill of reading text is the most common challenge for students with learning disabilities related to literacy, although it not always present. Alexander and Slinger-Constant's (2004) review of the literature suggests the skills required for typical reading development fall across five domains: phonemic awareness, phonics, sight word acquisition, vocabulary and comprehension of text. For students with learning disabilities, one or more of the domains may be weak and underdeveloped, resulting in difficulty reading and comprehending text (Alexander & Slinger-Constant, 2004; Sze, 2009).

In addition to reading, writing is often a demanding process for students with learning disabilities. Writing is a complex process that requires a number of skills to work in order for success. The skills identified by the National Writing Project & Nagin, (2006) consist of: the formation of letters, development of vocabulary, identification of the parts of speech, diagramming of sentences, mastery of grammar and punctuation, and the application of prescriptive conventions for writing paragraphs and genres of writing. For students diagnosed with learning disabilities, one or more of the required skills may be impacted. Furthermore, difficulties with letter/sound correspondence and working memory may further hinder writing production.

How literacy is defined significantly impacts the experiences of students in the classroom. The practices associated with both teaching students how to read and write in the classroom, along with methods of assessing their abilities, must be examined.

(i)Literacy Practices in Nova Scotia

In Nova Scotia, all teachers are expected to follow the Atlantic Canada Language Arts Curriculum framework, which states that Language Arts education "is shaped by a vision of enabling and encouraging students to become reflective, articulate, literate individuals who use language successfully for learning and communicating in personal and public contexts" (Nova Scotia Department of Education and Culture, 1996, p.1). The document provides teachers and families with both specific grade level and key stage outcomes as measures of literacy abilities.

The literacy practices of individual educators are greatly influenced by their ideologies about literacy development, and are directly linked to their cultural, social, political and historical experiences and understandings. They are also influenced by

external structures, such as curriculum documents and standardized assessments. Barton and Hamilton (2000) describe literacy practices as "fluid, dynamic and changing as the lives and societies of which they are a part" (p. 13). Therefore, describing current literacy practices in general terms is a challenge.

Although how to effectively teach literacy skills in the elementary classroom is a topic widely addressed in literacy research, a consensus on best practice in a classroom or with a particular group of students like those with learning disabilities does not exist within the literature (Bitter, O'Day, Gubbins & Socias, 2009; Cunningham, Zibulsky, Stanovich & Stanovich, 2009). The general conclusions of current research suggest that effective elementary literacy education should consist of a multifaceted approach, including both skill and literature-based activities for reading instruction in the classroom (Kessler, 2008; Snow, Burns & Giffin, 1998).

Skill-based activities are designed with a focus on explicit instruction in phonemic awareness, phonics, fluency, vocabulary and comprehension strategies (Armbruster, Lehr & Osborn, 2001). The areas of explicit instruction are specifically supported in the literature as being factors that influence literacy measures (Armbruster et al, 2001). In contrast, literature-based activities are designed to provide authentic learning experiences with literacy, such as reading to the students from a broad variety of text, providing time for independent and peer reading and discussing literature in various group structures (Morrow & Gambrell, 2002). Activities that are literature-based have been supported in academic literature to increase student achievement in all measures of literacy (Armbruster et al., 2001).

At some point in mid-elementary, the focus of literacy education shifts, with more emphasis being placed on students not "learning to read" but "reading to learn" (Snow et al., 1998). With the shift to reading-to-learn, research suggests that best practices for the literacy classroom change, with the emphasis being placed on critical literacy skills (Luna, 2003). Critical literacy is defined by Freire (1987) as being able and willing to explore the social, moral, and political implications imbedded in particular texts, in particular places and times, with no attention given to the isolated skills of being literate, such as decoding text. McDaniel (2004) further explains the instructional practice as "transcend [ing] conventional notions of reading and writing to incorporate critical thinking, questioning, and transformation of self or one's world" (p. 474). Critical literacy practices within the classroom consist of critically examining texts for voice and perspective, using texts to examine larger social issues, and using students' lives and experiences as the text (Stribling, 2008). The benefits of critical literacy as a classroom practice for students include enhanced comprehension of text, increased empathy and respect for peers and an increased awareness and understanding of social justice (Flores-Duenas, 2005; Peterson, 2006).

Methods of teaching literacy have evolved over the last several decades, as the movement towards inclusive classrooms has become the norm. Through a shift in how skills are taught and assessed, students with learning disabilities have potentially been provided with more strategies for learning how to gain functional literacy skills. However, students with learning disabilities may not achieve the basic functional literacy skills to enable them to critically examine text or generate arguments and stories. When a

discrepancy occurs, what role is assistive technology permitted to play in their school experience, and how is assistive technology use determined for the student?

Assistive Technology and Schooling in Canada

Assistive technology consists of a wide continuum of tools used by persons with disabilities. At one end of the continuum, requiring very little training or maintenance, are low-tech tools such as highlighters, raised lined paper and enlarged text in a book. Mid-tech tools include digital recorders, portable word processors and talking calculators. These items generally require some initial training and maintenance. The final category of assistive technology is high-tech, which involves specialized software such as *Co-writer*, accessibility options to computers like touch screens, or dedicated communication devices. These items require substantial training for proficiency (Alberta Education, 2006; Nova Scotia Department of Education, 2006).

The selection of the most appropriate assistive technology tools for each student is essential for success. Edyburn's (2001) review of current models of special education technology reveals four models which are associated with assistive technology consideration. Two of these: the Student, Environments, Tasks and Tools Framework (SETT), and the Wisconsin Assistive Technology Initiative Consideration Guide (WATI), are most commonly used in Canada (Alberta Education, 2006, Korotkov, Personal Correspondence 1 Feb., 2011, Nova Scotia Department of Education, 2006).

The SETT model examines four aspects affecting successful integrations. These are the student, the environment, the tasks and the tools (Zabala, 1995). Through the SETT model, the program planning team gathers data concerning all four categories and

is encouraged to try out various tools and reflect upon their suitability for the student and the team (Zabala, 1995).

The WATI Assistive Technology Consideration Guide (Reed, 2004) provides a framework for deciding upon assistive technology goals and options for a student. Under the WATI, the student's team is asked to reflect on what it is that they want the student to do, what the student's current abilities are, what assistive technology is available, and if the assistive technology could help with task performance (Reed, 2004). Similar to the SETT framework, WATI encourages whole team involvement but recommends the use of a specialist to complete a formal assessment and provide recommendations for the team to try, along with follow up and reflection in an ever evolving process (Reed, 2004).

The methods used for assessment and best fit for students using assistive technology vary across the provinces in Canada, with differences in who is eligible for the services. Alberta Education (2006) places emphasis on a team approach to decide on possible assistive technology accommodations. There are technology specialists available to assist in the selection process, which is guided by the SETT model. Assistive technology services are available to all students requiring accommodations, along with students with Individual Program Plans and students with learning disabilities (Alberta Education, 2006).

British Columbia also encourages the input of program planning teams and employs consultants to work with school-based teams to develop a Collaborative Action Plan; however, the model is only employed for students with low-incidence disabilities (experienced by less than 1% of the school population), meaning the process for students with high-incidence disabilities such as learning disabilities is not clearly defined and

becomes the responsibility of each school district (Randle, Personal Correspondence, Feb. 1, 2011; SET-BC, 2010).

Saskatchewan is currently transitioning approaches for assistive technology assessments from a medical model, where the diagnosis of learning disabilities met predetermined assistive technology tools, to a needs-based approach, which examines strengths and challenges of students to meet their specific needs perhaps including assistive technology (Beckie, Personal Correspondence, March 5, 2011). Under this new approach, Saskatchewan has developed an Impact Assessment to assist in prioritizing needs for the student. Although as a province there is not a recommended model for assistive technology assessment, Beckie (Personal Correspondence, March 5, 2011) notes that most school districts within the province have adapted elements of the SETT and WATI to ensure appropriate fit between students with learning disabilities and assistive technology. Provincially, an assistive technology plan for a student with a learning disability must be created, monitored, and reported by the student's team to ensure assistive technology is meeting the goals outlined in the plan for the student (Beckie, personal correspondence, March 5, 2011)-

Under New Brunswick's current assistive technology program, program planning teams complete applications for assistive technology services based on the recommendations of qualified personnel such as speech-language pathologists, psychologists, physiotherapists, or their own judgements with supporting documentation (Korotkov, personal correspondence, Feb. 1, 2011). New Brunswick is currently drafting their assistive technology strategy document, which will emphasize that program

planning teams employ the SETT model when completing application requests for assistive technology (Korotkov, personal correspondence, Feb.1, 2011).

In Nova Scotia, an emphasis is placed on collaborative team problem solving through program planning teams as the method for selecting assistive technology. Further support is available at the board level, as required, usually by Assistive Technology Specialists. Program planning teams may consider employing assistive technology for any student who may benefit from its use, including students with learning disabilities. Both the SETT and WATI models of collaboration are encouraged to be employed in the process to ensure best fit and "only as special as necessary" (Nova Scotia Department of Education, 2006).

All school boards follow the guidelines provided in the "Assistive Technology: Supporting Student Success" document; however, the financing and interpretation of these policies varies across school boards in Nova Scotia.

The Strait Regional School Board (SRSB) embeds assistive technology consideration in its Program Planning Process. If assistive technology is determined as an approach to consider, the assistive technology representative for the school becomes involved with the team. Assistive technology representatives are teachers at the school who have received in-servicing through Professional Learning Communities regarding the assistive technology guide, the use of assistive technology, and the SETT and WATI frameworks. The expectation for the assistive technology representatives is that they will recommend and provide support for the student and teacher in implementing assistive technology. They will also assist in the monitoring of the appropriateness of the assistive technology recommended. In addition, the SRSB has five mentors for assistive

technology available to help in more challenging cases. Although assistive technology may be recommended and implemented, remediation is ongoing for students with learning disabilities in the SRSB (Lynch, personal correspondence, March 14, 2011).

Cape Breton-Victoria Regional School Board (CBVRSB) requires a formal referral by a member of the program planning team to the Coordinator of Student Services, with the assessment being completed by a member of the assistive technology team (Kublek, personal correspondence, March 23, 2011). Elements of the referral consist of forms completed by the school and family, with the assessment occurring in the school setting. Recommended assistive technology is provided through a combination of funding from the CBVRSB Student Services and Technology departments, schools and families (Kublek, personal correspondence, March 23, 2011).

The South Shore Regional School Board provides access to assistive technology through a partnership with the Assistive Technology Center. Through the partnership, a variety of assistive technology is made available to students, based on recommendations from an Assistive Technology Specialist or facilitator employed by the SSRSB (SSRSB, 2011). Students are prioritized and referred to the specialist or facilitator through the school program planning team on requests from teachers, parents or Individual Program Planning teams. The assessment with the specialist or facilitator utilizes the SETT and WATI models and provides opportunities for students to explore and use assistive technology. The specialist or facilitator then completes a list of recommendations, assists the school in gaining access to the assistive technology, and provides training and support for the teachers involved with the student.

(i)Assistive Technology for Students with Learning Disabilities

The amount and kinds of assistive technology available to students with learning disabilities continues to evolve. High-tec supports such as Text-to-speech, voice recognition and word prediction software are all forms of assistive technology accommodations which have become readily available in the last twenty years for students with learning disabilities (Edyburn, 2003). During the 1990's, extensive research was conducted regarding the efficacy of these software programs, along with student response; however since 2005, there has been limited research of these programs (Balajthy, 2007; Forgrave, 2002).

Text-to-speech programs enable students to compensate for their deficits in the decoding process by using a program which converts printed text into an audio format (Edyburn, 2003). Balajthy's (2007) review of the literature regarding the effectiveness of text- to- speech software reveals a number of variances in success and the need for educators to closely monitor its use in the classroom. Students need to be explicitly instructed and supported in how to use the program effectively. Benefits of the Text-to-speech programs are further highlighted by Forgrave's (2002) review of literature, which concludes remedial benefits to decoding and word recognition skills with long-term use. Forgrave (2002) also notes a trend in research regarding Text-to-speech programs increasing students' motivation to read independently. Common software programs noted in the literature for the purpose of text- to- speech include *Kurzweil 3000, WordQ, Wynn* and *TextHelp* (Arter, Helman & D'Agata., 2010; Balajthy, 2007; Edyburn, 2003).

Voice recognition programs provide students with an accommodation to write, using voice input to generate text (Silver-Pacuilla & Fleischman, 2006). Some voice recognition programs require the student to train the program by reading through a series

of words or passages, articulating carefully and dictating punctuation and formatting (Peterson-Karlan, Hourcade & Parette, 2008). There is limited research to support these programs' effectiveness for students with disabilities, due to the nature of this rapidly evolving field of technology. However, a number of research studies in the late 1990's noted the potential for students to gain an increased working memory and higher levels of reading comprehension and writing skill development (Forgrave, 2002; Peterson-Karlan et al., 2008). Disadvantages of voice recognition programs for students with learning disabilities are commonly cited as the time required to learn the program and the sometimes specialized additional support needed throughout its use (Forgrave, 2002). Software programs which are commonly examined in the literature include *Dragon Naturally Speaking* and *Natural Reader (*Flood, 2008; Sherman, 2008).

Word prediction software for students with learning disabilities supports the writing process by anticipating target words as letters are typed and may also assist with word spacing and capitalization (Peterson-Karlan et al., 2008). Research regarding word prediction highlights its potential to increase accuracy in spelling. However, there is limited research available to support the effects of word prediction on student writing, motivation and responses to the programs (MacArthur, 2009; Peterson-Karlan et al., 2008). A disadvantage noted in Peterson-Karlan's (2008) review was the increased cognitive load of searching for correct words which decreases text generation. Programs for word prediction frequently referred to in the literature are *Co-Writer* and *WordQ* (MacArthur, 2009; Peterson-Karlan et al. 2008).

The selection and knowledge of assistive technology programs for students with learning disabilities is the initial step in the process of establishing access to assistive

technology for a student with a learning disability. However, there are a number of other factors which influence the degree assistive technology that is made available to the student, including the teachers' experiences and knowledge of assistive technology.

(ii)Teachers' Experiences Integrating Assistive Technology

. The types of assistive technology and its use as an accommodation strategy for students diagnosed with learning disabilities have evolved over the last twenty years, along with the general expectations that technology will be integrated in the classroom. Beyond the evolution of assistive technology as an accommodation strategy, the where, when and how of assistive technology has also been altered to meet the changing views of Special Education throughout North America (Kavale et al., 2009; Lerner, 1997).

The general use of various technology tools in the classroom has emerged as an area of focus for academics interested in examining current educational practices. The results of the research consistently suggest a trend of minimal use of technology on a daily basis in classrooms (Bingimlas, 2009; Wilson, Wallin & Reisser, 2003). Ertmer (1999) describes two broad classifications of barriers experienced by educators in regards to technology integration. First-order barriers are external to the teacher and encompass challenges such as professional development opportunities, lack of resources and time, along with the general school culture (Bingimlas, 2009; Ertmer, 1999; Hew & Brush, 2007). Second-order barriers are described by Ertmer (1999) as "rooted in teachers' underlying beliefs about teaching and learning and may not be immediately apparent to others or even to the teachers themselves" (p. 5). These barriers are fear of change in pedagogy, lack of confidence in using the technology and teachers' abilities in problem solving (Hew & Brush, 2007; Hixon & Buckenmeyer, 2009).

Research frequently classifies factors regarding technology integration into generalized themes that contain elements of both first and second-order barriers. Hew and Brush (2007) have suggested six interrelated barriers experienced by teachers. These include: the resources, institution, subject culture, attitudes and beliefs of the teacher, knowledge and skills of the teacher, and assessment of the students. Complementary to the framework of Hew and Brush (2007), Kopcha (2010) describes five broad categories of barriers, which are time, beliefs, access, professional development and culture.

Time is consistently identified as being problematic to technology integration for two reasons. First, the length of time related to planning lessons that integrate technology is reported as longer. Teachers also needed to prepare backup lessons in case of technology failure (Bauer & Kenton, 2005; Sicilia, 2005). Secondly, the time needed to organize and develop routines for students using technology in the classroom caused stress for the teachers. (Bauer & Kenton, 2005; Means, 2010).

Teacher attitudes and beliefs regarding technology integration have been consistently shown to influence the type and success of technology integration within the classroom (Bauer & Kenton, 2005; Inan & Lowther, 2010; Means, 2010). Beliefs that hinder integration include notions of limited benefits to students using the programs and fear of inability to use the technology in front of the students (Balanskat, Blamire & Kefala 2006; Empirica, 2006). Teacher readiness, such as computer proficiency and understanding of the software being used, has been identified as the major influence regarding the degree of technology integration within the classroom (Inan & Lowther, 2010).

Research highlights the importance of providing quality professional development to assist in technology integration such as through co-teaching and mentoring (Bingimlas, 2009; Franklin, 2007; Hixon & Buckenmeyer, 2009; Holland, 2001). However, most professional development opportunities, when offered, have been described in the literature as being out of context and focusing more on a particular programs rather than a transformation of pedagogy (Bingimlas, 2009; British Educational Communications and Technology Agency [Becta], 2004). Franklin's (2007) findings suggest teacher philosophy and preparation for technology use are the main predictors of technology integration in the classroom. This means a shift is required for professional development to facilitate teachers' understanding a clear link between the technology, instruction and learning.

The culture of the school is directly linked to the administration and their support of technology integration (Bingimlas, 2009; Means, 2010). Administration can assist in supporting the integration of technology by providing teachers with additional planning time, organizing fair access to computers and programs, and developing a clear vision of how technology should be used in the school (Means, 2010).

With an appreciation of the themes emerging from the barriers, an area of focus for researchers has been to examine ways to facilitate further integration of technology in meaningful, student-centered ways. Programs which are frequently recommended to assist teachers developing a technology skill level are peer collaboration and mentoring (Hixon & Buckenmeyer, 2009; Kopcha, 2010; Means, 2010). Many teachers report more success with technology integration when provided with time for peer collaboration (Lim

& Khine, 2006; Means, 2010). Peer collaboration enables the development of a learning community that fosters motivation and generates a support network (Kopcha, 2010).

Traditionally, teachers have not been responsible for the implementation and integration of assistive technology into the classroom (Chmiliar, 2007). Over the last decade, however, with the increased numbers of inclusive classrooms, the role of classroom teachers has shifted to incorporate the integration of assistive technology for students with various needs (Chmiliar & Cheung, 2007).

The shift in assistive technology responsibilities, however, has not resulted in teachers receiving effective training or developing a knowledge base regarding assistive technology uses (Chmiliar & Cheung, 2007; Morrison, 2007). Teachers' comfort level and familiarity with the devices are consistently noted in the literature as major barriers to assistive technology recommendation and integration (Blackhurst, 2005; Jeffs, Behrmann & Bannan-Ritland, 2006; Sze, 2009). Chmiliar's (2007) survey regarding teacher training with assistive technology indicates seventy percent of Alberta's teachers do not have any formal training and no teachers surveyed reported feeling very skilled with assistive technology. These reports may be attributed to the types of training opportunities being offered (Morrison, 2007).

Research from both Canada and the United States echoes the lack of exposure students in pre-service education programs have to assistive technology and its integration in the classroom (Baush & Hasselbring, 2004; Chmiliar, 2007; Lee & Vega, 2005). In addition, training for both pre-service and currently practicing teachers tends to focus on how to use the specific technology and does not include discussion on how to implement or integrate its use in the classroom (Baush & Hasselbring, 2004; Edyburn,

2003). For teachers implementing assistive technology, any training is typically provided at the initial stage of introduction, through workshops and conferences with limited follow-up, provided once the teacher begins to use the assistive technology with the student. The lack of follow-up means teachers are provided with little guidance on how to evaluate the use of assistive technology or are not supported in developing further ways of using the technology in the classroom (Chmiliar, 2007; Edyburn, 2003).

Time to develop knowledge and skills regarding assistive technology programs is a common barrier to integration (Baush & Hasselbring, 2004). Chmiliar (2007) reports teachers feel they do not have the time required to build their own skills with the assistive technology, to experiment with how to integrate assistive technology with the student, or to develop programming customized for the student (Chmiliar, 2007; Lee & Vega, 2005). Morrison (2007) suggests the provision of time for the development of Communities of Practice for teachers implementing and integrating assistive technology into the classroom. Through Communities of Practice, educators would be able to network with other educators, sharing experiences and activities, which would further develop the knowledge base of assistive technology for all participating.

Another barrier to assistive technology integration frequently noted in the literature is funding and availability of assistive technology equipment (Baush & Hasselbring, 2004; Bell, Cihak & Judge, 2010; Chmiliar, 2007; Sze, 2009). With over 40 000 assistive technology items registered in AbleData, an United States Department of Education website (2011), it is impossible for schools/districts or provinces to have access to all items. Many teachers describe the limited availability of assistive technology equipment and programs as problematic (Baush & Hasselbring, 2004;

Chmiliar, 2007; Lee & Vega, 2005;). Chmiliar (2007) recommends the development of centralized lending centers for assistive technology equipment trials, along with increased provincial funding to purchase assistive technology equipment for schools.

In addition, availability of operating equipment capable of running some assistive technology devices is limiting access (Lee & Vega, 2005). Examples of hardware problems are outdated or a limited number of computers, restricted access to computers and inabilities to save material on computers efficiently (Lee and Vega, 2005). Morrison (2007) further identifies access to technical support for computers and assistive technology devices as problematic, since generally it is the same technician responsible for both information technology and assistive technology programming, due to funding.

The shift in expectations regarding assistive technology integration has led to a body of research examining common barriers experienced by teachers. However, the majority of literature is American and does not necessarily reflect the current situation. In addition, the majority of research examines the experiences faced by Special Education teachers rather than classroom teachers, making the current study important in providing a forum for the classroom teacher's experience to be explored and shared.

This chapter highlighted current research literature and academic understandings across the many areas connected to the current research project. Within Nova Scotia, the context of inclusion, although readily defined, is still being implemented in a variety of ways and to various degrees across the province. With a wide variation in schooling contexts for students with learning disabilities, a consistent factor in the degree to which students are included and achieve literacy is their teachers' practices and beliefs. The influence of a learning disability on literacy is consistently documented in the literature

when the definition of being literate is traditional and rigid. Traditional definitions of literacy frequently limit students with learning disabilities from achieving higher levels of academic success by limiting their access to assistive technology. Assistive technology, implemented by a variety of policies and practices, can have a positive impact on a student with a learning disability.

The next chapter will provide an epistemological lens for the current research methodology, along with the research plan, questions and participant selection.

Chapter 3: Methodology

A Social Constructivist Lens

As a social constructivist researcher influenced by the work of Lev Vygotsky, Jean Piaget, Jerome Bruner and Howard Gardner, and by literacy studies/inclusive education theorists such as Nancy Nelson-Spivey and Catherine Fosnot, my aim for this study was to describe the experiences and practices of a sample of elementary teachers integrating assistive technology in their Language Arts classrooms. Specifically, I wanted to focus on the integration of assistive technology by teachers as they worked with students with learning disabilities in their classes. A social constructivist approach means that the researcher's intent is to interpret and make sense of the meanings others have about a specific context or experience (Creswell, 2009). The core of the research is an examination of the experiences and practices of elementary teachers implementing assistive technology.

By using a social constructivist lens, I hope to come as close as possible to the lived experiences of the teachers in regards to implementing assistive technology and to gain an understanding of how they construct their awareness of its applications. This theoretical lens will enable me to develop more relevant themes as they emerge to address the central research question. It is essential to consider first, then, how social constructivism frames the core concepts of the study: Learning Disabilities, Literacy and Inclusive Education.

Learning disabilities are understood through the social constructivist lens as being generated in the context of social relations, through activities and cultural practices found

in the institution of school (Dudley-Marling, 2004; Gergen, 1990). Delays or skill deficits commonly associated with having a Learning Disability, such as decoding or comprehension, are understood as being created by the institution of school and have a greater significance within the realm of school in comparison to other institutions or cultural contexts (Dudley-Marling, 2004). Therefore, social constructivists argue that the institution of school creates learning disabilities to meet the need of explaining why some students experience school failure, instead of questioning the legitimacy of schooling (Dudley-Marling, 2004). Varenne and McDermott (1999) further describe a learning disability as a product of schooling through tasks, settings and interactions rather than being something that is revealed by schooling. Under such a lens, Dudley-Marling (2004) highlights the need of researchers to "access the various factors that make up the social context in which students' learning identities are constructed so they can contemplate moves that might disrupt the performance of a learning problem" (pp. 488-489). By examining these factors, it is believed changes in teachers' actions will have a significant effect on students' learning (Gutierrez, 1994).

It is important to examine how the theory of learning, as developed by social constructivists, impacts classroom practice. Social constructivists emphasize the importance of making content relevant and responsive to each student through utilizing every student's interests and existing knowledge (Poplin, 1995). Therefore, through the social constructivist lens, the learning process requires each individual student to have ownership of the material and their progress, with teachers facilitating growth in the learning process (MacInnis & Hemming, 1995). Brooks and Brooks (1993) suggest a social constructivist approach to teaching requires teachers to assist in students

developing a broad range of strategies to approach a task or solve a problem, including using a vast array of tools such as technology (Blanton, Moorman & Woodrow, 1998).

In regards to literacy education, social constructivists contend that reading is a construction of meaning and that during this process, students need strategies to help plan, monitor, analyze and regulate their reading (Paris, Lipson & Wixson, 1983). Therefore, social constructivists support appropriate literacy instruction through authentic reading and writing experiences. To assist in developing authentic experiences, several principles have been proposed by Lenski, Wham and Griffey (1998). These include the teacher viewing literacy as a process of constructing meaning, creating an environment conducive to developing literacy skills and providing effective strategic instruction in reading practices.

Social constructivists argue that inclusion is a construct defined by the setting and social group in which it is created. Inclusion in a school community is understood as being created through an individual's apprenticeship into the rituals and routines of the classroom through learning to use cultural tools (appropriate use of technology, reading, and writing) as instruments in social participation (Mallory & New, 1994). The role of teachers in inclusion is to facilitate and provide an environment that is appropriate for each student (Leatherman, 2007). The apprenticeship for each student is ongoing and occurs in the classroom, with an underlying belief that all students must belong and be valued members of the school community (Kunc, 1992). Furthermore, social constructivists believe all students can participate in their own learning given both instructional and social supports and that these are provided by both teachers and peers. Mallory and New (1994) have derived several principles to describe inclusive classroom

practice through a social constructivist lens. The practices promoted by Mallory and New (1994) consist of the functioning of the classroom as a community of learners and the use of social relations as catalyst for learning.

Further support for my social constructivist epistemology is found in my own teaching experiences and practices with Michael. Although Michael did have a formal diagnosis of a learning disability, I was not interested in his deficits but rather in finding ways to support his literacy practices and to expand on what it meant for him to be literate through the use of assistive technology tools.

Gaining an understanding of the practices and experiences of teachers is important, since teachers create theories and beliefs about teaching and learning through their experiences and these beliefs further influence instructional behaviours and interaction patterns with students (Bauch, 1984). Hensel's (2009) findings further confirm the complex interaction between teacher beliefs and instructional practices, with many contradictions noted between teachers' identification of their practices, their stated beliefs and actual practice.

My qualitative research study aimed to develop an in-depth understanding of a phenomenon by examining the 'why' and 'how' questions (Yin, 2009). Creswell (2009) notes qualitative research is holistic and contextual, with research typically having certain characteristics such as a natural setting, multiple sources of data, inductive data analysis, emergent designs and a focus on participants' meaning related to a phenomenon. The case study enabled themes to emerge from data analysis and placed a clear focus on the meanings attached to the teachers' experiences and practices with implementing assistive technology in the classroom. Due to the nature of the research methodology, two research

methods were chosen to generate data, allowing a more comprehensive understanding of the complexities of the emerging issues.

Research Question

How can the participant teachers' experiences inform current understandings of the interconnections between children with learning disabilities and the teaching/ learning practices of assistive technology and literacy within an inclusive schooling environment?

The Case Study

The case study design emerged from the sociological field, but is now commonly employed in educational settings (Merriam, 1998; Tellis, 1997).The intent of a case study methodology is to obtain a holistic and in-depth investigation of the phenomena in a real life context through a comprehensive understanding of the situation and the meaning attached to the situation by the participants (Merriam, 1998; Yin, 2009). Employing a case study methodology permitted me to focus on a particular situation occurring in everyday practice and to illustrate the complexities of the practices and experiences of the teachers involved (Merriam, 1998). The 'case' for this research was five teachers from a single school board in Nova Scotia. The school board selected was located in close proximity to the researcher and was also recognized as having a unique model of assessment, dissemination and application of assistive technology in Nova Scotia. The whole purpose of concentrating on the five teachers who were currently integrating assistive technology was to develop, as much as possible, a comprehensive appreciation of the teachers' experiences (Silverman, 2005).

The case study design employed for this research was composed of both single hour- long interviews guided by open-ended questions and direct classroom observations

lasting in each case for approximately an hour in an attempt to organize data based on characteristics in relation to the phenomenon in question (Yin, 2009). I selected open-ended interview questions as one method for data generation. Interviews, as Patton (1990) explains, provide information which we cannot directly observe and provide an entrance into another person's perspective. Brantlinger, Jimenez, Kinger, Pugach and Richardson (2005) further support the use of interviews when the selection of participants is purposeful and questions are open-ended and reasonable. The interviews were used to generate data for gaining an appreciation into the experiences and practices of the teachers regarding assistive technology in their classrooms. The open-ended questions (Appendix A) allowed participants to talk about the issues and areas that were of importance to them, enabling them to share personal experiences and opinions of assistive technology use in the classroom. Educational research notes the use of interviews can yield a vast variety of data, depending on epistemological and methodological goals of the research, with a focus on what people report they say, write and do (Scott & Morrison, 2006).

The second method of data generation was observations of each participant's Language Arts classes for approximately one hour as a nonparticipant. Nonparticipant observations with descriptive field notes were selected as a secondary method of data generation, since this method would provide a first-hand encounter for the researcher with the phenomenon of interest while remaining detached and neutral (Borg & Gall, 1989; Merriam, 1998). One-time observations were conducted with the goal of substantiating the emerging themes from the interviews or to possibly contradict these themes (Merriam, 1998). For example, practices which may have become commonplace

to the participants and not mentioned in the interviews may lead to a deeper understanding of the context and participants experience by the researcher. Data generated through observations in classroom settings have been found to provide insights into the processes of education in naturalistic settings, to provide more detailed and precise evidence than other data sources and to provide a secondary source of information and see what the participants cannot (Scott & Morrison, 2006).

Recruitment of Participants

The participants in this study were upper elementary classroom teachers who teach students with learning disabilities and utilize assistive technology. A focus on these grade levels was selected since within the District 7 School Board, assistive technology accommodation recommendations are introduced for students with learning disabilities at this level and it would be more likely to encounter teachers who would have experience being the first teacher to integrate assistive technology for a student with a learning disability into the classroom. Using snowball sampling procedures for participant selection provided an opportunity to gather information from a sample considered likely to be using assistive technology in the classroom on a regular basis (Merriam, 1998).

With permission from the Research Ethics Board of Acadia University and the Superintendent of the District 7 School Board, the process for identifying and contacting participants began. In consultation with the Assistive Technology Specialist and Learning Disabilities Specialists for the District 7 School Board, a private list of six potential participants meeting the criteria of having a student with a learning disability and assistive technology adaptations in their upper elementary classroom was developed. For the purpose of the selection process, adaptations were defined as being formal written

and approved supports to the curriculum to enable students to perform to the best of their abilities without altering the actual outcomes of the curriculum. All six participants were invited to participate, since they represented a variety of school contexts such as size of the school population and experience level of the teacher. Potential participants were contacted via e-mail by the researcher to explain the research project and to seek their interest in participating (Appendix B). A follow up phone call and email was made after the potential participants had time to consider the invitation to participate (Appendix C). During the follow up phone conversation, the researcher obtained verbal consent. All participants who expressed an interest in participating received a complete hard copy of the consent package (Appendix D).

The Participants and their School Contexts

All participants were currently employed with the same school board in Nova Scotia as full-time term or permanent teachers. In the interests of confidentiality, the school settings are described generally and separately from the descriptions of the participants. This was done to preserve the anonymity of the teachers. Pseudonyms have been used for all participants and schools and any additional information that would tend to identify the participants has been removed or altered.

The five participants were employed at four schools. The schools had a variety of grade configurations with some deemed elementary and others middle school. The largest school had a population of approximately 560 students. The other schools had between 100 and 350 students. All of the schools provided an English language program and two schools offered Intensive French programs at the grade six level. All schools had resource/learning center rooms which provided support to a variety of students. All of the

schools had resource teachers and paraeducators (teacher assistants) on staff and active program planning teams.

All participants of the research were female. Three of the educators have been teaching for over ten years and the remaining two ranged from two to five years of experience. The participants were teaching in grades four through six but all have taught at several grade levels including Primary through grade twelve. Three of the participants had experience as Resource teachers and of the three; two had some part of their current teaching assignment as Resource. Three participants reported not taking any undergraduate or graduate level course in technology education and two participants reported taking graduate level courses in assistive technology. All participants reported having some directed training in assistive technology. However, two reported no direct training in assistive technology related to students with learning disabilities. All had previous experience using assistive technology in their classroom and with teaching students with learning disabilities.

Lucy Jones has been teaching for three years and had spent the last two years in her current school. She was teaching grade six and had previously taught fifth grade. Lucy has had five students with learning disabilities in her classroom since beginning her career.

Kayla White had been teaching for seven years and had spent the past three years in the same school. Kayla estimates she has had nine students with a learning disability diagnosis since beginning her career. She was currently teaching grade four and had previously taught in grades Primary and six.

Erin Walsh was in her fifteenth year of teaching and had spent the last twelve years at the sixth grade level in the same school. She estimated she has had approximately twenty students identified with learning disabilities over her career. At Erin's school she and another teacher split subjects, meaning Erin taught Core French, Language Arts and Social Studies.

Keltie May has been teaching for two years and had spent both years at the same school. Keltie had students requiring assistive technology and has had one student with a diagnosed learning disability since beginning her career. She was teaching fifth grade and had previously taught grade six.

Tasha Brown was in her fifth year of teaching and her third year at the same school although not all consecutive. Tasha had been the Resource teacher for the school and also taught grade five along with being a Literacy/Technology mentor. Tasha had previously had other teaching experiences in Primary through grade 3 classrooms. Tasha had several students with disabilities in her role as Resource teacher and had one student with a learning disability in her current classroom assignment.

Data Generation

The participants were interviewed individually about their experiences, practices and opinions about the integration of assistive technology for students diagnosed with learning disabilities. These approximately hour-long interviews were semi-structured, which gave the teachers a forum to share their experiences and provided me the opportunity to ask questions for clarification and follow up. In addition, single classroom observations were conducted with each participant during regularly scheduled Language Arts periods for approximately one hour. All observations were conducted before the

interviews on the same day, with the focus of the observations being on the teacher and how they interacted with assistive technology, their students with learning disabilities and the use of assistive technology in the classroom. I was the only person generating data. I have graduate level coursework in qualitative research methodology and previous experience using qualitative methods during an undergraduate thesis.

Observations and interviews were conducted between December 2010 and February 2011 at a place and time convenient for the participants. Once the teacher expressed interest in participating, an email was sent with the consent form outlining the purpose of the study, the expectations of the participants, confidentiality and debriefing procedures. Participants also were sent a copy of the outline questions for the interview and a letter outlining procedures for data collection, including that all interviews would be audio taped and later transcribed and that observations would occur with field notes taken by the researcher. A copy of the consent form and letter were also provided at the time of the interview and observation for their reference and record.

All observations occurred in the classroom of the participant during a regular Language Arts class. The researcher was introduced to each participant's class as another teacher interested in observing how they do a Language Arts class in their school. The researcher was positioned at the back of the classroom and was able to move around the room freely during the data generation time period. Field notes were produced during the observations in three key areas; 1) teacher interactions with students 2) classroom set up for technology and in particular assistive technology and 3) notable events in the classroom.

All interviews began with a review of the purpose of the research and assurances of confidentiality. Participants were also reminded that they could decline to answer any question, or withdraw from participating at any time including after the interview and observation without repercussion.

To ensure an effective interview, an interview guide was developed based on the research questions. The guide was flexible and was the basis of all interviews (see Appendix A). Interviews ranged in length from forty-five to sixty minutes. After the interview, I reviewed and clarified information on the teacher's preparation and professional development related to assistive technology, as well as her teaching history.

Data Analysis

The data analysis was guided by a desire to learn what makes teachers choose to implement and integrate assistive technology into their upper elementary classroom programming for students with learning disabilities. More precisely, I wanted to understand how the participants' experiences are connected to current knowledge of students with learning disabilities, and the teaching and learning practices of assistive technology and literacy in an inclusive classroom environment. As a social constructivist, I examined the data with the belief that teachers construct their understandings of the core concepts of the study through their interactions and practices within the classroom.

The data generated throughout the research was based both on the participants' points of view and their lived experiences, meaning it is important to examine the data in a manner to enable themes to emerge from the interviews and observations (Creswell, 2009). A three-part process was undertaken to create and classify data into thematic units.

The initial step of analysis was reading through all interviews to gain comfort in the data as a whole. With a general comfort level for the data, all interviews were reread and information was flagged as being significant on a statement to statement basis. Flagging was done through highlighting key statements on photocopied transcripts of the interviews. The next stage was the clustering of significant information into similar columns based on responses to experiences to create emerging themes which formed the basis of the results section.

An example of the coding procedure through the three stages is the statement "Our computers in the room are old and can't keep up with some of the programs". The initial stage of coding flagged the statement as being significant to the teachers' experience. The statement by the participant was then clustered with similar statements regarding technology. The statements were then divided into themes and the title heading 'technology support' was given. Finally, all title headings were then examined and broader categories were created to reflect clear responses to the analysis questions.

Observational data were analysed in a similar fashion. All data was initially read to gain a comfort level with the information. Significant information was then flagged by highlighting. Highlighted observations were then placed under categories established by the data analysis of the interviews.

The themes which emerged from the data are presented in the next chapter and are based on the collective responses and experiences shared by the participants, along with observations made by the researcher. Where differences among the group emerged, or if an individual response contradicted the majority, distinctions are noted and discussed. Material contained within quotation marks are direct quotes from the interviews, although all names

used are pseudonyms. The quotations selected were based on being representational and not for their uniqueness.

Chapter 4: Teachers' Experiences with Assistive Technology in Upper Elementary Classrooms

The participant teachers of this study represented a cross section of upper elementary grades, with varying degrees of experience and years of service. Of particular interest in the data was teachers' definitions of successful assistive technology integration and the factors that facilitate or hinder assistive technology integration in an inclusive Language Arts classroom. By examining the teachers' experiences and practices, I gained insight into the factors that affect teachers' choices to implement assistive technology or not, as well as some insights into the interconnected nature of literacy as regards to students with learning disabilities using assistive technology in an inclusive elementary classroom. I realized it was important to separate teachers' positive experiences from the barriers they faced along the way, to ensure themes emerged which were reflective of a more complete picture of the experiences and practices of the participants involved.

Through a series of guiding interview questions (Appendix A), participants were asked to reflect upon their current practices and experiences integrating assistive technology for students with learning disabilities in their District 7 School Board elementary classrooms. In addition, I also spent time in each participant's Language Arts classroom observing and producing field notes reflective of the teachers' experiences implementing assistive technology during class/instructional times. Through examining the data by reviewing transcripts and field notes, using the analysis process of coding and seeking commonalities detailed in Chapter 3, four themes emerged: Assistive Technology as Independence, Use of Assistive Technology as a Literacy Practice, the role of Professional Collaboration, and the Sustainability of Assistive Technology in the classroom.

The four themes will be examined and discussed in detail in this chapter and will be substantiated by direct quotes from the teachers interviewed, along with information from the researcher's classroom observation field notes to demonstrate the practices and experiences of classroom elementary teachers integrating assistive technology.

Assistive Technology for Independence

Teachers talked about assistive technology as a pathway to independence for students with disabilities and as an opportunity for them to engage in conversations about self-advocacy.

The responsibility of teaching self-advocacy skills to students with learning disabilities in the classroom was raised by a number of participants as being part of the students' developing independence. Collectively, participants spoke of the importance of educating the students to speak with respect, asking permission and clearly communicating their learning needs, in order for success in future years, especially in regards to having access to assistive technology. Keltie described her practice in fostering self-advocacy skills in her students using assistive technology as:

> From day one, when the assistive technology is introduced, I tell them that this can be their tool to use all through school, but that sometimes they will have to make people aware of what the tool can do for them and that it is not cheating. I keep this dialogue going on all year with them, hoping they will internalize it. I really worry about them being able to defend using it, so that they will use it in the future, especially those students that it means the difference between a C and an A for.

Erin also described her approach to teaching self-advocacy skills via assistive technology:

> A lot of kids, especially L[earning] D[isabled] kids, have learned over the years to just sit quietly or to act out and you know, not be noticed for whatever. What I try to get them to do is just be polite, but go to the teacher and say look I can do this, but I need you to let me use this tool, and if the kid knows that they need it and they feel confident with that tool, then they are much more likely to speak up in the grades after.

Beyond teaching students how to "speak up", many teachers highlighted their role in assisting the students with learning disabilities in comprehending their unique learning styles and abilities. Keltie described her journey with one student:

> With Marcus, I knew I would have to find ways of having him and his family understand that he was not stupid or lazy and that the assistive technology was not cheating. I took time to read him several books about what having a learning disability means and what it doesn't; the guidance teacher (a position unique to the board, with an assignment of supporting student development, usually held by a teacher currently enrolled in a Masters of Counselling program) helped with that too. […] I worked a lot on convincing Marcus that he had strengths and that his strengths like drawing could be used for success in school. He was much better at identifying his challenges and how they stopped him from having success in school. That's where the assistive technology recommendations came in. He would get in a challenging academic situation and I would show him how the assistive technology could bridge the gap between what was in his head and what

> he could get out on paper. […] The final result of that is now he knows one, that he can learn and two, that he just might need a different way to get to the end product and that's okay, because his end product is just as good as everyone else's.

The experience Keltie shared with Marcus highlights the importance of providing supports which foster independent learning over a reliance on teachers or peers to support learning. Further evidence of how assistive technology can facilitate independence was provided by Kayla:

> One year, I had this student who just relied on me for everything. He would not even start his work without checking in with me. […] I introduced Kurzweil to him by scanning a Social Studies test review activity. I modeled how to start and stop the reading feature and that was it. He didn't ask me for help; he just answered the blanks on paper and he was so proud. Now the responses were not overly comprehensible so we soon worked on typing in Kurzweil and that really did it … he was a changed kid. […] he would go to it to do all of his work […]. He went from being a kid I had to read every question to; that would not take any risks, to a student that I had to remember to check in with because he became such an independent worker.

Although the student described by Kayla was a student from a previous school year, during observations in her current classroom I was able to note several incidents which indicated her current student with a learning disability was working independently with activities like the use of audio recordings for reading a group novel, and the completion

of a Literature Circle assignment on an assistive technology software program, without asking for peer or teacher assistance for reading or writing.

When asked, "How do you approach assistive technology programming for a student with learning disabilities?", all teachers replied in ways which demonstrated various levels of student involvement in the decision making and problem solving process. All participants understood the protocol established by their school board for obtaining a referral for an assistive technology assessment, but many spoke of beginning the assistive technology process before receiving the assistive technology assessment or results. All participants noted they were part of their students' Individual Program Planning Team; however, none noted student involvement during the planning process. By being a member of each of the student's Program Planning Team, all participants were involved in developing the Individual Adaptations and considering the use of assistive technology for each of their students with learning disabilities in their classroom. Keltie highlighted her awareness of the teacher's role both within the Program Planning Team and the classroom, by stating:

> I am here to ensure that every student learns the best way they can, so it is my responsibility to provide them with all the tools possible. So, for students with learning disabilities, I need to make sure assistive technology is considered and at least tried.

How the participants implemented the Individual Adaptations in regards to assistive technology integration varied. Tasha reported systematically introducing the assistive technology outlined in the Individual Adaptations based on the assistive technology assessment results and requiring its use in class once the student was familiar

with it. In contrast, the remaining participants described providing opportunities for the students to decide how and when assistive technology would be integrated, which would assist in fostering a sense of independence for the students by enabling them some control over the introduction and use of the assistive technology. Lucy described her approach to assistive technology for students with learning disabilities: “I ask them [students] to try it, then [I say] we can discuss it to figure out if it works for them”.

The need for student input was echoed in a comment from Kayla: “My approach I guess could be summed up by letting the student guide me. I provide the opportunities, but I don’t regulate its use”. In this example, Kayla highlights her student-centered approach to assistive technology use, which was further observed in her classroom practice, where she provides easy access to all assistive technology resources for her students. During my observations, one student with a learning disability, after struggling for a few minutes with a writing task, opted to use a laptop with Co-Writer to complete the task without prompting or assistance from the teacher. The laptops were available on a cart to the side of the student’s desk, so the student was able to select a laptop and return to their desk without distracting other students by requesting the computer or having to move to use the laptop. Kayla also provided private praise to the student when the task was completed independently using the assistive technology.

From the discussions and observations with participants, the role of assistive technology in promoting independence emerged. Participants clearly described the role of assistive technology in fostering independence for students and also as a tool for supporting the promotion of self-advocacy.

Assistive Technology as a Literacy Practice

When asked about successful implementation experiences for students with learning disabilities, all participants were able to share examples of both current and former students achieving higher levels of literacy through assistive technology use. All teachers described students using assistive technology to engage in books and writing activities in ways that they were not able to before the assistive technology introduction and integration. For example, Erin shared this:

> [A student] that came in, [unable to] really recognize his name if it's in different fonts just read [using a audio format] the Invisible Man by H.G. Wells and was flipping out about it […]. He would come in and if we weren't reading that day, he'd be angry with me. […] It's exciting for me to see that, because he's an intelligent kid, grade level intelligence. He should be enjoying these books, but he wasn't able to access them before.

Through Erin's example, it is evident her student increased his reading level significantly by using an audio format to match his comprehension and interest levels. Further evidence of success provided by Erin was another story of a student who, at the beginning of the school year, could hand write one sentence in a thirty minute period, but was currently producing three pages of typed text, with some attempts at revision, during the writing class. These changes were attributed to the integration of assistive technology for the student.

In addition to the participants' own words, the use of assistive technology as a tool to engage students in reading and writing activities was observed in all of the classrooms in the study. During observations in Lucy's classroom, one class activity involved reading newspapers and discussing specific articles. Initially, photocopies of the

article were distributed to all students. However, both of the students with learning disabilities were observed during the time assigned for reading as being off task and they did not participate in the discussion of the article. Lucy observed the students disengagement and when the next article was distributed, she suggested they use a program to read the newspaper article on the Internet. The student's engagement with the activity was heightened and they were observed listening to the article and they were able to contribute to the class discussion for the second article.

The participants all structured their classrooms in ways which enabled their students' easy access to the assistive technology as a way to assist in its use. For example, Kayla had all computers turned on in her classroom before the Language Arts period began and ensured the necessary programs were available for each student by having the students pre-assigned to computers and providing each student with a USB flash drive to store their own work or reading material. Similarly, it was observed that Erin organized her classroom library to include audio books that were available on USB flash drives or mp3 players. All hard copy books were in bins and the books that were available in audio format were marked with an asterisk and a number to reference a particular USB flash drive or mp3 player where the book was stored. All of the USB flash drives and mp3 players with audio were stored in a transparent pocket chart with clear labels near the book bins. The titles of books available on audio were also on a printed spreadsheet with a bin number beside the title for students to find the book. The spreadsheet was in a duotang hanging on the wall beside the library area and each student in the class was also provided a copy three times a year.

Through such examples provided by all participants, it is apparent a traditional definition of what constitutes being literate is not employed by the teachers interviewed, but rather a more functional assessment of literacy that reflects a continuum of learning that enables the achievement of goals and full participation in society is applied (CLLN, 2011). Tasha commented: "It's not the ability of the students to read text at their instructional level but rather to be able to read [and write] text based on what they're doing in the classroom that is important". Erin provided further support to a functional assessment of literacy by discussing the shift in mainstream public practices in relation to reading:

> A lot more adults are using audio [books] like on the bus or during their daily run or whatever. I think we are going to find that's going to be added as one of those media expectations. I mean we pull videos from You Tube to do media literacy. I think give it five years and we're going to be doing that with audio[books].

In contrast to Erin's positive outlook on the evolution of media literacy within schools, Keltie expressed frustration with how her definition and beliefs of literacy did not match current practice and policies within the school board.

> When it comes to assessing my students, I want to be fair and as consistent as possible. This past November, however, was difficult with report cards. As a school, we decided to follow the marking guidelines supplied by the Literacy Consultant. These guidelines, however, only took into consideration their independent and instructional reading levels, not what they could do with text or with supports. After conversations with my principal, I gave my student with a learning disability a D even though with the assistive technology support he was

> reading higher level texts and completing more complex activities with the texts than anyone else in the class. It made my stomach sick. But in the comments, I put he was exceeding expectations across all three components of the Language Arts program because he is! His parents were confused and could not believe the discrepancy between practices in the classroom and assessment practices at the school and board level.

Similar to Keltie, all teachers expressed an awareness of discrepancies between their interpretations of being literate and other teachers' definitions, assessments and practices regarding literacy. Kayla described the discrepancies between teachers' integration and use of assistive technology as "dangling a carrot in front of the students and then turning around and eating it on them". Kayla's comment reflects the challenges that students who are exposed to successful assistive technology integration may experience in future years if not provided the same opportunities for use, along with an awareness of potential barriers expressed by all participants regarding the overall use and acceptance of assistive technology by educators in the classroom. Erin shared:

> [Some] teachers look at some of these things they're like, well if he's not using his eyes, he's not reading. I mean for me, if I give a kid a piece of plastic or audio and it makes them more comfortable reading, helps them concentrate better, I don't care, but other people see this as a big deal.

Kayla and Erin's comments highlight the different perspectives teachers within the participants' schools have regarding literacy. Participants shared how their practices using Assistive technology to support literacy development did not correspond with their colleagues' practices regarding literacy education. Participants shared their frustration in

how rigidly literacy was defined by some of their colleagues to mean the traditional reading and writing measurements and how some colleagues viewed the use of Assistive technology as a form of cheating.

The general findings that emerged from discussions and observations with participants during Language Arts periods regarding their responsibilities and commitments to students with learning disabilities reflect their comprehension of what being a teacher in an inclusive classroom means. Participants clearly described their role in both selecting and implementing Assistive technology and they also discussed their role in developing and fostering independence in their students with learning disabilities. In addition, participants expressed an awareness of discrepancies in practice within the school, school board and province regarding Assistive technology integration in the Language Arts classroom and provided support for a broader definition of what being literate means in the 21st Century.

Professional Collaboration

Through examining participants' responses to "What factors do you see lead to successful experiences with assistive technology integration for students with learning disabilities?" along with "What strategies have you employed to overcome the barriers experienced?", the theme of developing and fostering collaborative professional relationships surfaced.

All participants emphasized the development of collaborative partnerships as being a key to successful integration of assistive technology for students. Lucy further expanded on the partnerships by stating: "Having support from your school administration and program planning team [are] important to a positive experience. Here

at the school I can really share my experiences and frustrations and not feel threatened or judged".

Erin further supported the need for collaboration by sharing: "You really have to look around and start asking questions and as teachers we tend to get in our little classrooms and shut our doors and you know we don't want to admit that we don't know everything sometimes".

The collaborative partnerships described by the participants frequently involved the Resource teacher. As noted previously, all participants described themselves as active members of their students' Program Planning team. Within the Program Planning team, many of the participants noted the only other member assigned to the student was the Resource teacher. Many of the teachers described the Resource (Program Support) teacher as assisting in selecting the assistive technology for use. Lucy provided insight into the collaboration process by describing their development of a strategy for a student:

> The PST [Program Support Teacher also known as a Resource teacher] and I discussed what we should start with and decided intervention was first needed with reading so we introduced Raz-Kids. […] So the PST and I decided we should look at another way of assisting with reading so he can read things that interested him, plus we had some big research projects coming up and we wanted to make the material as available to him as possible.

Further need for collaboration regarding assistive technology selection was indicated by Keltie:

> I don't feel I can make these decisions on my own, even with the recommendations from Cindy (the Assistive Technology Facilitator for the

> School Board). I mean, the recommendations are awesome and I wish I could implement all of them, but the reality is I have to pick and choose. For the last student, I shared samples of their work with the PST and we went through to prioritize what needed to be addressed first which was writing. So we looked back at the recommendations and selected Co-writer to go with first.

Beyond providing support with assistive technology selection for the participants, many teachers indicated initial training for the student in how to use assistive technology was a common task designated to the Resource teacher. In cases where initial training was provided by the Resource teacher, tasks such as how to locate the program, develop basic student skills and familiarity with the program, and some troubleshooting of common problems were all expectations the teachers had for the Resource teacher. Kayla justified the dividing up tasks related to beginning assistive technology integration, by stating:

> I am anxious to have them use it, but usually the assistive technology is introduced by Sarah. She is our PST and she does the student training before it comes into the classroom. That way when it is in the room, I only need to help with troubleshooting rather than instructing its use. The system works well for the most part.

The division of responsibilities and collaboration regarding integrating assistive technology as described by Kayla also is further elaborated on in Tasha's description of her role with assistive technology integration from the perspective of her Resource assignment role:

> [I have students] using it in the learning center, so from the beginning of the year I said [to teachers] if you want them to use it, this is a place where students can come and then they can go back [to the classroom] gradually[…].

Observations of students leaving the classroom to receive assistive technology training were limited to Kayla's writing class, since all other participants had students' comfortable using assistive technology in the classroom at the time of data collection. During Kayla's Language Arts period, one student was sent to the Resource teacher to work on an assignment using assistive technology. The transition of the student out of the classroom setting was distracting for the teacher and other students. The student was unsure of Kayla's expectations for the assignment he was to work on and did not know where his previous work was located, requiring Kayla to spend time revisiting the assignment and assisting the student in locating his work in his desk. The student returned to the classroom three times during the half hour to ask for further clarification and to find further materials required. Each time, the student stopped to talk to other students before going to his desk or exiting the room.

Beyond introducing assistive technology to the students with learning disabilities, some teachers indicated the Resource teacher was able to provide technical support to them in regards to using assistive technology more effectively, such as accessing assessment data, troubleshooting errors and finding computers that were capable of running the programs. In addition, many of the participants noted the Resource teacher was an advocate for assistive technology use in the school and assisted in transitioning the student's assistive technology to the next grade level. Keltie shared:

> I can count on the Resource teacher to help in June with transitions, which helps. I mean the kids work so hard to become good with the technology- it takes most of the school year. So knowing Resource is in my corner to help advocate that the assistive technology needs to continue is so important, it makes all the work seem a bit more worth it.

A few participants also highlighted the importance of developing collaborative partnerships with administration and other teachers within the school to assist with assistive technology integration for their students. The partnerships developed by some participants with administration began as ways to ensure funding of assistive technology equipment and software; however, participants noted a shift to more of a collaborative approach over time. Keltie described her experience with an administrator:

> Before she would come to the meetings to sign IA's [Individual Adaptations] and not really understand what the recommendations and supports were really all about, I don't think. Since I have started inviting her into the class to see what the students are doing, she seems more supportive. I can share students' work using the assistive technology with her and she gets what it is all about. Now when I ask for money for more equipment, I can usually have some success. Last week she was at an administrators meeting and they had a demonstration of an IPod touch and she came to me to share what she had learned and wanted to discuss how we could maybe use it with a particular student in my class.

Keltie's comments reflect the importance of opening up communication within the school and developing partnerships that will assist the professional development of teachers and contribute to student success.

Collaboration with other teachers and support staff at the school or within the school board was another area some of the participants noted as being important to experience success with assistive technology integration. In particular, many participants emphasized the importance of having support from the Assistive Technology Center (ATC) and its staff as being a key factor to their positive experiences. Staff at the ATC was noted by most of the participants as providing the majority of initial instruction with the assistive technology programs found in their classrooms and also with providing the recommendations for the assistive technology to be implemented for the student. Through initial training and discussion, the ATC staff collaborated with the teacher. Kayla describes her relationship with ATC staff:

> I can email Ann or Cindy [ATC staff], they are quick to respond and will come and help if it is something I don't know and need in-servicing on.[...] I don't know what I would do without them. Well actually I do- the assistive technology just won't be happening in my classroom.

Further evidence of the ATC staff's collaboration was provided by Lucy: "I am able to call [Ann] and [Cindy] anytime if I am feeling done or overwhelmed and they provide awesome support, not just with the technology but with understanding my position and the pressures on me."

Partnerships with the I.T. specialists within the board were consistently noted as being inadequate. Many participants noted their frustrations with using outdated computers and software, issues they consider to be responsibilities of the I.T. department. In addition Kayla described a major barrier to collaboration with I.T. specialists:

> My tech didn't know how to fix it…took over a week and let's face it, reading the web for a research project is rather important. My tech explained that they are not trained on the programs and are not even aware of what most of the programs do. So now I know that if I have assistive technology that isn't working, call the ATC before the tech so I have the instructions for the tech.

Erin also noted a situation with an I.T. specialist at her school, which highlights the isolation and specialization of applications related to assistive technology.

> I've been able to transfer into E pub (a digital text format) but I haven't been able to yet to get the E pub document into V books. My goal is to by the end of this year to be able to take every quiz, every worksheet ever and scan it into E pub and be able to, you know, give it to that particular child, everything that they need to use. I asked my I.T. specialist about how to do it and he quickly replied that was not his area, if was it was a reading thing I should talk to [Ann] at the ATC. This seemed like a pass the buck, I mean he had helped me with other apps before, some of which weren't even academic, but when I mentioned it was for assistive technology, it was shut down at record speeds.

Overall, the findings suggest collaborative partnerships regarding assistive technology exist for all participants. The types of partnerships varied; however, commonalities existed, such as the sharing of progress, discussions regarding next steps, and support in regards to troubleshooting the technology and programs. The separation of assistive technology and mainstream I.T. was reflected in the participants' expressed frustrations with the inadequate collaborative partnerships available with I.T. specialists within the school board. The division between assistive technology and information

technology is important to note, since it mirrors the traditional division of responsibilities of the various educators within the school system, such as Special Education teachers and general classroom teachers. These professional divisions promote the idea that certain teachers are responsible for particular categories of students, resulting in parallel systems of support.

Sustainability

The theme of Sustainability emerged through examining participants' responses to the interview questions: “What barriers have been experienced when you have integrated the assistive technology recommendations in the classroom?” and “How do you overcome barriers to assistive technology integration?”. Three major sustainability issues ~~a~~rose from participants' responses: time, access and collegial acceptance. Throughout my analysis of the teacher dialogue, I realized it was also important to consider the teachers’ talk in ways that give some insights into the degree of resilience the teachers demonstrate in overcoming the barriers identified.

i) Time Commitment

All participants noted that the lack of time available for implementing assistive technology in the classroom was a major concern. Although all teachers noted they were frequently given training opportunities to learn the programs through their school board and Assistive Technology Centre, the actual implementation required more of a time commitment. Also, additional preparation time is not provided for the ongoing technology integration phase for the classroom teachers with students with learning disabilities.

Keltie stated:

> Getting the training to use the program is important. I am really excited after the session, but then reality sets in and I have to figure out how to divide my time so I address the students' needs in planning and in the classroom with the assistive technology, plus address the needs of all the other students.

The dynamics of the overall classroom and the time required for programming and planning for students with additional academic or behavioural challenges was further noted by Lucy:

> This year, for example, I have several students that require various adaptations and accommodations beyond my student with a Learning Disability. Because I have so many, I can't spend as much time on the needs of my student with a learning disability and I feel guilty, because in previous years my students with a learning disability were my highest need and I could really make sure I addressed their needs. Now they tend not even to hit my radar. I find I assign work and then realize that oh yeah Johnny needs support, his assistive technology. I hate that feeling, when it's an afterthought!

In Kayla's classroom, the time required to take the additional step of preparing for assistive technology was observed when the class was completing a newspaper activity. Although Kayla had prepared for all her students by photocopying the article, the reality was she did not embed the assistive technology accommodation in the lesson plan. After observing her two students with learning disabilities disengaged and struggling with the activity, she had to stop her lesson and assist the two students with learning disabilities to setup the assistive technology accommodation.

Beyond the time devoted to planning the assistive technology for students with learning disabilities, many participants noted time was also required to format materials to be ready for assistive technology use. Evidence of the time commitment in preparing materials Kayla provided: “If Johnny wants to read that new book in the book order, it requires someone to scan, edit and convert the book…there goes my preps for a week or more!”.

Similarly, Keltie noted:

> All the reading programs can take up your time. I have sat for hours scanning and editing with Kurzweil. While many teachers are sharing, the reality is every kid wants to pick their own book title for independent reading, which means I have to scan, edit and convert [to mp3]. I’ve spent three or four hours before scanning a book the student wants to read.

During classroom observations, it was noted that both Lucy and Keltie were scanning materials during the Language Arts period for immediate student use. In both cases, the materials were response sheets to activities assigned for the class to complete that day.

Along with participants voicing concerns regarding the amount of time required for implementation, they were all able to provide personal strategies for overcoming the time factor. These include converting books to audio at home, teaching an Educational Assistant how to scan and edit, sharing resources with other teachers and saving materials to build a personal library of resources.

ii) Access to technology

All participants noted that money was a factor in determining the degree to which assistive technology was available to them in their classrooms. Tasha elaborated on the challenge she was currently facing:

> Not having the technology, the software, whatever is needed or having a trial version and now the trial is up and you know it costs a lot of money to get the licence, so we won't be doing that. So we're looking to other means to try and get it for the student.

In addition, many participants noted the software programs recommended were not always easily available due to budgetary restraints at the school and board level. Lucy described one situation resulting from funding:

> Last year I had two students with learning disabilities, one jumpstick of Kurzweil and one laptop that could support it. There was a challenge! Same with there being only one licence for Co-Writer in the class and two students with the need to use it. I had to constantly juggle to ensure it was available to them when they needed it last year.

Although all teachers did identify money as being an issue, they were also able to provide several strategies for overcoming the barrier. Erin shared:

> Generally with the money issue I try to sort of prioritize, what do I really want this year and I will go to my administration and say look, this is all I'm asking from you this year.

Many teachers noted their schools used money from the provincial book bureau order to purchase assistive technology software programs required at the school. Also, teachers noted their administration was able to provide some money to assist in assistive

technology purchases, although some noted the money provided was a trade off, meaning they would not have money for other initiatives or resources during the school year. All teachers also identified the Assistive Technology Center as being a major resource for borrowing required materials.

Beyond money for purchasing the assistive technology, all participants described a number of problems related to hardware, such as computers crashing or being too outdated to load the new software programs. The teachers expressed frustration with the issue and also expressed concern about students feeling possibly defeated by the set backs. Kayla described her situation:

> Our computers in the room are old and can't keep up with some of the programs. Kurzweil for example. Even the jumpstick version crashes the computer and when it doesn't, other issues come up like too-recent a version of Firefox so it can't read the web. […]

Kayla's explanation of the barrier was also observed during her class with one student wanting to read on article from a website but the version of the web browser did not enable the student to use the 'Read the Web' tool on Kurzweil. To overcome the problem, Kayla printed the article from the website and then scanned it into Kurzweil to be read.

The challenge of hardware was reported by the participants as being more difficult to overcome, beyond making requests to administration and technology support staff for more up to date equipment.

iii) Collegial Acceptance

The third issue to emerge from participant concerns was collegial acceptance of assistive technology use. All participants identified the attitudes of colleagues in their school as hindering assistive technology integration for their students. The resistant position of their colleagues regarding assistive technology for students with learning disabilities was described by Erin:

> In some cases, for some of these kids [students with learning disabilities] it would be better if they were blind, at least people would acknowledge that there is an issue. I mean for me, if I give a kid a piece of plastic and it make them more comfortable reading, helps them concentrate better, I don't care, but other people see this as a big deal.

Erin's statement is significant since it highlights the role of individual adaptations in a student profile and the obstacles faced by students in overcoming challenges due to teacher attitudes.

In addition to the participants' own personal experiences with assistive technology and colleague's opinions, Kayla described the effects on the students: "The difference in philosophies of use between teachers is the most challenging. Most kids once they start using assistive technology, have success, want to use it all the time and are discouraged when it isn't made available.".

The influence of educators' varying levels of assistive technology acceptance on a student with learning disabilities was also echoed by Tasha:

> If teachers believe in it [assistive technology], then I find it's easier on the students. Students are asked to use it and they are comfortable with doing that, but if it's resistance with the teacher then I find that affects the students.

Ways of overcoming the negative teachers' attitudes and biases were shared by the participants. Many reported displaying samples of work using assistive technology and without, having discussions and modeling assistive technology use during staff meetings and in-services. Some teachers talked about promoting technology use by having students visibly using it their classes and the school hallways.

The main concerns voiced by the participants regarding the sustainability of integrating assistive technology for students with learning disabilities at the elementary level in their classroom were: not having enough time to prepare materials for their student with a Learning Disability, having limited funding and resources to run assistive technology programs, and the negative attitudes of other teachers at the school regarding the use of assistive technology as an adaptation for students with learning disabilities. Beyond the concerns voiced by the participants, a number of strategies were shared to limit the degree these concerns became barriers to experiencing success for the participants.

In summary, the data generated by observations and interviews with the participants led to the emergence of four specific themes regarding teachers experiences integrating assistive technology for students with learning disabilities. Teachers shared that they view assistive technology as a way to foster independence through educating their students with learning disabilities about their rights and their abilities. In addition, all participants provided examples of how the assistive technology impacted student

performance and confidence within the classroom. The interview data suggests that the participant teachers hold beliefs that view assistive technology is a literacy practice. The teachers provided personal definitions of what constitutes literacy, along with how they approach strategies for achieving literacy for their students.

A third theme that emerged was the need for professional collaboration. All participants shared how they seek out and develop collaborative relationships to facilitate assistive technology integration. Persons collaborating with the classroom teacher regarding assistive technology integration included the Resource teacher, other school staff and ATC staff. Participants also addressed one key resource group they felt was excluded from the collaboration processes,the I.T. specialists.

The final theme which emerged from the data was the notion of sustainability. Participants shared a number of concerns regarding the hindrances they experienced and challenges they feel students may face in the future while attempting to integrate assistive technology in the classroom: time, access to technology and collegial acceptance.

Through examining the data generated in this chapter, I have gained a greater understanding for my own experiences and practices as both a classroom and Resource teacher attempting to integrate assistive technology in the classroom. To further develop meaning related to the findings and the interconnection of the themes, the following chapter will consider the findings within the context of the literature identified in Chapter 2 and experiences of Michael shared in Chapter 1.

Chapter 5: Implications and Conclusions

As a student with a Learning Disability, Michael had a variety of positive and negative experiences with his elementary teachers in regards to their facilitation of his recommended assistive technology as a literacy support as shared in Chapter 1. Michael experienced the successes of full integration and the struggles of having the assistive technology not consistently available. For Michael, the teachers in his classroom heavily influenced the level to which his assistive technology was implemented and they influenced the construction of how he measured being literate and the degree to which he was genuinely involved in the classroom environment during literacy activities.

Comprehending and sharing the experiences and practices of elementary teachers who are successfully integrating assistive technology in their Language Arts classrooms was the goal of my research. I have presented what samples of elementary teachers have shared with me in a manner that highlights their lived experiences and shares their genuine teaching practices. As educators, these participants are actively involved in developing and moulding the experiences all students have within the context of their inclusive classroom. The teachers' experiences integrating assistive technology has a role in the degree the classroom and curriculum outcomes are accessible to all.

Social constructivists define inclusion as being ongoing and occurring in classrooms where all students belong and are valued members. Furthermore, the role of the teacher in an inclusive classroom is defined as facilitating and providing an environment that is appropriate for each student (Kunc, 1992; Leatherman, 2007). Social constructivists promote the belief that all students can participate in their own learning given both instructional and social supports, and that these supports can be provided by

both teachers and peers within the environment. I see Assistive technology as an important social and instructional support for students who struggle with literacy. Similarly, I believe inclusion occurs when teachers create an environment which enables all students to participate meaningfully and engage in their own learning through whatever means necessary to achieve success. This chapter will focus on a discussion of the implications of the findings of my research, leading up to three recommendations for future teacher practice regarding the use of assistive technology as a tool for inclusive education. The implications of the findings are discussed in terms of the role of assistive technology in Universal Design for Learning, the availability of professional resources and supports and the influence of collegial resistance to assistive technology.

Assistive Technology as Tools for Universal Design for Learning

Participants highlighted a number of issues that they had faced or continued to struggle with as they integrated assistive technology in their classrooms. The most common obstacle noted by the teachers was time required for programming and planning. Similarly, Bauer and Kenton (2005) noted that time is consistently found to be a barrier for teachers integrating any form of technology in the classroom. The teacher participants of my study spoke explicitly about time commitments in the same way that Baush and Hasselbring (2004) noted tasks such as personal time to learn the technology, formatting materials to digital media and checking in with students to ensure proper use of the technology. The collective strategies for overcoming the challenges related to time were developing a network with other teachers to access materials, completing tasks during their own time, and creating collaborative partnerships with support staff to assist with teaching students how to use the assistive technology. Time, however, may not be a true

barrier to the integration of assistive technology but rather the time factors mentioned may be indicative of the particular type of planning required to ensure an inclusive environment for all students.

Teachers' experiences and shared practices about how they integrated assistive technology in their classroom draws attention to many elements of the principles of Universal Design for Learning as a way of achieving all-encompassing practices in their classroom. Although the teachers did not label their current practices as Universal Design for Learning, the teachers' descriptions, along with data from classroom observations, reflects the framework and principles of the practice.

Although the study participants cited time as being a challenge to integrating assistive technology, it could be argued that applying the qualities and principles of Universal Design to initial program planning would lead to more efficient and effective lesson development, since Universal Design for Learning is based on the fundamental inclusive belief that each student will follow a unique pathway to success.

Beyond the fundamental inclusive belief, there are three core brain networks associated with Universal Design for Learning labelled recognition, strategic and affective (Center for Applied Special Technology [CAST], 2012). The first brain network, recognition, is also described as the quality of representation by Michael and Trezek (2006), and places an emphasis on providing information in multisensory formats and through a variety of means. For example, providing multiple ways for presenting the content such as orally, with graphic organizers and models highlights the recognition network. The strategic network, also described as the quality of expression, is the differentiation provided for students to express what they know in a variety of formats

through Universal Design for Learning (CAST, 2012; Michael & Trezek, 2006). To achieve Universal Design for Learning under the strategic network teachers may provide opportunities for assessment on the same content orally, with hands-on materials and through writing. The final network associated with Universal Design for Learning is affective, also known as engagement, which calls attention to the importance of planning for differences from the initial stages to ensure motivation for learning (CAST, 2012; Michael & Trezek, 2006). Ways of ensuring motivation and planning for differences in engagement is through authentic experiences, providing choice in content or assignments and 'setting the stage' for autonomy by providing access to tools to assist students from the start.

Under the Universal Design for Learning Framework, educators are encouraged to utilize both technological and non-technological strategies and methods to achieve learning outcomes for all of their students through the principles of equitable use, flexibility, perceptible information, meaning and guiding feedback, simple and intuitive use, low physical effort, and size and space for approach (Michael & Trezek, 2006).

The first Universal Design for Learning principle, *equitable use* within the context of education, meaning assessing instructional materials and determining ways in which the material may be presented to be more accessible, is found in all the participants' interviews. For example, the teachers described the use of colour filters to help with attention, the use of text-to-speech programs to assist with reading, and word prediction software to assist with producing written work as common within their classrooms practices.

A second principle of *flexibility* in use is achieved according to King-Sears (2009) when teachers design their instruction to meet the broadest range of interest, styles and preferences of their students. Participants described these elements when sharing about converting books to audio for their students based on their interests, providing various ways of assessing students and teaching them about their different learning styles.

Another principle is *perceptible information*, defined for educational purposes as varying the presentation and practice of key learning outcomes. The teachers discussed a variety of ways in which they achieved and were cognisant of this principle through the integration of technology for all students. Several participants shared a variety of information technology programs which were integrated into curriculum delivery for all students, such as *Spellingcity.com* and *Audacity*.

Educators providing meaningful and guiding feedback are practicing the principle of *tolerance for error* in an educational setting. In addition, utilizing technology which provides teaching opportunities when errors are made also applies the principle and was frequently noted by the educators. Examples of the technology used to provide teaching opportunities included programs such as *Co-Writer,* which provides students with flexible word prediction along with reinforcement of proper pronunciation through the audio component of the program.

By presenting material in a straightforward manner while addressing the various needs within the classroom such as learning style, concentration levels and background knowledge, a lesson will achieve the fifth principle of *simple and intuitive use*. The teachers were able to share ways in which they addressed this principle, including

ensuring students requiring assistive technology have the necessary knowledge on how to use the programs before being expected to use them to complete assignments efficiently.

Low physical effort in a classroom setting is achieved through designing activities which minimize the amount of physical energy required to complete tasks and is the sixth principle of Universal Design for Learning. Participants frequently highlighted this principle when discussing using assistive technology to reduce the energy (both physical and mental) required when producing written work assignments.

Lastly, *the size and space for approach* and use is applied to education by ensuring that materials are presented in ways that are visibly clear to all students. Although the teachers did not share information on this principle during interviews, I was able to observe this principle in some classrooms. My observations noted how the layout of the room and ease of access to the technology made it possible for the students with learning disabilities to easily have access to the materials in an alternate format through assistive technology without being singled out or disturbing the flow of the class.

Michael and Trezek (2006) support the application of the principles of Universal Design for Learning Framework to curriculum development and delivery by suggesting the framework enables students to experience authentic and situated learning environments which make the material accessible to all students. With a Universal Design approach, inclusion is implicit since differences in students are anticipated and expected, which further highlights its strength as a way of planning for the use of assistive technology in the classroom. Edyburn (2010) disagrees, noting that the seven principles of Universal Design "offer little insight into how to design instruction to ensure that diverse learners are successful" (p. 36). Instead, Edyburn (2010) suggests a

focus must be placed on instructional design and "complex interactions between learning objectives, learner characteristics, performance support strategies, technology, and outcome" (p. 36). McGuire, Scott and Shaw (2006) also advocate for an increased focus on evaluating the use and application of Universal Design for Learning in education. The discrepancies in research related to applying Universal Design for Learning principles in the educational context has resulted in a limited number of educators embracing the practice and acknowledging the value of Universal Design for Learning. I believe it is a valuable framework for promoting inclusive education and as a framework would assist teachers in overcoming challenges frequently cited in the literature and in Chapter 4 in regards to implementing and integrating assistive technology in the classroom. The Universal Design for Learning approach to curriculum, teaching and learning begins with the premise that teachers will expect differences in the learning process and plan for appropriate supports to be present in the learning environment.

Professional Resources and Supports for the Implementation of Assistive Technology

A second common experience noted by participants to successful assistive technology integration was the availability of sustainable technology, professional resources and supports. Participants talked about how budgetary constraints at the school and board level contributed to the lack of assistive technology resources available. Budgetary constraints as a barrier to technology are not isolated to the District 7 School Board. Research by Chmiliar (2007) and Lee and Vega (2005) also noted the difficulties teachers face trying to accumulate the necessary materials and fiscal supports to integrate both assistive technology and information technology, due to the financial constraints and priorities of the school systems.

The challenge of having the necessary equipment for assistive technology to meet the demands of the student population is further compounded in the District 7 School Board by the division between assistive technology and information technology. Teachers within the study noted the absence of Information Technology (I.T.) specialists and the I.T. department in general from their circle of professional partnerships when preparing and implementing assistive technology. Participants described how their I.T. specialists were unable to troubleshoot basic problems with assistive technology software due to their lack of knowledge of the programs and because they were not responsible for assistive technology beyond installing the discs on computers.

By having a division between assistive technology and information technology, there is a degree of separation between the people who are in the school on a consistent basis to work with technology and the front line people who are using assistive technology in their classrooms. If I.T. specialists were to receive professional development around the functions of various assistive technology software programs, they could potentially troubleshoot problems quickly and may respond to work order requests more promptly, since they would have a greater understanding of the implications of the programs for students. Having more knowledge, the I.T. department may be more willing to provide classroom teachers with the hardware necessary to meet the demands of the assistive technology programs.

The specialization of categorizing assistive technology as separate from mainstream learning technology further contributes to the third challenge raised by the participants: collegial resistance to the use of assistive technology.

Collegial Resistance to Assistive Technology

The use of assistive technology in classrooms can be a key element to success for some students with learning disabilities and the diligent efforts of the participant elementary classroom teachers of this study to ensure assistive technology use must be acknowledged. The teachers also expressed concern for their students' progress once the students leave their classrooms, as overall school climates are not always accepting of students using assistive technology for literacy activities.

Teachers reported having conversations with their colleagues regarding assistive technology that were negative and consisted of their colleagues dismissing the use of technology in the classroom in general. The research of Wilson et al. (2003) and Bingimlas (2009) validates this resistance from teachers in regards to technology integration and both have suggested there is a trend of minimal use of technology on a daily basis in classrooms. The participants' experiences are also similar to the findings of Kopcha (2010) who reported that the role of collegial attitudes is critical to the degree technology integration can become part of any school culture. The impact of some teachers' resistance to technology in general is that fewer resources will be directed toward technology development in the school and there is less of a support network in place for the teachers attempting to integrate the technology. For example, if only two of twelve teachers in a school are embedding technology within their lessons on a regular basis, administration and the I.T. department will be less likely to provide the school with more up-to-date hardware. With less up-to-date hardware, the teachers interested in embedding technology will experience more challenges since the technology is old and perhaps not as well maintained. The hardware deficiency situation will further hinder integration of assistive technology software for students with learning disabilities,

especially if the use of assistive technology is viewed as an "extra". Also, classroom teachers with an interest in technology integration would have less of a network within the school from whom to seek advice or support and that might lead to them abandoning technology use. Finally, if students are not provided with ample opportunities to use technology in general, it is argued that they will have more difficulty becoming proficient with assistive technology software, since they are learning how to operate general computer software along with their assistive technology software, thus compounding the learning curve.

Most participants provided examples of ways colleagues hindered further assistive technology integration at a school level through their resistance to having it used in their classroom or incorporated into students' Individual Adaptations. Chmiliar (2007) suggests that classroom teachers resist integrating assistive technology due to the specialized nature of the programs and the perceived skill sets required by teachers to make the technology work in their classroom.

In conjunction with participants noting collegial resistance to technology in general, participants also discussed their concerns that colleagues did not view assistive technology as a legitimate literacy practice. Many of the participants' colleagues indicated that the use of assistive technology was potentially a form of "cheating"; making assessment of reading/writing invalid. The teachers interviewed for this study detailed a solid acceptance of assistive technology for literacy activities that related strongly to their broad definitions of what constitutes literacy.

The success of assistive technology integration relies heavily on the acceptance of the classroom teacher to view the support as an equitable literacy practice. As the data

demonstrates, all participants expressed a willingness to engage in the assistive technology integration process. In addition, participants displayed a genuine understanding of the role assistive technology has in the Language Arts program for students with learning disabilities to ensure equality and opportunities for all students to fully engage in literacy activities. The flexible definitions of literacy provided by the participants were illustrated by examples of students engaging with text and producing text in a variety of ways, including the use of assistive technology. These explanations of literacy reflect a definition based on functionality rather than on isolated skills such as decoding. Literacy as defined by the participants resonates well with the research literature that discusses how computer technology is shaping literacy viewpoints (Larson, 2009). The shift in defining literacy beyond a set of isolated skills; however, is not universal, but is reflected in educators who embrace a pedagogy closely aligned to constructivist approaches and the Universal Design for Learning framework (Grobecker, 1996; Michael & Trezek, 2006).

If a classroom teacher thinks of literacy as rigidly defined by a student's ability to read and write independently through traditional internal methods (like the single psycho-linguistic model of reading for typically developing students), students with learning disabilities are set up to have minimal academic success and to be excluded. By definition, having a learning disability means underachievement in terms of a particular skill set such as phonological awareness or language processing, which is directly linked to limitations with reading or writing.

In Nova Scotia, emphasis is placed in the elementary years on providing high quality reading instruction along with effective interventions for those experiencing

difficulties in their literacy development (Nova Scotia Department of Education, 2002). Although not specifically provided as a strategy for intervention, it could be argued that the introduction and use of assistive technology for students with learning disabilities is required to ensure their inclusion in the classroom and to further ensure their development as a literate citizen who can meet the literacy demands of the 21st century.

A necessary shift in defining literacy also requires school climates to become accepting and aware of the various assistive technology tools available for students with learning disabilities. Then the teachers dedicated to integrating assistive technology do not feel their efforts are in vain as the students progress to the next grade level. Achieving a more positive climate towards assistive technology use will require exposure and formal professional development in assistive technology related to both assessment practices and literacy practices.

Conclusion

Through examining data generated during this study by observations and participant interviews, four themes emerged regarding teachers' experiences integrating assistive technology for students with learning disabilities. The themes were the use of assistive technology to foster independence skills, a shift in literacy definitions, the need for professional collaboration, and concerns over sustainability. From these themes, suggestions have been developed to ensure the continued development of inclusive practices for students with learning disabilities and the sustainability of assistive technology in the classroom. Educators are encouraged to use Universal Design for Learning as a starting point for all planning. Furthermore, removing the divisions generated by the specialization of assistive technology from mainstream information and

communication technology will increase classroom teachers' acceptance of the technology and make it easier to facilitate its implementation with more frequent support made available through I.T. specialists. Finally, the measure of literacy must be re-examined to reflect the evolving demands of society, and as such should become more flexible with how text is 'produced' or 'read' to achieve the desired goal. Through creating and promoting such a goal, assistive technology will be more likely to be accepted, as it should be as an equitable literary practice.

Throughout the research process, I have realized that my own experiences and struggles as a classroom and Resource teacher integrating assistive technology for Michael and other students like him are not anomalies. Through this research, the teacher's sense of responsibility for student success and alternative definitions of what constitutes literacy have been identified as being key. The identification of teacher responsibility and flexible definitions of what constitutes being literate should be addressed in future professional development regarding assistive technology integration for teachers. This will ensure more widespread successful experiences integrating assistive technology, and in turn more equitable literacy experiences for students with learning disabilities.

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Appendix A

Interview Questions

1. What types of AT are you currently using for your students with an LD?
2. What types of AT do you find useful and in what ways for students with LD?
3. How do you approach AT programming for a student with an LD?
4. What barriers have been experienced when you have integrated the AT recommendations in the classroom?
5. What strategies have you employed to overcome the barriers experienced?
6. What factors do you see lead to successful experiences with AT integration for students with LD's?
7. How do you feel AT impacts a student's literacy development?
8. Have you had any professional development regarding AT? If so, what have you found the most valuable?

Appendix B

Introductory Letter

Hello _____,

My name is Denise Burgess, and I am a Grade 5/6 teacher, Math mentor and PST at *** School. In addition to teaching I am also completing my M.Ed (Inclusive Education) thesis this year. I am contacting you because I am currently seeking educators to participate in my thesis research project concerning the use of assistive technology in the Language Arts classrooms for students with learning disabilities. Through my discussions with various senior board staff you have been recommend as a potential candidate for my project.

If you agree, your involvement in the project would be approximately an hour interview session with me at a time that is mutually convenient and an observation conducted by me during your Language Arts period (if you currently have a student using assistive technology in your Language Arts class).

I would greatly appreciate your participation in the research. I have attached the formal explanation of the project along with all ethical considerations for you to review. If you are interested in participating or have further questions please do not hesitate to contact me at email, school phone number or home phone number

Thank you for your time,

Denise Burgess

Appendix C

Formal Explanation Letter

Dear Participant:

Please allow me to introduce myself. My name is Denise Burgess, and I am currently a Graduate student at the School of Education, Acadia University. I am undertaking a supervised research study entitled "assistive technology for students with learning disabilities: Upper elementary teachers' practices and experiences".

The implementation and integration of assistive technology recommendations for students with learning disabilities is essential and it is important to gain an understanding of educators' practices and experiences implementing the assistive technology within the Language Arts classroom. The research looks to explore the specific nature of educators' experiences implementing AT, and as such I am asking you to volunteer to participate in this research study.

The research study will consist of an interview session with me and observations in your classroom. The interview session will last a minimum of one hour and will be audiotaped, with the possibility of a follow up interview. Once transcripts of your interview are complete you will be requested to review the transcript for accuracy. The observation component will take place in your classroom a minimum of once during Language Arts instruction. The purpose will be to observe AT implementation. The observations will last the duration of your Language Arts instruction period. All data generation will be completed within a three month period. Participation will be voluntary and there are no negative consequences if you chose not to participate, furthermore you can withdraw from the research at any time without consequence.

Should you volunteer, your identity will be protected, and the information you share will only be used for research purposes. Data will be stored at the School of Education, Acadia University for a period of five years after which it will be destroyed.

I realize your time is valuable and would greatly appreciate your contribution to the study.

The research has the approval of Acadia University's Research Ethics Board and District 7 School Board.

You may contact me at home phone or via email anytime if you have questions or concerns. You may also contact my thesis advisor, Dr. Aylward at:

Dr. Lynn Aylward

Department of Graduate Education

Acadia University

Phone:

E-mail:

Once again, I will be in contact with you soon regarding the time and place for the interview and observations.

I greatly look forward to learning from you.

Respectfully,

Denise Burgess

M.Ed (Inclusive Education)

Acadia University

Dr. Lynn Aylward

Thesis Supervisor

Dept. of Graduate Education

Acadia University

Appendix D

Informed Consent

I, _____, agree to participate in the above research project entitled "assistive technology for students with learning disabilities: Upper elementary teachers' perspectives and experiences". The purpose of this research is to help increase the understanding of educators experiences and practices related to integrating assistive technology in the upper elementary Language Arts classroom through discussing and recording my experiences and being observed implementing assistive technology in my classroom.

I understand that participation is voluntary, and that I may withdraw from the research at any time without negative consequence.

I understand that my identity will remain anonymous and that any information that is shared will be kept confidential and used only for research purposes.

I understand the research may be published by the researcher in academic journals. It will be published in a Master of Education Thesis at Acadia University.

I understand that the data will be stored in a safe, secure location at the School of Education, Acadia University, for five years after which the tapes will be erased and documents shredded.

I understand that there is no anticipated harm or risk to myself.

I understand that there are no direct benefits to my participation.

I understand that a summary report will be made available for me to view.

I have read and understood the purpose of the research and my involvement including all possible risks and benefits. I understand that I have the right to withdraw my participation at any time and that I may ask any questions at any time.

I am giving my free consent to research participation by signing this Research Consent Form.

Date: _____

Signature: _____

You may contact the Chair of Acadia University's Research Ethics Board, Dr Stephen Maitzen at number or email at email, if you have any questions about the conduct of the study.