CURB CUTS FOR WRITING: STUDENTS WITH LEARNING DISABILITIES’ PERCEPTIONS AS LEARNERS AND WRITERS USING ASSISTIVE TECHNOLOGY

by

Robin Elizabeth Schock

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Abstract

Assistive technology, specifically, word prediction software holds great promise in supporting the writing process for students with learning disabilities. This thesis reports on a qualitative study that examined eight students’ self-perceptions as learners and writers using word prediction software.

Participants were purposefully recruited from a local Learning Disabilities Association’s listserv located in a mid-sized Eastern Ontario city. Three groups of two to three Grades 4-8 students previously identified with a learning disability, and who were already using word prediction software (e.g. Co-Writer or WordQ), attended a 3-hour session. This session included an instructional workshop, and completion of a short reflective writing task followed by a focus group. Separately, participants’ parents attended a focus group. Data for this study includes focus group responses (student and parent), observations from the workshop, and the written student reflections. Using content analysis, emerging themes from participant responses were analyzed. The main themes from this analysis were: (1) students’ perceptions of having an equal opportunity to participate in academic subjects; (2) increased student self-efficacy; and (3) an ad hoc approach to training and the use of assistive technology software in school. These themes were then linked to relevant literature and a set of recommendations was developed for educators. Recommendations for the future included facilitating increased self-efficacy for students with learning disabilities; reducing the ad hoc approach to teacher education by instituting mandatory courses about students with disabilities.
in teacher education programs; and increased instruction in the use of assistive technology for parents and teachers.
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Chapter 1: Introduction

An elementary school janitor arrives to a snow-filled school parking lot just after a snowstorm. As he quickly works to remove the snow from the stairs leading into the school, many students begin to line up. A young student in a wheelchair arrives and asks the janitor if he would mind shoveling the accessible ramp so this student could get into the school. The janitor had been working very hard to clear the stairs of snow and told the boy he would get to the ramp later. The wise young boy exclaimed, “If you shovel the ramp first, we could all get into the school” (n.d., used with permission).

This story’s theme of equal access for all students serves as the metaphor for the role of assistive technology as it supports students with learning disabilities in academic subjects. It imagines assistive technology as a curb cut for students to access the curriculum. Primarily this metaphor was birthed from my experience as a woman with a physical disability, as well as my experience as an assistive technology instructor for students with learning disabilities. I was curious to examine students’ perspectives on how the technology supported their learning. In particular, I wondered if there was an association between changes in students’ own self-perceptions and the use of assistive software and whether their parents also observed this change. In terms of sidewalks, curb cuts were originally created for one population, those with physical limitations, but their use often extends to others who benefit from the accessibility that curb cuts create.
Personal observations over the years have furthered my desire to investigate this phenomenon in a qualitative tradition. This first chapter will introduce the theoretical underpinnings of this study along with definitions of terms.

The Social Model of Disability

The perspective of this study is from a social model of disability, a perspective that focuses on the environmental barriers faced by students with learning disabilities as they interact with their environment (Love, 2003). The social model of disability perspective has had a powerful impact on social sciences research (Simmons, Blackmore, & Bayliss, 2008). This perspective is different from the medical perspective that views disability as residing within the individual (Barnes, 1998). Different from the traditional individualistic medical approaches to disability, the social model embodies a more radical approach (Barnes, 1998). The seeds of this new approach were sown in Britain by the disabled people’s movement as a rebuff to the politicization of disability (Barnes, Mercer, & Shakespeare, 1999). A brief explanation of the social model of disability follows.

Prior to the 1970s the medical model of disability focused on the limitations and impairments of an individual leading to a personal tragedy approach which in turn lead to rehabilitation and therapy for individuals with disabilities in the 1970s (Barnes, 1998). From the World Health Organization’s (WHO) definition of disability in 1976, conceptions of individuals with disabilities were focused on what individuals could not do, redefining normality as able-bodied and disabled as abnormal. The social model focused on obstacles forced on disabled people that limited their opportunities to
participate fully in society. “It is society which disables people with impairments and therefore any meaningful solution must be directed at societal change rather than individual adjustment and rehabilitation” (Barnes et al., 1999, p. 77). The medical model supports the following assertions: disability as antithetical to health and well-being; problems experienced by people with disabilities are a direct consequence of their individual impairments; the condition of disability is situated in the body or mind of the individual; and issues arising from this condition are by definition, medical issues (Barnes et al., 1999).

The social model of disability supports the following assertions: disability is compatible with health and well-being; problems experienced by people with disabilities are a direct consequence of ablest, arbitrary and exclusionary norms; disability is situated in society's failure to adapt to the needs of its citizens; disability issues are by definition, political and economic; and society is in need of rehabilitation (Barnes et al., 1999, p. 77). My perspective aligns with many who maintain the social model of disability as being fundamental to equitable provision of educational services for students with disabilities. This view envisions the environment as the barrier and the venue in need of change rather than the individual student who must change to suit the educational environment (Love, 2003). Throughout this study, the lens of the social model of disability will underlie my analysis of the data and interpretation of the relevant literature. Additionally, qualitative methods are used because, as Pentyliuk states, “qualitative
methodologies have emerged as some of our most important tools, in understanding the complexities of disability in its social context” (Pentyliuk, 2002, p. 18).

Why is writing important?

Dubbed the “expressive side of the literacy coin, writing is arguably equally significant [as reading] and worthy of instructional emphasis” (Peterson-Karlan, Hourcade, & Parette, 2008, p. 13). Writing helps us to make sense of our world; it is an effective means of developing higher-order thinking skills and is a powerful predictor of academic success (Peterson-Karlan et al., 2008). A complex process, writing is our strongest communicative tool. Requiring multiple processes activated simultaneously, Hayes (2004) explains “writing is a communicative act requiring a social context and a medium, a generative activity requiring motivation and an intellectual activity requiring cognitive processes and memory” (p. 1402).

Effective writing skills are a necessary life skill and as such are crucial ingredients in instruction for every student. Writing has been said to be “the most sophisticated complex achievement of the language system” (Lerner, 1997, as cited in Goddard & Sendi, 2008, p. 408). As will be discussed in Chapter 2, under the section about the writing process, students with learning disabilities face difficulties with writing. As more careers require greater levels of literacy skills, these students who may be unable to write effectively will find themselves disadvantaged unless given explicit instruction to support writing (Peterson-Karlan et al., 2008). It is therefore imperative that
educators understand and implement strategies to help students to become confident communicators through writing.

Traditionally, reading is given greater emphasis especially for the population of students with learning disabilities. However, writing is clearly just as important for students to master and is a means of expression valued by many. As Zlata Filipovic, author of Zlata’s Diary: A Child’s Life in Sarajevo, explains, we write to let others know we were here:

I discovered the beauty of writing—when one can pour oneself onto a great white emptiness and fill it with emotions and thoughts and leave them there forever. And I kept on writing during two years of war; it became a type of therapy for dealing with everything that was going on (Filipovic, 1999 as cited in Gruwell, 1999, p. xiv).

She wrote this in the foreword of The Freedom Writers Diary, a compilation of student’s journal entries from Woodrow Wilson High School in Long Beach California. These at-risk students, from Erin Gruwell’s class, were the characters in the movie, Freedom Writers. As a teacher, Erin inspired her at-risk, perceived un-teachable, students by introducing them to others who had persevered in the face of difficult life circumstances. She demonstrated to her students how writing in their journals could become a place of refuge. Famous people such as Anne Frank and Zlata Filipovic became role models for these students as they witnessed their own stories published in book form. Filipovic hopes readers of the students’ book will be inspired to “write their own diaries, stories,
poems, and books to fight prejudice and choose to deal with what happens to them in a positive way, to learn lessons and share them with other people” (Filipovic, 1999 as cited in Gruwell, 1999, p. xvii). All students need to be given “authentic writing activities, [so] they are able to appreciate the power and influence of writing and foster a positive motivational regard for writing” (Troia, 2005, p. 330).

**Definitions**

**Assistive technology.**

Lewis, Graves, Ashton and Kieley, (1998) define assistive technology “as any technology with the potential to enhance the performance of persons with disabilities” (p. 16). This will be the definition I will use for this study. The specific assistive technology discussed in this study is the use of word prediction software that is documented to be one of the most promising strategies for improving the text-entry speed for students with learning disabilities (Lewis et al., 1998). Originally created to reduce the number of keystrokes necessary for individuals with mobility impairments and alleviate fatigue, (Love, 2003) word prediction software is essentially a form of a curb cut to improve the student’s access to the production of writing.

**Word prediction.**

Word prediction is used along with a word processor and is a technology which “monitors the letters that the user types, generates a list of the most likely words and displays them in a prediction list” (Tam, Archer, Mays, & Skidmore, 2005, p. 301). Word prediction programs reduce the number of keystrokes necessary to transcribe a word by using the first one to three letters that are typed to predict the target word (Peterson-
Karlan et al., 2008). The program provides a list of choices or guesses as to the word the user is targeting using rules of word frequency and grammar to provide the user with a list of words (Handley-More, Deitz, Billingsley, & Coggins, 2003). The user may then choose the desired word from the prediction list by pressing a designated key on the keyboard, either a number key, an arrow key or using the mouse. The added benefit of the speech synthesis allows the user to listen to the computer’s echo of the typed letters, words or sentences (Tam et al., 2005). The natural language used in the newer technologies such as Co-Writer and WordQ, allow a more appropriate visual and auditory cueing system to assist the writer with text composition (Shein, Nantais, Nishiyama, Tam, & Marshall, 2001 as cited in Tam et al., 2005).

Additional features of the software include automatic spacing, automatic capitalization, topic dictionaries, personalized vocabulary lists, and subject-specific vocabulary lists. The added benefit for students with learning disabilities is the editing feature called “read back” which allows the user to choose selected text to read back for revision purposes. Research on the use of word prediction software is limited with few controlled studies (Handley-More et al., 2003; Tam et al., 2005). In Chapter 2, the lack of research on assistive technology in the literature will be discussed further.

**Learning disability.**

The definition of learning disabilities has generated controversy, mostly over the labels and definitions that continue to plague service provision for students. For example, other countries such as the United Kingdom use the term “learning disabled” to refer to students with intellectual disabilities while the term used for students with learning
disabilities is dyslexic learners or students with dyslexia (Burden, 2008; Klassen, 2002a). The importance of using a consistent definition is crucial when searching for literature on the topic. Therefore, articles with comparable definitions must be sourced for accuracy of interpretation. For the purposes of this study, the following definition for a student with a learning disability is adopted:

Learning disability applies to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life span (National Joint Committee on Learning Disabilities (1997) as cited in Dyson, 2010, p. 44).

Any definition of a medical term will include these negative labels; however, this definition is more respectful in its language than older definitions and is preferable given this study’s premise of adopting the social model of disability.

**Standpoint as a Researcher**

As a lifelong advocate for students with disabilities and as a woman with personal experience with a disability, I find myself positioned as an insider in the area of disability studies. I spent the first twenty-years of my career supporting adults and children with intellectual disabilities. I worked as a camp counselor, a group home supervisor, and as an educational assistant. I became frustrated with my inability to affect structural systemic change for the students I supported; thus I went back to school in my forties to
attain a degree in Disability Studies. It was during my time at Ryerson University that I became aware of the power of evidence-based research to bring about systemic change. I situate myself within the framework of the social model of disability which views disability as a societal phenomenon rather than a problem located within an individual as the medical model of disability purports (Oliver, 1990). It is through this lens that I began to view disability in the world.

With this new worldview, I immersed myself in the literature focusing on inclusion for students with disabilities. In more recent employment, I found myself again constrained by the structural processes of the public school system. Through my experiences, I have witnessed numerous barriers that prevented students with learning disabilities from freely using their assistive technology. Sometimes the barrier has been as simple as the student not being provided with a work area close to a power source. However, as both an assistive technology instructor, and a liaison for high school students with learning disabilities, I have observed firsthand the transformation that occurs as students discover how assistive technology software can support their learning challenges. From my frustration and desire to advocate for students, I hope to give voice to the students’ and parents’ perspectives on how assistive technology supports their learning and investigate their self-perceptions as learners and writers.

Given my standpoint as a researcher, I was deeply aware of my position within the research as I proceed with my study. I can understand and empathize with the challenges disability causes for students. Having worked alongside teachers, I can also
appreciate the struggle to teach students with a range of learning challenges. Though living with a physical disability, I also deal with societal issues of segregation, discrimination, and disenfranchisement. I am curious about the changes that may take place for students when they begin to use assistive technology for writing

I am a firm believer in the power of a story and the significant power of that story being told from the individual’s perspective to bring about systemic change. I hope that the results of this study will contribute to an understanding of the importance of hearing from the users themselves. Subsequently, it is my desire to see educators act on suggestions from the students and their parents for future classroom applications of assistive technology. Exploring how students perceive themselves as learners will offer a window into their experiences. By hearing from the students about their self-perceptions as learners, the qualitative data will contribute to an authentic rendering of what it means to have a learning disability. As those who are often spoken for or about, the quotes from the students themselves will add legitimacy and reality to the study. As the instrument of research, I am also cognizant of the biases I inhabit from my standpoint within the research and the potential for choosing data to support only my position. Careful attention to my own bias will mitigate this potential outcome as well as a rigorous coding method, the use of an inter-rater reliability check, and ongoing readings of the study by my supervisor. Contrary to quantitative studies, qualitative studies rely on the stories of individuals to inform the research process: “it can be as important to understand the stories behind the numbers as to have the statistics themselves” (Patton, 2002, p. 152).
Theoretical Framework

This study rests on three foundational assumptions that form the theoretical framework. All three assumptions are necessary to understand how students perceive themselves as learners and writers. First, student success can be supported through the process of empowerment and a holistic, strengths-based approach to learning; second, how assistive technology reduces the cognitive load for students with learning disabilities; and third, how technology should be viewed as a universal instructional medium for all students.

Empowerment through a holistic, strengths-based approach.

The first assumption is empowerment for students with learning disabilities. Poplin (1995) suggests that technologies that “allow non-readers and writers to read and write text offer students with learning disabilities both a sense of achievement and independence” (p. 137). Often in education, technology has been used to address deficits in the learning of students with learning disabilities through reductionist means such as the repetitive completion of worksheets or lists of spelling words without a meaningful context. By creating a holistic school environment, the use of a computer is viewed as liberating and empowering for students. In order to adopt a holistic approach to learning, the educator works with the student by incorporating the parts of a much larger picture, by viewing the entire individual in the context of new learning. Poplin (1995) challenges educators to be: “Holistic educators [who] attempt to look at the whole set of possibilities, taking into consideration the students, their talents, their development and their interests” (p. 132).
Poplin (1995) and her colleagues at Claremont Graduate School in California found that “students with learning disabilities performed identically to their peers on a non-verbal measure of computer aptitude, interest and literacy” (p. 136). Using a *Computer Aptitude, Literacy and Interest Profile*, students achieved high scores in areas of computer literacy. Other areas such as visual arts, music, and divergent thinking were tested with similar findings. As the authors suggested, often students with learning disabilities are taught compensatory strategies in order to perform the same as their peers; however, this has traditionally been viewed as a dependence on the strategy rather than a necessary support (Poplin, 1995, p. 136).

By focusing on areas of strength, students may come to a deeper understanding of how they can compensate for their limitations and pursue a more holistic approach through strengths-based learning. Often in special education, the tendency is to identify areas of deficit and weakness, rather than ability and strength. Poplin (1995) views this holistic approach as a better way to support students because students can place their school life in context to the larger context of their lives; their liberation may mean their ability to reflect on required action to succeed. The use of technology in traditional school subjects, such as reading and writing, has the potential to release students from the cycle of failure as they attempt to achieve equally as their peers. The technology’s support can be seen as a vehicle to access otherwise inaccessible information and motivation for improvement. By viewing the student holistically, rather than as deficit parts of a whole, a more respectful approach to education can be achieved according to
Poplin’s theory. This strengths-based approach is a foundational assumption of this study, as well as the necessity of cognitive load reduction.

**Reduction of cognitive load.**

The argument that assistive technology for writing reduces the cognitive load on the multiple processes required for effective writing is the second assumption undergirding this study. As all students discover early in their elementary schooling, performing the act of “normal writing” requires the simultaneous activation of multiple cognitive processes. Writing for many people and for most kinds of writing tasks, appears to demand considerable cognitive resources, and experienced writers suggest a need for uninterrupted effort to produce successful pieces of writing (Torrance & Jeffery, 1999). Reducing the cognitive load helps students with learning disabilities focus their cognitive energy on the larger intact skills of comprehension and content generation (Forgrave, 2002; MacArthur, 1998). These students benefit from word prediction (choosing a word from a short list of possibilities) with speech synthesis (spoken words translated to text on the computer screen) because written work can be composed and edited more accurately (MacArthur, Graham, Haynes, & De La Paz, 1996).

Graham and Harris (2003) explained that the writing process can be divided into three main processes: “planning what to say and how to say it, translating plans into written text and reviewing to improve existing text” (p. 323). The problem exists for students with learning disabilities as they “tend to rely only on knowledge-telling” (Swanson, Harris, & Graham, 2003, p. 323). Consequently, the text produced is simple, often far below the student’s level of ability (Forgrave, 2002). Graham, Harris, & Fink
(2000) demonstrated that students with learning disabilities were preoccupied with spelling, grammar, and punctuation and letter formation to the extent that these mechanical concerns interfered significantly with their written product (as cited in Swanson et al., 2003).

Similar to the experience of writing out the words to the national anthem with one’s non-dominant hand, the cognitive load required to manipulate the many processes required for writing impairs the procedure for students with learning disabilities (Wiens, 2009). Clearly, “for people without disabilities technology makes things easier; for people with disabilities technology makes things possible” (Marrero-Martinez & Hernandez-Estrada, 2008, p. 58). Assistive technology offers the potential to reduce the cognitive load for students with learning disabilities, providing a strategy to reduce frustration in writing.

The purpose of this study is to understand from the students’ perspective how they feel the assistive technology benefits their learning. Subsequently, understanding how these feelings translate to their self-perceptions as learners and writers will provide a genuine perspective on their experiences.

**Universal design for learning.**

The third foundational assumption for this study is the theory of universal design for learning. Astute educators embrace the advantages of using technology in the classroom to meet the needs of many students, rather than viewing technology as a separate entity required by only a few students. Universal design for learning is designed to “provide instruction, materials and assessment in multiple formats that will make
learning possible for all in the classroom” (Rose & Meyer, 2002, p. 7). As a concept, universal design for learning has its roots in the architectural world, designing buildings for everyone. Within this framework, curriculum design supports learning differences from the outset, as opposed to retrofitting pre-established curriculum (Mariano, 2006). Adopting the use of assistive technology embraces a universal design for all students served in a classroom.

It has been established that word prediction techniques both facilitate access and reduce barriers to writing. Similar to the original sidewalk curb cut, word prediction technologies are now incorporated into electronic devices used by the general public for swifter and easier communication. As an automatic response, universal design in educational technologies makes sense because “rather than retrofitting a curb, a restroom, or a textbook after the fact to allow access for everyone, it makes better sense to incorporate universal access as one of the specifications of the basic design” (Lewis, 2005, p. 332).

Students with learning differences can maximize word prediction technology in the classroom as Steve McLean, principal of special projects for the Upper Canada District School Board believes. McLean claims assistive technology is appropriate for all students and demonstrated their commitment to universal design for learning by installing word prediction software in all of their school computer labs (Kinross, 2009, para. 1).

We’re operating on the premise that adaptive technology [AT] is necessary for students with learning disabilities and good for all students. Good teaching
dictates that we hit all of the learning modalities that kids need. Just because a student is doing well, or moderately well, doesn’t mean that they couldn’t benefit from AT. Making the technology uniformly available will remove the stigma and encourage collaboration (Kinross, 2009, para 6).

By adopting a similar mindset, more school boards could address the diverse needs of today’s students by using technology. The next chapter summarizes relevant literature on: how the writing process is affected for students with learning disabilities and how assistive technology can scaffold the process; positive learning outcomes from a strong sense of students’ self-efficacy; causes of parental stress from having a child with a learning disability; and the effective use of focus groups with children.
Chapter 2: Literature Review

This literature review will be divided into five sections. I begin with an initial review of the literature explaining how the writing process occurs for all students followed by aspects of writing which are affected for students with learning disabilities. Next, articles and studies about assistive technology and the support offered for these students will be highlighted. Subsequently, the critical component of self-efficacy is reviewed with a focus on the impact on self-perceptions of students with learning disabilities and a brief look into the issues facing parents of children with learning disabilities. Finally, the effectiveness of focus groups for children as a means of obtaining qualitative responses will be evaluated from relevant literature. By examining current research, critical analysis of this study’s outcomes and its relevance to the field of education will be provided.

The Writing Process

Children’s developmental writing process begins with the drawing of symbols and pictures (Graham & Weintraub, 1996). It has been reported that these symbols and pictures are often hard for children to differentiate (Ibid). Children’s writing begins as “scribbling undifferentiated forms to eventually forming letters, generally between the ages of three and six years of age” (Graham & Weintraub, 1996, p. 19). Early writers often read different messages from their writing. At first, children are not aware that their marks on paper are part of a finite set and they use letter-like symbols, pictures, stars, squiggles, and numbers with little awareness that the letters represent individual
phonemes (Gillet & Beverly, 2001). In order to understand what happens for students with learning disabilities when they write, the cognitive processes involved in writing must first be understood.

The revised framework of the original Hayes & Flower (1980) model of the writing process presents a more accurate framework within which cognitive processes are activated. The revised model gives a more central role to working memory which operates on input from the task environment and from the writer’s long-term memory. The task environment refers to anything external to the writer that influences their writing such as the intended audience or the medium used to produce text (Hayes, 2004). The writer then activates schemata for proposed writing tasks from their long-term memory. A schema is a “general formula or script that the writer can follow to solve routine writing problems” (Bruer, 1993, p. 221).

By organizing information into schemas, our encoding of information becomes easier and we are able to encode a greater amount of information. By accessing writing schemas, expert writers reduce the cognitive load required to perform a writing task. The richer the schemata one possesses, the faster one is able to process knowledge already encoded into long-term memory (Anderson, 1994). The revised model of cognition and affect in writing places more emphasis on the role of working memory as a major component of the individual (Hayes, 2004). The new model also includes the important component of visual and spatial representations required to make sense of text such as
graphs and pictures. Long term memory is important but the working memory’s role is crucial for this population.

Working memory “refers to the system or systems involved in the temporary maintenance and manipulation of information” (Hayes, 2004, p. 852). The working memory is a limited resource that both stores information and carries out cognitive processes suggesting that cognition operates structurally from a central executive with two specialized memories, the phonological loop and the visual/spatial sketchpad (Ibid). The phonological loop stores memory for sounds while the sketchpad stores visually and spatially coded information (Hayes, 2004). The central executive retrieves information from long-term memory, managing tasks that are not fully automated and require problem-solving. Most individual’s working memory capacity holds between seven to nine items with plus or minus two items (Miller, 1956). Once a task becomes crystallized, it moves to the long-term memory stores and can be retrieved with activation of schemata (Lee, 2008).

Hayes (2004) added the role of motivation as part of the individual influencing writing and the cognitive processes which is a vital aspect of writing for anyone, but especially for students with learning disabilities (Sideridis, 2009). As a generative act, writing requires motivation (Hayes, 2004, p. 1402). Many a writer has stared at an empty page or blank computer screen wondering what to write, moreover, why they must write. The revised model of writing situates motivation and affect centrally as their roles are crucial to the writing process (Ibid).
The writing process relies heavily on one’s ability to use these cognitive processes simultaneously to produce quality written text. Text production must account for the writer’s expertise, content knowledge, and with the nature of the writing task, therefore, “the process is composed of a number of different activities each associated with different cognitive processes and, consequently, with different cognitive demands” (Torrance & Jeffery, 1999, p. 2). The complexity of the writing process is demonstrated by interventions requiring expert writers to only use capital letters or remember a string of numbers while writing. Their performance decreased dramatically under these conditions (Fayol, 1999).

Expert writers appear to agonize more over their text, engaging in substantially more explicit planning and problem-solving than do novices (Scardamalia & Bereiter, 1991, as cited in Torrance & Jeffrey, 1999, p. 1). One of the keys to understanding the writing process lies in the appreciation of the complexity of the varied cognitive processes requiring activation when an individual begins to write. If any of these processes are compromised, the process will be more complicated and cause greater effort to generate and produce quality text.

**The writing process for students with learning disabilities.**

“Students with learning disabilities often find the task of writing exasperating if not impossible” (Goddard & Sendi, 2008, p. 409). For students with learning disabilities the ability to maintain a number of items in their working memory is limited, therefore, the more automatic a task becomes, the less cognitive load is required to complete a task (Swanson et al., 2003). Since students with learning disabilities often have trouble with
the concept of writing for an audience, the inclusion of the task environment as the social environment, in the revised Hayes (2004) model is a vital aspect in understanding why they have difficulties with writing. Their primary objective in writing is knowledge-telling which involves writing all information related to a topic even if only somewhat related (McCutchen, 1988; Santangelo, Harris, & Graham, 2008). Good writers need to consider the needs of their audience and the genre in which they are writing to produce quality text, without these ingredients, the quality will be affected (Santangelo et al., 2008).

Additionally, confidence in writing is affected by their “reduced motivation which is hampered from being told they are poor writers” (Santangelo et al., 2008, p. 81). For students with learning disabilities, writing struggles are compounded by their processing difficulties, rapid naming speed impairments required to map sounds on to letters, and dysgraphia (unintelligible handwriting) in written expression (Ibid).

As mentioned earlier, the multidimensional writing process comprises three distinct processes, planning, translating, and revising (Graham & Harris, 2003). Students with learning disabilities allocate “little attention to rhetorical goals, whole-text organization, the needs of the reader, or the constraints imposed by the topic” (Swanson et al., 2003).

The tendency for little planning for writing tasks by students with learning disabilities was demonstrated by an intervention with fifth and sixth graders with learning disabilities who were asked to plan their writing beforehand which resulted in students
spending less than one minute of planning time (Swanson et al., 2003). Little attention was paid to story-line or plot progression. According to Swanson et al. (2003), this phenomenon “may be due to their inability to access their prior knowledge on any given subject and their difficulty in both sustaining the writing effort and their problems with the mechanics of writing” (p. 325). Most writers pause up to 70% of the total time they spend writing, especially during initial stages of writing (Troia, 2005). When asked to describe what is involved in good writing, students with learning disabilities responded with suggestions such as the importance of spelling words correctly, writing neatly, adding the date to their assignment, or holding their pencil correctly rather than content or logical progression of their ideas (Graham & Harris, 1989b).

Preoccupation with spelling, grammar and punctuation, and letter formation interferes significantly with students’ written product (Santangelo et al., 2008; Swanson et al., 2003). The results contribute to written content that is minimized or content which is forgotten because so much time and effort is spent on transcription. Fifth and sixth grade students with learning disabilities misspell about 12% of their words and lack initial capitalization or final punctuation in about 33% of their sentences (MacArthur & Graham, 1987). Spelling, punctuation, capitalization, and grammar errors are found in approximately 40% of all words written (Lewis et al., 1998). However, with the help of technology, improvements can be seen for many of these students. A synthesis of studies with students with learning disabilities who used assistive technology for spelling support
with explicit instruction found positive effects on spelling outcomes (Wanzek, Vaughn, Wexler, Swanson, & Kim, 2006).

Students with learning disabilities also generate less content than their peers, often including superfluous or non-functional material (Troia, 2005). Nearly half of learning disabled students provided only simple descriptions of picture prompts compared to their peers (Nodine, Barenbaum, & Newcomer, 1985). When asked to share the important components of a narrative or essay, fifth and sixth graders omitted crucial aspects such as setting or the premise of an essay, incorrectly assuming their audience had this information (Graham & Harris, 1989a). When asked to add more to their essays, Graham (1990) found students wrote more and by teaching students to set goals for the length of their writing by using self-monitoring, their writing productivity increased (Graham, 1990). This finding shows that it is possible to support students to become more successful writers.

Revision strategies are also affected with less than 20% of revisions made by struggling writers representing any substantive changes to the original text (Santangelo et al., 2008). Often their revisions include only spelling changes, word changes, or rewriting to make the text neater (Graham, 1997; MacArthur & Graham, 1987; Santangelo et al., 2008). This population’s evaluation criteria are inaccurate as well as their ability to distinguish errors (Swanson et al., 2003).

The use of spellcheckers has been shown to be ineffective for these students as they cannot recognize their errors or the correct version of the word used (Ashton, 2005;
MacArthur, Graham, Haynes, & De La Paz, 1996, 2000). By having to switch attention to the mechanical demands of writing, the writer may forget already formed plans, intentions, and meanings affecting coherence and the complexity of content integration (Scardamalia, Beretier, & Goelman, 1982). Additionally, as mentioned earlier, these students appear to be unable to consider the reaction of their audience (Graham & Harris, 1989a).

The multidimensional writing process is complex and for students with learning disabilities it seems to be even more difficult to master. However, there is evidence in the literature that with the help of assistive technology and explicit instruction in strategy development, these writers can experience success.

**Assistive technology for students with learning disabilities.**

Over the past three years, throughout my Master’s courses as I searched for articles on this topic it often felt as though I was looking for a needle in a haystack. These efforts resulted in my discovery of a gap in the literature on qualitative studies with this group of students using computer software for writing. Research on assistive technology for reading disabilities was much more common than for writing, as well as quantitative studies with the population under investigation (Love, 2003; Peterson-Karlan et al., 2008). Due to a lack of empirical research on the topic (Ashton, 2005), I also extended my search parameters to include reports and dissertations, as peer reviewed articles were minimal. A broad search of the literature on the use of assistive technology, specifically word prediction software, resulted in the following set of studies.
**Literature Search Process**

Search parameters initially included peer reviewed sources, elementary-aged students, children with learning disabilities (as opposed to other disabilities such as attention deficit disorder or autism), and assistive technology. Bibliographies of articles located with these parameters were searched as well as articles from previous classes which were applicable to the topic. Through a QCARD library database search using *learning disabl*, *assistive technology* and *writing*, with no year limitation, 47 articles were identified. Adding the qualifier of ‘peer reviewed’ 34 articles remained. Of the 34, only nine articles were directly related to the population (learning disabled), genre (writing), and medium (assistive technology). Some of these articles were related to teaching strategies and were not actual studies with students using assistive technology, however, their content added to the baseline information for the study. The remaining seven articles’ salient points will be referenced throughout the literature review and remaining chapters with information regarding aspects of the use of assistive technology.

A subsequent search using the keyword phrase, *word prediction*, resulted in six articles, of which three applied to this study. Fortunately, two of these articles by Evmenova, Graff, Jerome, and Behrmann (2010) and Silio and Barbetta (2010) were current studies and highly relevant to the topic at hand. Although these studies are current, both employ the use of quantitative measures and only one used a qualitative measure along with the statistical measures. Looking for qualitative studies proved to be an even greater challenge. Surprisingly, even when using the key word *learning disabl*
for these searches the results included studies about students with physical disabilities. This finding qualifies earlier comments regarding the difficulty in singling out a diagnosis of only learning disability.

Additional searches were conducted in the following journals: *Journal of Learning Disabilities, Learning Disability Quarterly, Exceptional Children, Learning Disabilities Research and Practice, and International Society for Technology in Education*. These searches resulted in a few articles applicable to the research topic, however, the sample sizes were small, and some material about assistive technology was quite dated. Again, qualitative studies were limited, especially those asking the students themselves for input about how they felt about using assistive technology, or how using word prediction software enabled their learning. A search in handbooks on *Learning Disabilities, Writing Research, and Special Education Technology Research and Practice* resulted in articles by Lewis (2005), Ashton (2005), Troia (2005), Berninger and Amtmann (2003), Graham and Harris (2003). These quality articles were foundational to my understanding of how assistive technology, specifically word prediction software, has been and continues to be used with students with learning disabilities.

Finally, a database search was conducted of ERIC (Educational Resources Information Center) and PsychINFO to round out the literature search. Using the same keywords, a search in ERIC resulted in three hits which dealt with adult learners. Using the bibliographies of articles I had already found proved to be more profitable.
As a novice researcher, I have been taught to read handbooks and meta-analyses of one’s topic early in the research process. A few reviews of assistive technology were found with word prediction covered briefly. As Evmenova et al. (2010) recorded, “despite available research, the area of assistive technology for students with learning disabilities is still not fully developed” (p. 170). Research that is available is often contradictory in its findings.

**Search results.**

Charles MacArthur is one name well known in the literature on the topic of writing and students with learning disabilities. In MacArthur’s studies (1998; 1999; 2000), the effects of word processing and word prediction with speech synthesis were compared on the spelling, composition rate, and legibility of journal writing of students with learning disabilities. His findings showed positive results for spelling and legibility for four of the five students in one study. In his second follow-up study, three mediums were compared; word processing, handwriting, and word prediction with Co-Writer, one of the programs used in my study. One student out of three showed improvements in the proportion of words spelled correctly from use of the word predictor with no effect on legibility (MacArthur, Ferreti, Okolo, & Cavalier, 2001). Students with severe spelling difficulties were required to know the initial sound of each word which earlier word prediction programs were not able to offer. With advances in word prediction technology this is now possible and is an area for further study.

The third MacArthur (2000) study used the same three participants with a more detailed writing task which resulted in improvements in legibility and spelling but a
reduction again in composition rates for two of three students. Additionally, slow typing rates may contribute to slower composition as proven by other studies in this area (Graham, 1990; MacArthur, 2000). In another study for elementary students with learning disabilities who were randomly assigned a handwriting, word processing, or word prediction intervention, improvements were seen in their writing quality, spelling and grammar (Zhang, Brooks, Frelds, & Redelfs, 1995).

Limitations in many of these studies included: undefined or weak control groups, insufficient information about participants, small sample sizes, and individual differences affecting outcomes (MacArthur et al., 2001). In my view, the lack of any qualitative comments from the students themselves is also lacking in these studies. As MacArthur (2000) stated: “Absence of research on the tool [word prediction] does not mean that the tool is not effective” (p. 86).

Further to this point, the ability to correct errors and produce an attractive publication can be highly motivating to students who find handwriting and spelling difficult (MacArthur, 2000, p. 88). Increased motivation is an area of focus with regard to self-efficacy of students and will be discussed at length in the next section. Teachers also reported students’ increased motivation and quality of their written products in a 1992 study of 17 students with multiple disabilities. These students used a word prediction program called ROBO-Writer, a similar program to WordQ and Co-Writer with word lists, vocabulary lists, and speech synthesis. Of the 17 students, the five students with learning disabilities experienced improvements in their spelling (Newell, Booth, Arnott,
improved legibility and spelling skills were also confirmed in a study by Handley-More et al. (2003) with five students with learning disabilities using word prediction software.

Finally, a recent study by Barbetta and Silio (2009) with six students from the fifth grade with learning disabilities used word processing alone, or word processing with word prediction (WordQ) for 15-minute writing sessions. Both groups were reported to have written more words in total, spelled more words correctly, and the quality of writing improved (Barbetta & Silio, 2009). The authors suggested the reason for these consistent results “may be attributed to the advancements in word prediction software, the students’ increased familiarity with computers and enhanced overall computer knowledge in comparison to students from research completed a decade ago” (p. 1151).

Limited qualitative studies.

Two studies had qualitative aspects with interviews and case study approaches imbedded within the research design, a mixed method format. Williams (2002) reported on a nine year old with severe learning disabilities in reading and writing. A case study approach was used to describe the student’s progress with the support of Co-Writer. Williams also included samples of response journal writing before and after the introduction of the word predictor. Over time, a surprising outcome was discovered in the child’s ability to produce the sounds necessary to sound out words which were previously impossible for him. Williams (2002) used the “back up and try another vowel” strategy (p. 75). The student wrote longer passages of higher quality using Co-Writer and said that working with the software was ‘fun’ “an adjective his teachers had not heard him
ever use in reference to writing” (p. 76). Unfortunately, further comments from the student were not reported. These comments would have added insight into his self-perceptions as a writer and as a student with a learning disability and offered evidence for the support of assistive technology from a student’s perspective.

MacArthur (1998) detailed the story of another nine year old student also with a severe learning disability with illegible handwriting. The word predictor’s speech synthesis allowed him to read his teacher’s responses independently and provided a mode for him to more easily respond. Before the introduction of the software his journal stated “I mad a sroe cale the day tat frog eat Texis. Texis is my favt sterae” [I made a story called, The day that frog ate Texas. Texas is my favourite state] (p. 67). After the introduction of the software, one entry read, “My favorite frog is a poisonous dart frog. I have catch frogs. Frogs are helpful” (MacArthur, 1998, p. 68). From the support offered by the word predictor, this student experienced greater independence and was able to communicate his ideas in writing in spite of his spelling issues. I found the replications of the student’s writing insightful and representative of the power of the software to support his writing. Richer descriptions of the students’ stories would have added another dimension to the reported interventions and provided a window into the experience of the student themselves. Interestingly, in both cases, the researchers commented on how quickly the students were able to master the programs.

A recent comparative single subject study by Evmenova et al. (2010) described the experience of six summer campers from Grades 3-6 who attended an assistive
technology camp. All six had severe learning disabilities and were introduced to WordQ, Co-Writer, and Write Assist. Although the study was designed to compare the three software programs, the researchers’ rich description of each student’s interactions with the software also provided the reader with a personalized view into their experiences: “it was like telepathic”, one student said of WordQ (p. 179). Using student and teacher interviews, the social validity of each program was examined during and at the end of the camp. Students’ comments were summarized detailing their feelings about how and why they liked each program. “Student M noted that he did not have to write the whole word and the program would finish it for him” (Evmenova et al., 2010, p. 179).

Moreover, Canadian occupational therapists conducted a one-year study with 29 students with physical and learning disabilities using WordQ and Co-Writer. Students ranged in age from four to nineteen. Their written productivity was enhanced using the word prediction software. Interviews with families reported that students had increased motivation to write and used a broader range of words which was confirmed through the quantitative measures (Tam et al., 2005). However, this study was not peer reviewed and therefore, should be judged accordingly.

Overall, the limited number of studies mentioned is representative of a literature search by Barbetta and Silio (2009). In their article, Effects of Word Prediction and Text-to-speech on the Writing Skills of Students with Learning Disabilities, the authors conceded to finding only five studies on this topic with this population. The authors
boldly suggest that due to the fact that these studies were over ten years old perhaps the “results are of limited value given the advances in assistive technology today” (p. 1151).

**Negative aspects of word prediction.**

Cautious optimism is suggested with regard to technology’s potential for improving literacy skills of students with disabilities (MacArthur et al., 2001, p. 298). MacArthur (1999) offers the caveat that “students with learning disabilities already have trouble with working memory, attention issues and executive functioning impairments and the effective use of word prediction software may present additional challenges” (as cited in Berninger, & Amtmann, 2003, p. 352). Students must monitor the list of options as presented by the word predictor which changes with each new letter inputted. Subsequently, student’s composition rate can be slower but their spelling accuracy higher (Lewis, et al., 1998). For younger students, word prediction may allow their composition skills to be enhanced, while for older students writing longer compositions, other text entry programs, may be less frustrating (Berninger & Amtmann, 2003).

Another issue to consider is the level of students’ keyboarding skills in order to be able to use word prediction software. This issue has two opposing arguments for and against the use of a keyboard by students to bypass the act of handwriting. Arguments against the use of a keyboard are often related to the time and energy required to locate the keys for typing which required extended practice to become automatic (Peterson-Karlan et al., 2008). Research has shown that the additional time required to become proficient at keyboarding and efficient with use of a word predictor (which always work in conjunction with a word processor) may minimize the amount of text produced by a
new user, but the transcription is more accurate with more correctly spelled words (Newell, et al, 1992). Arguments for the continued use of handwriting for students primarily focus on the need to maintain the skill and not to completely abandon it in lieu of keyboarding. With maturity, the quality of handwriting changes and individual styles are developed. Researchers study this by evaluating handwriting over time and at various developmental stages. By Grades 4 and 5, students become more fluent and their handwriting strokes become more varied suggesting this is the stage when writing begins to be more personalized (Graham & Weintraub, 1996).

The lower level skills of handwriting and the mechanics of spelling and grammar often cause students to be sidetracked from the higher level skills of organization and revision (Forgrave, 2002; MacArthur, 2001). The argument for introducing keyboarding instead of handwriting resides in the fact that by reducing the mechanics of writing for students with learning disabilities, the higher level skills of planning and content generation can be targeted. Having to switch attention to the mechanical demands of writing, the writer may forget already formed plans and intentions, and meanings affecting coherence and the complexity of content integration (De La Paz & Graham, 1995). Recognizing the benefits of an assistive software program for writing, with the added benefit of word prediction, students can more adequately manage the cognitive load required to manipulate multiple processes required for writing.

Without explicit instruction, the benefits of the software may not be realized for these students. However, when combined with such instruction, students are able to see
and hear what they have written which can ameliorate their planning, content generation, revising and text transcription to improve their writing (Troia, 2005).

As these studies have shown, the benefit of word prediction includes the software’s equalizing effect, better quality in writing, spelling support, motivation to write, and changes in students’ self-efficacy. The area of self-efficacy will now be discussed linking this issue to relevant literature.

**Self-efficacy for Students with Learning Disabilities**

Believing one is able to produce a desired result by their own actions is the essence of self-efficacy and the essence of humanness according to Bandura (Davidson, 2003), the originator of social cognitive theory. If an individual does not believe in his or her own ability to accomplish a given task, perseverance through life’s challenges becomes much more difficult. For students with learning disabilities, the concept of self-efficacy takes on greater importance as educators, families, and the students themselves attempt to harness its motivational power. This section will begin by reviewing the concept of self-efficacy from the framework of the social cognitive theory of human functioning. Next, information on students with learning disabilities and the effects of self-efficacy on their self-perceptions will be explored with context specific relevance to this study.

**Literature search process.**

A literature search was conducted using the keyword of *self-efficacy*. A time period restriction from 1977 to the present was applied to limit references to only those written after Bandura’s seminal work on social cognitive theory. A broad QCAT library
database search resulted in 201 references. Narrowing the search by adding the keywords “learning disabl*” and “children” resulted in seven references. A search limited to handbooks resulted in a few valuable chapters. A journal search was conducted through PsychINFO with the same keywords resulting in 51 hits. This list was then narrowed down to include only articles about elementary students with learning disabilities, and writing. Dissertations were excluded due to time restrictions. Using the same keywords, an ERIC search was completed resulting in 22 hits, some of the references were duplications. Four new sources are included in this review. A specific search within the Journal of Learning Disabilities resulted in five articles. Only one was directly relevant based on the study’s inclusion of elementary students with learning disabilities. A similar search in the Council for Exceptional Children journal resulted in six findings. One article about reading was excluded. In sum, 16 articles and four handbook chapters were reviewed. Bandura’s (1986) book, Social Foundations of Thought and Action and a DVD entitled Bandura’s Social Cognitive Theory: An Introduction (Davidson, 2003) were also included.

Using identical definitions to those used in this study were important. As mentioned in Chapter 1, varied definitions exist for the same condition depending on the author’s country or community. Careful distinctions need to be made to include literature germane to one’s topic.

**Self-efficacy and social cognitive theory.**

In the field of social psychology, Bandura’s (1977) seminal work on the construct of self-efficacy through social cognitive theory stands the test of time. Authors cite his
work on motivation and self-efficacy as foundational to the subject (Burden, 2008; de Caso, Garcia, Diez, Robledo, & Alvarez, 2009; Garcia & Fidalgo, 2008; Klassen, 2002a, 2002b; Schunk & Pajares, 2009; Sideridis, 2009; Tabassam & Grainger, 2002).

Bandura suggests there are multiple methods to achieving self-efficacy. The most effective method is through achieving mastery of the activity because successes build a robust belief in one’s abilities (Bandura, 1986; Davidson, 2003). Second, through social modeling in a vicarious manner, an individual can observe others who are successful at the activity. Third, through social persuasion, an individual’s confidence is built up until they believe they can achieve a prescribed goal. Lastly, through monitoring one’s own physical and emotional states, one can achieve any number of personal goals when judged accurately (Bandura, 1986; Davidson, 2003). For example, stress, fatigue, and depression can lower one’s self-efficacy, and therefore, these negative emotions need to be self-regulated. This self-regulation can occur through cognitive processes, motivational aspects, choosing tasks, persisting with those tasks, decisional aspects, and emotional aspects of optimism and pessimism (Bandura 1986; Davidson, 2003). Efficacy beliefs contribute to one’s predictions of academic outcomes beyond what is contributed by achievement, skill, ability, and previous achievements (Klassen, 2002a).

**Self-esteem and self-concept.**

Burden (2008) provided an overview of twenty years of research into the relationship between the various aspects of self-perceptions and learning disabilities. His hierarchical model of the interrelated aspects of self-concept, self-esteem, and self-worth is a helpful conceptual model towards understanding how these aspects are related. The
formation of one’s self-perceptions involves multi-faceted concepts. The purpose of this review is to provide an understanding about the effects of self-perceptions on learning disabled students with regard to their writing, and not an in depth study of social psychology; therefore, a simple explanation follows.

Self-concept is defined as one’s collective self-perceptions formed through experiences with and interpretations of the environment and influenced by reinforcements and evaluations by others (Shavelson & Bolus, 1982). “Self-concept is generally assumed to be a measure of how [they] perceive themselves, their self-esteem can most usefully be considered as relating to one’s feelings about those perceptions” (Burden, 2008, p. 192). For example, a student may perceive him or herself to be a poor writer but not be concerned about it and have a lower academic self-concept without having it affect his or her academic self-esteem. It is not until a person is concerned about the task or activity as being important or meaningful that success or failure in that activity will have a direct effect upon one’s self-esteem (Burden, 2008).

Students with learning disabilities are at risk for developing low self-esteem over time as evidenced by multiple research studies (Bender & Wall, 1995; Burden, 2008; MacArthur, 1998; Williams, 2002). With no explanation for their difficulties, children are left to conclude they cannot measure up and in essence give up with little motivation to persevere. Inevitably, their self-efficacy beliefs may lead to lower motivation for tasks, especially those they find most difficult. Self-esteem is conceptualized as one’s judgement of his or her own self-worth, whereas self-efficacy is the judgement of one’s
capability (Davidson, 2003; Schunk & Pajares, 2009). This clear distinction explains the
differences between these concepts.

Pajares and Schunk (2001, as cited in Schunk & Pajares, 2009) suggest that self-
esteeom is one of the elements of the multidimensional self-concept. A more direct
conceptual framework situates “self-efficacy beliefs as cognitive, goal-referenced,
context-specific and future-oriented judgments of competence that are malleable due to
their task dependence” (Schunk & Pajares, 2009, p. 39). When both self-efficacy and
self-concept are measured, only self-efficacy accounts for significant unique variance in
task performance and is therefore more related to outcomes (Troia, Shankland &
Wolbers, 2010). For this reason alone, the enhancement of self-efficacy is of utmost
importance in education.

**Self-efficacy’s importance for learning disabled students.**

One of the keys to understanding Bandura’s construct of self-efficacy and its
implications for the findings from this study lies in the interplay between personal,
behavioural, and environmental influences (Schunk & Pajares, 2009). This triadic
relationship is reciprocal with all three influences operating as interacting determinants of
each other (Bandura, 1986; Davidson, 2003). This reciprocal interplay is crucial to
understanding the responses from the participants in this study. All three aspects of
Bandura’s model contribute to an individual’s self-efficacy, not simply one or the other.
Environmental factors effect a student’s beliefs about their ability, and their learning
behaviour (Klassen, 2002a).
The effects of having a high level of self-efficacy may explain “the length of time an individual will persevere to complete a task as well as how resilient they may be in the face of adversity” (Schunk & Pajares, 2009, p. 37). Self-efficacy accounted for powerful and independent contributions to performance on mathematics problem-solving and enabled students to solve more problems and rework more missed problems, than did learners with lower self-efficacy (Pajares & Kranzler, 1995). It is imperative for educators to understand the effect of self-efficacy on a student’s learning capabilities. When one is an efficacious person, achievement and better learning result from the motivational effects of self-efficacy causing a student to expend greater effort to succeed (Davidson, 2003).

**Miscalibration or overestimation of ability.**

The match between student expectations about their ability and their actual performance and self-efficacy must be balanced in educational settings. If students believe they can accomplish a task and yet cannot perform it or vice versa, they may abandon a task before trying or overestimate their abilities and sometimes fail, which will lower motivation. As Bandura (1986) points out, continued overestimation of one’s abilities may lead to continued failure with resulting decreases in a students’ motivation to learn. Alternatively, if a student’s self-efficacy beliefs are enhanced, the anxiety and apprehension for a task may be diminished or eliminated (Troia et al., 2010).

In his review on the role of self-efficacy beliefs in early adolescents, Klassen (2002b) included studies in which students with learning disabilities reported higher levels of self-efficacy about their writing. He discussed Graham and Harris’ (1993) study,
which employed a self-regulated strategy instruction for 10-14 year old students with learning disabilities to aid in their revising and composing skills. When their self-efficacy beliefs were assessed and compared to their non-learning disabled peers, the students with learning disabilities were just as positive about their writing capabilities as their peers who were better writers. The concern for educators lies in the student’s overestimation of their abilities because they may fail to allocate the necessary resources and effort while applying learning strategies believing it to be unnecessary (Klassen, 2002b).

For students with learning disabilities, this overestimation of ability can be a detriment to their overall achievement. Often students with learning disabilities have problems with their self-knowledge and an accurate awareness of the task being assigned. Difficulties with metacognition can be attributed to ongoing inaccurate estimations of individual abilities and the components of a task (Schraw & Moshman, 1995; Troia et al., 2010). The difficulty in metacognition or thinking about one’s thinking; contribute to a reduction in self-regulation of one’s thoughts, feelings, and behaviours during the writing process. Good writers reflect, revise, and revisit their thoughts often throughout the process (Schraw & Moshman, 1995).

In Klassen’s (2002b) review, five out of six studies dealt specifically with the task of writing, and researchers reported students overestimated their abilities. He suggested these findings support what Graham and Harris (1986b) believed to be a “growing body of literature that indicates learning disabled students have difficulty accurately assessing
or predicting their performance capabilities” (p. 212). Researchers postulate that students may inflate their abilities due to their attempts to hide their difficulties from the public or to create a facade of competence (Alvarez & Adelman, 1986; Klassen, 2002b; Sideridis, 2009). Students’ ineffective use of newly acquired strategies is also a consideration in their miscalibration of their abilities.

**Ineffective strategy use.**

Students with learning disabilities have been found to exhibit ineffective strategy use, minimal output, insubstantial revising processes, and weak basic skills all in contrast to paradoxically high confidence in writing capabilities (Graham et al. 1993, as cited in Klassen, 2002b). For students with learning disabilities, they lack the “domain specific knowledge, skills and strategies along with procedural knowledge about how to apply, self-regulate, and control them for effective and efficient writing task performance” (Garcia & Fidalgo, 2008, p. 415). As discussed earlier, students with learning disabilities spend little time planning what to write. They generally rely on a single composing process which is comprised of creating or composing an idea from memory, writing it down, and using each preceding phrase or sentence to stimulate the next idea. The resultant piece of writing is generally a topic related idea rather than a coherent discussion or examination of the topic (Swanson et al., 2003). Explicit instruction in strategy implementation is crucial for these students.

**Task analysis to reduce cognitive load.**

One such strategy is from Case’s (1985) theory of task analysis which has been successful in “teaching subjects such as mathematics with long division and fractions, in
language arts for sounding out words and discriminating letters as well as spelling and life skills training” (p. 407). From personal experience, breaking down a larger task into manageable chunks and explicitly teaching steps in the same order proved to be a successful method of teaching assistive technology programs. When teachers are able to construct carefully graded sequences of tasks, it will minimize the cognitive load of the momentary processing space. “The key to accomplishing instruction successfully is via mass practice and automization where in other theories; instruction must be delayed until a child’s short-term storage space has increased developmentally” (Case, 1985, p. 406).

How to increase self-efficacy.

The question remains about how to increase this valuable commodity? The challenge for educators is to help students accurately evaluate their abilities without lowering their confidence, optimism, and drive. One method suggested by Bandura (2001) is to help students predict competence for a specific task. For example, students could be given a 7-point scale and answer questions such as: “How confident do you feel in creating an outline, or accurately punctuating your story?” Students could quickly complete the task at the beginning of a teaching session. Teachers would then be able to identify those students who feel adequately prepared for the task at hand and help them to more accurately assess their abilities (as cited in Klassen, 2002b). Providing children with instruction and practice with self-evaluation can increase the correspondence between self-efficacy and performance (Schunk & Pajares, 2009).

Teachers can aid students in developing self-efficacy by providing accurate assessment of student work with clear recommendations for improvement on subsequent
tasks. Scaffolding to build their confidence in writing is imperative, as is modeling of how to deal with difficult writing assignments (Troia et al., 2010). The concept of developing mastery goals is considered to be a potential successful strategy. Publishing student work online has been shown to improve student motivation to write. Students with learning disabilities honed their skills and appealed to wider audiences while sharpening their problem-solving skills in deciding how to best represent their work in digital formats (MacArthur & Karchmer-Klein, 2010).

Although Burden (2008) demonstrated it is difficult to make generalizations for this unique population because of their varied characteristics, he cited a number of potential successful strategies for enhancing students’ self-efficacy. One suggestion is early and accurate identification which has been shown to be formative in a student’s self-identity. The sooner students are accurately diagnosed; the less likely they are to develop low motivation for unknown deficits in their abilities (Burden, 2008). Although this is the reality of the process currently used by schools to provide students with access to computers and assistive technology, it is based upon the medical model, the opposite to this study’s theoretical framework. In spite of this ideological difference, the literature suggests the importance of early diagnosis for these students.

In terms of another valuable instructional strategy, De La Paz, Swanson, and Graham (1998) discussed the success of teaching a procedural support strategy for writing. The process is designed to ensure the separate elements of the revision process for writing are coordinated and regular. Using self-regulated strategy development
(SRSD), students take each sentence and revise one at a time and evaluate sentences from the writer’s and reader’s perspectives. Students are then given instruction in revision tactics and choose one to apply to their work. Results indicated students found this strategy less onerous since the task was broken into manageable parts. Additionally, their written products were longer and of better quality.

Another study by de Caso, Garcia, Diez, Robledo, and Alvarez (2009) implemented a writing intervention for 60 Spanish students using Bandura’s four sources of self-efficacy. Through a five-week intervention, the researchers established a positive psychological and affective state between students and teachers. They encouraged verbal persuasion and feedback, and used vicarious experiences and modeling by having students mark each other’s papers and developed mastery through process instruction. Although the intervention was of short duration and the definition of the students’ disabilities was lacking, the results demonstrated students’ written product improved in structure, coherence, and quality. The students’ levels of self-efficacy improved from pre-test to post intervention (de Caso et al., 2009).

**Teachers’ self-efficacy.**

The impact of teacher’s self-efficacy on their own teaching practice is a factor in enhancing students’ levels of self-efficacy. The instructors must believe they possess the knowledge, skills, and strategies necessary to teach and engage learners. Using the example of a “lesson study” format from Japan, Troia et al. (2010) described how teachers participated in a professional development approach that included developing,
refining, and altering curriculum and instruction rooted in challenging goals that placed teachers in the role of researcher.

Similar to the action research model, (McMillan & Schumacher, 2010), teachers evaluated and planned with a small team from their local school. Troia et al. (2010) suggested the results from a longitudinal study conducted in an urban Michigan school warrant the application of adopting this process in other schools. Grade 3 students chose a feature article as their writing activity for the lesson study research. Two of the characteristics of self-efficacy enhancement are using a challenging, novel assignment and allowing for student autonomy (Bandura, 1986), both of which occurred in this study. Although not all the written products were of higher quality, teachers felt better equipped to implement future writing tasks by helping students attain their goals for writing (Troia et al., 2010).

*Parental influences on students’ self-efficacy.*

Parents play a critical role in influencing the self-efficacy of their children. As Burden (2008) explained, “The support and understanding of parents can make all the difference as to whether the child begins to give up or continues to keep trying” (Burden, 2008, p. 192). Positive encouragement can go a long way towards helping a child to achieve their best as we know “home and family play a key role in children’s development and learning” (Dyson, 2010, p. 43). The importance of the parent’s role will be further understood from participant responses in Chapter 4.

From the framework of the social cognitive theory of human functioning, self-efficacy influences one’s ultimate accomplishments and can lead “to a self-fulfilling
prophecy in which one accomplishes what one believes one can accomplish” (Schunk & Pajares, 2009, p. 38). Of the motivational variables assessed, self-efficacy was usually found to be the strongest, or among the strongest predictor of writing competence for students with and without learning disabilities (Klassen, 2002a). By focusing on what students can do, educators can take the example of parents who recognize the power of self-efficacy for their children, and be better positioned to be a causal force in creating an environment in which students can become efficacious individuals.

**Parental Stress**

Few articles were found discussing the issues specifically faced by parents of children with learning disabilities. Many articles dealt with issues for parents of children with more visible disabilities, such as behavioural issues, autism, and physical disabilities. Although some stresses are common to both types of families such as maternal stress (Antshel & Joseph, 2006; Dyson, 2007, 2010) and difficulties with family adaptation, a few are unique to those with children with learning disabilities (Dyson, 2010).

Parents of children with learning disabilities may create unrealistic expectations and false hopes for the child’s academic performance; diagnosis later in school may be unanticipated, causing an additional family crisis, and family integration may be threatened (Dyson, 2010). Studies of siblings of both students with visible disabilities and those with learning disabilities have also had mixed results. Although not the focus of this study, the impact on siblings will generally affect the family dynamics either positively or negatively. As Dyson (2010) discovered, “there have been no studies
reporting on the family as a unit and its life in general as related to a child with a learning disability” (p. 45). Her research provided valuable information to fill this void.

Dyson’s (2010) Canadian qualitative study used two focus groups of parents with children with learning disabilities. The purpose was to discover how having a child with a learning disability changed their family life in ways they did not expect or anticipate and how the life of the siblings was affected. The themes emerging from the focus groups were: “Family’s emotional reactions, parenting dissonance, unsupportive extended families, negative interactions with the school, and mixed effects on the siblings and family coping mechanisms” (p. 48).

Of the emotional family reactions, guilt, strained family life, and lack of social support were mentioned. Parents reacted differently within each family causing a dissonance within the family unit when disagreements arose regarding parental responsibilities. Extended family members would unfairly compare their children causing added stress for the family with a child with a learning disability. Parents reported negative interactions with the school that resulted from “many unsatisfactory encounters involving initial assessments, uncoordinated service delivery, labeling and rejection of the child” (p. 49). Not only were assessments difficult to obtain, the diagnoses were inconsistent. As was mentioned in the section on self-efficacy, early and accurate diagnosis of a learning disability is crucial for a child’s identity formation.
Parents reported they had little time to rest due to constant meetings, support for homework, and calls from the school. Parents resented the label attached to their child in spite of the recognition that the label was required for service provision and equipment:

Parents believed that children should not be labeled. Rather than being incompetent, they are in fact, intelligent and capable of learning in different ways. “We should not be calling our children learning disabled-my child learned to read in a year, but they just learn differently, she is very intelligent, if we keep using the term learning disabilities it’s inaccurate (Dyson, 2010, p. 50).

Three of eleven parents in Dyson’s (2010) study had positive experiences with the school related to accurate assessments of their child’s abilities with resulting service provision.

Additional positive outcomes were the effects on siblings from advocacy to increased responsibility adding to the child’s maturity and family coping strategies in the form of seeking community support. Dyson’s (2010) study found both “positive and negative unexpected outcomes leading to a competence model of family coping otherwise undiscovered” (p. 53). Dyson (2010) suggested ongoing community support could meet the needs required by families to cope successfully with the diagnosis of a child with a learning disability. Support could be provided by local Learning Disability Associations. Increased communication between school and home may reduce unnecessary stresses through the introduction of a parent-school forum for sharing educational concerns and initiatives providing a venue for parents to be part of a parent-professional partnership (Turnbull & Turnbull, 2001, as cited in Dyson, 2010).
To confirm the stress levels faced by families of a child with a learning disability, Antshel and Joseph’s (2006) study on maternal stress levels was reviewed. The mothers of elementary-aged learning disabled, nonverbal learning disabled, and reading disabled students were compared to mothers of typically developing children. Using a single factor between group design, these researchers found that the stress levels of the mothers of children with learning disabilities were higher than the control group. Their study’s measures included a neuropsychological battery of tests with the children and questionnaires for the mothers. Maternal stress was directly related to the specific disorder of the child and the lower the IQ of the child, the higher the stress level of the mother (p. 195). The study’s outcomes demonstrated that “Having a child with LD appears to predispose parents to higher levels of frustration and dissatisfaction” (Heiman, 2002; Slater & Wikler, 1986, as cited in Antshel & Joseph, 2006).

Results from Antshel and Joseph’s (2006) study concur with those from Baker and McCal’s (1995) study of parents of students with attention-deficit hyperactivity disorder (ADHD) and parents of students with learning disabilities compared to parents of students with no disability. Not surprisingly, the levels of parental stress were higher for those parents whose children exhibited externalizing behaviour problems (p. 57). Maternal stress of the students with learning disabilities was higher than mothers of non-disabled students. Measures were completed as part of an ongoing parent training research project for parents of students with ADHD (Baker & McCal, 1995).
Finally, a successful counseling group intervention was completed by Shechtman and Gilat (2006) in Israel with 45 families of children with and without learning disabilities. The purpose of the study was to determine the benefit of a group counseling intervention compared to psycho-educational groups typically offered to parents of children with disabilities. The benefit of the group process was the fact that “in groups, parents realize that they are not alone, gain knowledge about the disabilities, and learn new coping strategies” (p. 275). The format which resulted in the greatest gains for parental coping strategies were for those attending the counseling group. The counseling group used a process oriented group support and interpersonal interaction framework to promote change. The typical psycho-educational groups were often short term and cognitive-behaviorally oriented. The researchers believed that by enhancing the parent’s self-esteem and efficacy it might improve the parent-child interactions.

This study did result in gains for the parents attending the counseling group as reported by results from questionnaires given to the parents and their children over a two-year period. “Provision of information alone is not sufficient and the unique factors of group counseling better addressed the parents needs” (Shechtmann & Gilat, 2006, p. 283). Asking for the children’s feedback was a unique feature of this study. By meeting the emotional needs of parents, the children benefited as well, demonstrating the viability of this supportive social climate which had a broader effect encompassing the entire family.
Focus Groups as Chosen Method

The dual purpose of this section is to promote an understanding of the importance and value of using focus groups with adolescents, children, and vulnerable persons and secondly, to review methods for analyzing focus group data. As a qualitative method, focus groups are an efficient way of gathering a number of responses from more than one participant at a time. A focus group is generally understood to be a group of 6-12 participants with an interviewer or moderator, asking questions about a specific topic (Smithson, 2008). For the purposes of this study, smaller groups of 3-4 children were created as the literature suggested a smaller group of four to a maximum of five children is best (Eder & Fingerson, 2001; Smithson, 2008).

Focus groups can “produce a rich body of data expressed in the respondents’ own words and in the correct context” (Bickman & Rog, 1998, p. 506). Unlike survey responses and individual interviews, focus groups reduce the artificiality and surface nature of responses. They allow the researcher to “interact directly with the participants and probe further with responses as well as follow up questions and observe nonverbal responses such as gestures and facial expressions that may carry valuable information regarding the subject being studied” (Denzin & Ryan, 2007, p. 516). Respondents can create a synergistic effect within the group resulting in the production of data or ideas that might otherwise have been missed through individual interviews or other qualitative methods (Bickman & Rog, 1998). Morgan (1996) suggests the hallmark of a focus group
“the explicit use of the group interaction to produce data and insight that would be less accessible without the interaction found in a group” (as cited in Smithson, 2008, p. 359).

Focus groups have been identified as one of the few research tools available to obtain data from children (Bickman & Rog, 1998; Eder & Fingerson, 2001; Morgan, 1996). By providing the researcher with direct access to the language and concepts of the participants, focus groups facilitate a means of observing the structure of a group’s interactions and a window into their experiences. This qualitative research method is especially suited to working with young children as the researcher may make explicit use of his or her own experiences as a way of encouraging discussion (Smithson, 2008). Rather than relying on adult interpretation of a child’s or adolescent’s feelings on a given issue, directly interviewing youth of varied ages gives this often overlooked group a voice and a forum to promote their empowerment. Children and adolescents may share information in a group interview that otherwise may go uncovered through daily conversations and interactions (Eder & Fingerson, 2001; Madriz, 2000).

Additionally, focus groups have been successful in eliciting information from vulnerable populations. Feminist researchers use this method to approach sensitive topics. Using this method, there is space for discussion and reflection and time to explore issues in-depth rather than the way routine dialogue is performed in individual interviews (Eder & Fingerson, 2001; Smithson, 2008). The literature suggests a focus group is best suited to research dealing with sensitive issues (Dickson-Smith, James, & Liamputton, 2008; Madriz, 2000). Moreover, focus groups can be a powerful research method for minority
groups or groups which are often ignored in other research methods, to express their views and experiences (Eder & Fingerson, 2008; Smithson, 2008; Wilkinson, 1998). The unpacking of the social construction of sensitive issues may uncover different layers of discourse, and illuminate group taboos and the routine silencing of certain views and experiences (Denzin & Ryan, 2007; Smithson, 2008).

Inherent within this study is the underpinning of the theoretical model of inclusion and the social model of disability. The focus group provides the researcher with a holistic approach to those who are involved in the research by viewing individuals in a social situation with others of similar situations. And the focus group allows the research agenda to be shaped by both the researcher and the researched to develop an understanding of the world-view from the participants’ perspective (Guba & Lincoln, as cited in Dickson-Smith et. al, 2008). By genuine representation of the respondents in their own words and language, the researcher can avoid viewing them as separate or “Other” (Eder & Fingerson, 2008). By including those being researched in the process, we move towards reducing the power imbalance that has traditionally shaped research with children and adds reciprocity to the research, often cited as an ethical dilemma when working with children (Eder & Fingerson, 2008). Conroy and Harcourt (2010) suggested additional measures are taken by researchers to genuinely inform children of the process involved in the research to guarantee their “acknowledged participation versus mere generators of amusing narratives or artifacts as part of adult research” (p. 158).
The second issue of power imbalance involves the age of the researcher in comparison to those of the group. By creating a small group of children, the numbers of participants outweigh that of the moderator and minimize the power imbalance caused by the age of the moderator (Conroy & Harcourt, 2010; Eder & Fingerson, 2008). From his study with students with learning disabilities, Goodey (1999) discovered it was vital to use the word “difficulty” rather than the word “need” to further enable one to see something not purely as a consequence of specific characteristics of the child, but of the encounter between the child and the context (as cited in Eder & Fingerson, 2008).

A number of best practices for creating successful focus groups with children and adolescents are suggested in the literature. In designing questions, adults need to express themselves simply and clearly using concepts that are familiar to the children; match explanations to the age and level of understanding of the group; be aware of emotional distress; elicit children’s fears and offer reassurances; allow plenty of time for children’s questions; ask for feedback; repeat; simplify; and expand or build on previous answers, and use communication tools such as prompt cards, pictures, books or videos (Conroy & Harcourt, 2010; Darlington & Scott, 2002).

Moderator readiness, skill level in working with children, and the creation of a natural context for the focus group are vital components to a successful focus group session (Darlington & Scott, 2002; Eder & Fingerson, 2008). Skilled moderators will move from less sensitive topics to more sensitive topics, avoid abstract questions, and will make the group session as “unschool-like” as possible (Darlington & Scott, 2002).
By inviting children to be part of the research as knowledge-makers, the stage can be set for empowerment and advocacy by those inhabiting a more vulnerable identity in society (Darlington & Scott, 2002; Denzin & Ryan, 2007).

Often limitations of focus group research are listed when, in fact, all social science research methods have limitations (Bickman & Rog, 1998). Primarily, the most often cited limitation is the reduced generalizability of focus group data. The open-ended nature of questions often makes summarization and interpretation of the results difficult (Atkinson & Delamont, 2007; Bickman & Rog, 1998).

The analysis of focus group data has been an area much debated in the literature. One method is to look for interactive patterns from the data for analysis. The group is viewed as the unit of analysis (Darlington & Scott, 2002). One recurring component to accurate analysis is the transcription integrity from the focus group sessions. Too much editing can skew the comments requiring careful field-notes by an observer (Bickman & Rog, 1998). Analysis must be determined by the question the researcher hopes to answer. Vigilance to issues of bias must be dealt with at all stages of the project, but most carefully during the analysis (Bickman & Rog, 1998).

Every effort to interpret a focus group represents analysis of content (Morgan, 1996). Content analysis allows the researcher to enhance the overall informational content of the focus group. Janis (1965) defined content analysis as: “any technique used to classify sign-vehicles which rely solely on the judgement of the analyst, provided his or her judgments are regarded as the report of a scientific observer” (a sign-vehicle is
anything that may carry meaning, such as a word, gesture, set of words used within the context of the interview) (as cited in Bickman & Rog, 1998, p. 516). Content analysis with coding is best done when the focus group has followed a set list of questions. The key issue or analytic focus need not be only on what people say in a group context but on the discourses which are constructed within this group context (Alasuutari, Bickman, & Brannen, 2008).

**Purposeful sampling.**

Patton (2002) defends the use of purposeful sampling as a qualitative sampling technique because “it fortuitously opens the door for rich description of a small sample size” (p. 46). The sample size in qualitative studies does not follow the same rules as quantitative studies but is based on what the researcher wants to know, the purpose of the inquiry, what is at stake, what will have credibility, and what will be useful (Patton, 2002). In qualitative studies, the sample size is “more concerned with information-rich cases and the observational and analytical quality” (Patton, 2002, p. 245). This study used a purposeful sampling method to locate students with learning disabilities who currently use word prediction software at school.

This chapter has examined the relevant literature germane to the topic of understanding the self-perceptions of students with learning disabilities in relation to their use of word prediction software. A brief explanation of the writing process was explained followed by important aspects of the writing process for the specific population under investigation. The necessity of assistive technology, specifically word prediction software, was highlighted with an emphasis on the development of self-efficacy of
students with learning disabilities. Finally, issues facing parents of these students were listed and the benefits of focus groups as the chosen method for the study with children and their parents were offered. The next chapter will explain in detail the method that was used in this study.
Chapter 3: Method

Research Purpose

The writing process involves a complex interplay of several different cognitive sub-processes or functions. For students with learning disabilities, the complexity of this process can be magnified by impairments in working memory, processing speed, rapid naming speed or dysgraphia (problems with handwriting) (Fayol, 1999; MacArthur, 2000; MacArthur, Graham & De La Paz, 1996; Torrance & Jeffery, 1999). The use of assistive technology for writing, which has been underrepresented in the literature, has the potential to assist these students (Lewis, 2005; Love, 2003).

Specifically, word prediction software is a relatively new technology often suggested for students with learning disabilities (Handley-More et al., 2003; MacArthur, et al., 2001; MacArthur, 1999; Silio, 2008; Zhang, et al., 1995). As defined in Chapter 2, word prediction programs were originally developed to reduce keystrokes in typing for individuals with physical disabilities. Word prediction programs such as WordQ and Co-Writer are now able to recognize phonetic spelling in addition to conventional spelling (Evmenova et al., 2010). The program offers prediction options based on the first letters typed and then, before the next letter is typed, makes suggestions for the next most likely word. Thus, the user can type the first letter or first few letters and choose from a list of predictions instead of typing the whole word (MacArthur, 1998). In this study, the term assistive technology refers to these software programs.
The purpose of this study was to understand from the perspective of the users, how the software helps the student’s writing. Therefore, this study was unique in that it documents the students’ own words as they described their self-perceptions as learners and writers. Additionally, parents of the students were invited to attend a parent focus group to discuss their perceptions of their children’s interaction with assistive technology.

This study adopted the use of focus groups and written reflections to examine the students’ self-perceptions and their feelings about the role of using assistive technology for writing (Bickman & Rog, 1998; Smithson, 2008). By giving attention to the voices of both students and parents, the study’s findings authentically represented their experiences. Their firsthand knowledge offers valuable qualitative research data to the field of education. Recommendations for educators were generated based on participant responses and analysis from relevant literature and are reported in Chapter 5.

**Research Questions**

The following were the research questions crafted for the study:

1. How do students with learning disabilities describe themselves as learners?
2. What are the differences between student’s experiences with their word prediction software for writing at home and at school?
3. How do students with learning disabilities perceive the use of assistive technology contributing to their school experience?

Using three student focus groups comprised of small numbers of students, through scripted questions, I explored the students’ feelings about their use of the assistive
technology for writing. I found out from the students themselves how the technology supports their writing. Before each focus group session, I delivered a short workshop entitled: “Secrets to Success” to teach students new ways their programs could be used to support their writing (Appendix B). After the workshop, I asked each student to write a short reflection on what they learned using the software program of their choosing. The focus group transcripts, the students’ written reflections, and observations taken during the focus group discussions comprised a bounded system of the student, the computer software, and the learning context for subsequent analysis.

**Research Design**

The research design consisted of three student focus groups with two to three participants for a total of eight student participants and one parent focus group with six participants. The focus group method was chosen as a means of collecting responses from students and their parents outside of the school setting. At the beginning of each focus group session, as the moderator, I explained the purpose of the focus group and shared a few “best practices” for the participants. Best practices included assurances that there were no wrong answers; admonishments that individual responses need to be respected; and responses were confidential and not to be shared outside of the focus group context. Throughout the focus group discussion, the note-taker observed interactions among group members taking field notes for analysis. She was a Master’s of Education first-year student who herself uses word prediction software. A woman with a learning disability and a strong self-advocate, she added further authenticity to the study. Her disability is
similar to that of the participants; thus her representation of the discussions was insightful with an insider’s perspective. As Patton (2002) suggested “detailed field notes add qualitative data important for analysis of the event” (p. 386). She participated in the discussion adding her comments related to her own experience of having a learning disability. In her notes, she captured observations of the interactions between students which I may have missed while leading the workshop and focus groups. Her notes further enhanced the quality of the discussion responses from the focus groups.

**Participants.**

This study adopted a purposeful sampling selection process. Through an initial questionnaire distributed to all the families of the local Learning Disabilities Association (LDA), selected individuals were invited to participate in small focus groups. Specifically, for this study, the resources and time available to the researcher as a part-time Master’s student dictated the size of the sample as an achievable amount of research with ensuing transcription and analysis. The LDAK’s Board of Directors approved the recruitment letter and information letter for distribution to their more than 400 listserv subscribers. The Director sent out my invitation to participate in the workshop and focus groups. The letter of information and consent form identified three criterion for potential participants. Families were given the opportunity to respond by email if they chose to enroll their child in the study. Participants meeting the study’s criteria were chosen on a first come first serve basis. This selection process was detailed for families in the introductory email. I received eleven inquiries from parents with eight students as the final number of student participants. Through e-mail and telephone, respondents were
notified of their inclusion in the study. All of the participants returned their consent forms to me at the workshop or sent them via email. The following criterion was required for participants:

a) the student currently uses word prediction software at school, preferably on a single laptop;

b) the student was formally identified as having a learning disability; and

c) the student was in Grades 4-8.

By using the local Learning Disabilities Association’s mailing list, I was able to include only students who received support for a learning disability at school. This was vital due to the material being covered in the workshop and the population required was only students with learning disabilities. Parents of these children who volunteered for the student focus groups were invited to participate in the parent focus group.

**Setting and workshop.**

The setting for the parent and student focus groups was a centrally located church meeting room with space for the students to set up their laptops for the initial workshop. All of the students attended a workshop prior to each student focus group on their designated Saturday morning. The goal of the workshop was to entice students to use their word prediction software more often at home or at school with a better understanding of how the programs could support their writing.

The workshop took place for 45 minutes followed by a time of refreshment. The content of the workshop included tips and best practices for using their software. The software program demonstrated during the workshops was WordQ by Quillsoft. This
program appears as a simple four button overlay toolbar used in conjunction with Microsoft Word, the word processor used for demonstration. WordQ bases word predictions on the users’ creative writing and context with examples of commonly confused words with speech feedback. It offers predictions before the user enters a starting letter based on what the next most likely word might be.

A laminated mnemonics card was given to the participants to help in their application of the workshop content after its conclusion. The memory aid displayed a three-step process to remind students to first turn on their laptop’s word prediction program; second, to listen to the word usage samples; and third, to use the “read back” feature to edit their work. Time was taken during the workshop to introduce the steps using WordQ and to explain how the mnemonic might help them with their writing. The mnemonic used for the workshop is replicated below in Figure 1.

![Secrets to Success mnemonic for use with word prediction programs WordQ and Co-Writer](image)

*Figure 1. Secrets to Success mnemonic for use with word prediction programs WordQ and Co-Writer*
The mnemonic’s pictorial design was intended as a visual reminder, with three simple steps for easy recall, to minimize the cognitive load for this process. The first symbol is a graphic representing the power button on a laptop along with the symbol for WordQ or Co-Writer. These icons are typically found right on student’s desktop. The second step uses a graphic suggesting the student listen to the sentence usage which is a screen shot from WordQ. The final step is a screen shot of the button used from WordQ for the read back feature, and the pencil to represent editing one’s work. This laminated card was also explained to the parents in a handout each student received at the completion of the workshop. The intent was to encourage the students to use the mnemonic again for their homework. The parent handout also explained a number of steps for use with either WordQ or Co-Writer with screen shots for easy reference. A resource list was provided for parents for keyboarding programs to encourage active practice to develop students’ keyboarding skills.

Between the 45-minute workshop and the student focus groups there was a 20-minute refreshment period when team-building activities were organized that enabled the students to become comfortable with each other and with the note-taker and myself. By engaging in activities prior to the focus group, an atmosphere of camaraderie and trust was created to reduce any anxiety prior to the discussion session. Following the refreshment break, the student focus groups took place for 35-50 minutes, depending on the group. The community setting was chosen for the neutrality that it offered since the study was not dependent on approval of a school board. The setting was chosen to
encourage the students to feel more relaxed and less vulnerable about their learning
disability.

**Data collection.**

Data was collected from the focus group discussions via audio recording using a
digital recorder and observations that were recorded by the note-taker. The audio
recordings were transcribed verbatim. I was the moderator of each focus group. The
timeline for the data collection is described in the Table 1.

Table 1

*Timeline for Data Collection*

<table>
<thead>
<tr>
<th>Date</th>
<th>Task</th>
<th>Amount of Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late Nov/Dec 2010</td>
<td>Recruitment of participants through initial questionnaire to LDA member listserv</td>
<td>One month to e-mail response to researcher/telephone contact with further information</td>
</tr>
<tr>
<td>Sat. Jan. 8, 15, 22, 2011</td>
<td>Workshop/Team building/ Student focus groups #1, 2, 3</td>
<td>3 hours per participant</td>
</tr>
<tr>
<td>Sat. Feb. 05, 2011</td>
<td>Parent focus group</td>
<td>2 hours per participant</td>
</tr>
<tr>
<td>February-March 2011</td>
<td>Transcription of all focus group responses</td>
<td>2 months</td>
</tr>
</tbody>
</table>

Parent and student focus group discussion questions are detailed in Appendix A. The
questions were designed to reduce the group’s discomfort with one another and begin to
solicit the students’ feelings about the use of their laptops. Using the criterion already mentioned, the focus groups were created based on the age and grade of each student. At the conclusion of the “Secrets to Success” workshop (Appendix B) students were asked to write a brief reflection about their experience using their writing software on their laptops. All the students chose to use WordQ for their reflection. The written reflections were saved on a memory stick for analysis. The reflections were analyzed for the content of the students’ and parents’ opinion about the software and their use of the word prediction. The data collection was comprised of three data points; the audio recordings of the discussions, the observational notes, and the written reflections by the students.

**Data analysis.**

The main ingredient for analysis was the participant responses and written reflections along with observations from the focus group discussions. From both the student focus group responses, and the parent focus group responses, potential themes were explored in the areas of student self-perceptions as learners and writers, perceptions of assistive technology use, and interactions with one another. Throughout the analysis, recurring themes emerged and were coded with attention being paid to themes duplicated in both the student and parent discussions. The theme analysis was then reviewed in consultation with my thesis supervisor.

Using Patton’s (2002) method of triangulated reflexive inquiry, I combined self-reflexivity regarding what is known from working with students with learning disabilities and what has shaped personal perspectives as an insider with a disability. Analysis took the form of inductive analysis as the writing of the data was reflected through my lens of
personally experiencing the social model of disability on a daily basis. In keeping with Richardson’s (1994) approach, I took the stance that the analysis would also act as a “method of discovery” (p. 517). The theoretical model of the social model of disability was applied to the study as the environment was analyzed and not the individual in the context of the student’s use of their word prediction software. As part of the inductive analysis I followed Patton’s (2002) query when he pondered what should be done with the themes discovered: “these questions challenge the researcher to also be a learner, to reflect on our personal epistemologies, the ways we understand knowledge and the construction of knowledge” (p. 495).

The third part of the triangulation of the study was related to giving attention to the reflexivity of my audience. Anticipating how my committee will receive the study’s findings, the data analysis progressed towards conclusions along with the committee’s potential knowledge-making from the data presented. LeCompte’s (2000) suggestions for data analysis informed my ability to “find items, create stable sets of items, create patterns and assemble structures into cohesive groups of data” (p. 148). Applying LeCompte’s admonition to ensure the data accurately represented the group being studied was a common thread throughout the analysis.

**Reliability and validity.**

Often the drive to make generalizations from one’s data can obscure the nature of the findings. It was the purpose of this study to understand from the student’s perspective, how the use of word prediction software alleviates the difficulty posed by the writing process for students with learning disabilities. Does the use of their laptop with word
prediction software contribute to feelings about themselves as students? How do their perceptions of themselves change, if at all, by applying word prediction to their writing? By adopting a qualitative approach, the study aimed to show “the data that are collected provide a much more detailed rendering of events than even the most creatively prejudiced mind might have imagined prior to the study” (Bogden & Bilken, 1998, p. 34). By including the voice of the students and parents themselves, the study’s reliability was enhanced. “Consistency across different observations is the goal, rather than viewing reliability as a fit between what researchers’ record as data and what actually occurs” (Bogden & Bilken, 1998, p. 36). The study’s use of triangulation provided a three-way data point system to present findings of the phenomenon with a richer, fuller picture of the experiences of the students with a learning disability. “Triangulation’s purpose in qualitative studies is to test for consistency and adds credibility to the data” (Patton, 2002, p. 494).

Because I have been a lifelong advocate for students with disabilities, my worldview added validity to my standpoint as a researcher and as one invested in the population being studied. In order to check my bias, I conducted a rigorous coding process that consisted of integrating all of the focus group responses into one document organized by question. Then, I looked for initial common themes most frequently mentioned, first, in the student focus group responses and then the parent focus group responses. I assigned a different color to each code. Next, I combined similar codes into larger categories with overarching themes. Finally, in consultation with my supervisor,
these themes were renamed and defined for the final analysis and are listed in the discussion section. Authenticity and reality were added to the study by the quotes from the students themselves, who are often spoken for or about. Reeve (2010) underscored the benefits of qualitative research, “Understanding what people value and the meanings attached to experiences from their own personal and cultural perspectives are major inquiry arenas for qualitative inquiry”.

Following each focus group discussion, transcription occurred in a timely fashion with joint collaboration with the note-taker to avoid omissions or misrepresentations. Throughout the research study my field notes, and journal entries were gathered on an ongoing basis to record personal biases, theories, and potential themes to chronologically record my thought processes to consolidate during the analysis.

**Limitations**

The limitations of this study included the small sample size, the short time period for data collection, the convenience sample chosen for the study, and inherent restrictions of using focus groups as a method. Qualitative studies may have a range of sample sizes because their results are not necessarily to generalize to the larger population but rather to conduct a deeper analysis of the participants and their experiences. The purpose of the study is directly linked to the choice of sampling method; to search for information-rich cases for study in depth (Patton, 2002). The smaller sample size lends itself to deeper unit analysis, in this case, the experiences of eight students with learning disabilities and their parents.
The study was limited due to the short time period available for data collection. The facility used for the workshop and focus groups was available for specific times as well as the amount of time required to perform the focus group transcription and data analysis. As Patton (2002) eloquently stated:

No rule of thumb exists to tell a researcher precisely how to focus a study. The extent to which a research or evaluation study is broad or narrow depends on the purpose, the resources available, and the interests of those involved. In brief, these are not choices between good and bad but choices among alternatives, all of which have merit (p. 228).

The convenience sampling technique led me to access the local Learning Disabilities Association’s listserv, primarily, in order to recruit as many families as possible in a short period of time with children with diagnosed learning disabilities. Similar to Dyson’s (2010) study, “the voluntary nature of the participation may restrict the results to only those families who are adapting well to the situation of having a child with a learning disability” (p. 54). If I had the luxury of more time for the study, I would have extended recruitment to a broader audience, recruiting directly from local schools. Having a longer period of time to observe the students would have allowed for richer qualitative descriptions of the students and their situation at school and at home.

I would have preferred to have one or two more students in each focus group and at least two parent focus groups to add an even richer dimension to the data. However, due to participants’ sickness, family commitments and the Saturday time slot for the
students’ workshop and focus group, some families were not able to participate. Others may not have responded to the recruitment letter due to increased stress facing families with children with disabilities. These families stress levels are often higher than for parents whose children are not demonstrating specific learning difficulties (Dyson, 2010).

I also would have conducted a more structured writing reflection session with the students and not have planned a game right afterwards to facilitate greater concentration on the task.

Documented limitations of focus group research include the number of questions that can be asked are restricted in a group setting, available response time for each participant is restrained in order to hear from everyone and facilitating a group requires considerable group process skill beyond simply asking questions (Patton, 2002). Patton’s (2002) solution is to maintain the focus of the group at all times. Finally, my status as a novice researcher has been ameliorated by the guidance, experience, and expertise of both my supervisor and committee. Participating in this qualitative research project has been both illuminating and invigorating. Until a student embarks on his or her own research, the reality behind the power of evidence-based research is not fully understood.
Chapter 4: Presentation of the Data

In this chapter, I will present the results of all data collected during the study beginning with the demographics of the participants including their age, gender, diagnosis, and their familiarity with the assistive technology. Next, the results from the student focus groups will be discussed in a table displaying the amount and type of data collected followed by an analysis of the recurring themes emerging from the transcripts. Following the students’ responses will be a short analysis of the students’ written reflections. This study followed the coding process suggested by Bogden and Bilken (1998) looking for setting/context codes; definitions of situation codes; perspectives held by participants; participants’ ways of thinking about people and objects; process codes; activity codes; event codes; strategy codes; relationship and social structure codes; and methods codes.

Throughout the analysis measures were taken to include liberal use of the student’s quotes, representation of the students in their own language, and analytic bracketing to uncover what children think and believe (Bogden & Bilken, 1998). Following the analysis of the student data, themes from the parent focus group will be highlighted. Throughout all of the focus groups and three student workshops, observations of participant behavior were recorded and will be included in the analysis along with relevant journal entries from my notes complied from the onset of the study.
Demographics of Participants

From the parents who responded to the recruitment emails, I began to collect consent forms and demographic information about each student. The ratio of boys versus girls was not surprising given the statistics on the distribution of learning disabilities. The documented total is 60-80% of students with reading disabilities are male (DSMIV-TR, 2000). In an attempt to gather a wide range of grade representation, the criteria for the study specified that students be from Grades 4-8. The final number of participants in the study was eight students. The respondents represented the following grades: one student from Grade 4, four students from Grade 5, one student from Grade 6, one from Grade 7, and one from Grade 8. Four students attended local Catholic schools and four attended public schools (Table 2). The majority of the students came from the city with three living in rural areas surrounding the city. Only two students were new recipients of their assistive technology. On average, the students had all used their computers for over one year at the time of the study.

Difficulties with diagnoses.

Of the eight student participants, seven had formal psycho-educational assessments by a registered psychologist. Four students had received their formal assessment through the school board. The other three families paid for a private assessment by a registered psychologist. One student had been assessed by an occupational therapist and was provided with a laptop for handwriting difficulties and attention deficit hyperactivity disorder (ADHD).

Table 2 describes the demographic information of each participant.
Table 2

Student Participants

<table>
<thead>
<tr>
<th></th>
<th>Focus Group 01</th>
<th>Focus Group 02</th>
<th>Focus Group 03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
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<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Age</td>
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</tr>
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<td>Grade</td>
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<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Dyslexia</td>
<td>ADHD and DYSG</td>
<td>ASB and LD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NVLD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CLD</td>
</tr>
<tr>
<td>Length of time with laptop</td>
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<td>6 years</td>
<td>2 years</td>
</tr>
<tr>
<td>Public/Catholic</td>
<td>C</td>
<td>P</td>
<td>P</td>
</tr>
</tbody>
</table>

Note: ADHD = Attention Deficit Hyperactivity Disorder; DYSG = Dysgraphia; ASB = Asberger’s Syndrome; LD = Learning Disability; NVLD = Non-verbal Learning Disability; CLD = Communication Learning Disability.

This information was provided by each student’s parent. I did not have access to students’ school records or formal assessments in order to verify what the parents understood their child’s disability to be. These labels were self-reported by the parents as explained to them by school administrators. As can be seen in Table 2, all but one student had a learning disability. One student had Asberger’s and a learning disability and one had dysgraphia and Attention Deficit Hyperactivity Disorder (ADHD). The Asberger’s Syndrome of the one student influenced his contributions to the focus group in the quality and quantity of his answers, however, his written reflection offered excellent insight into the role the laptop played in his daily life at school. All of the other participants in the
study had diagnosed learning disabilities such as dyslexia, non-verbal learning disability and communication learning disability.

Each student group was chosen based on their grade with an attempt to select both boys and girls; however, only one girl participated. Additionally, some students were only able to attend the workshop and focus group on certain Saturdays, so I attempted to accommodate the family’s requests while at the same time forming groups with participants of the same age and grade level. Since the sessions were offered on three Saturday mornings, families had various events running concurrently with the workshop and focus group such as sports activities, family and friends’ birthdays, and prior commitments. Some parents were so interested they missed previously planned events in order for their child to participate in the study.

Each parent was invited to participate in the parent focus group held on the first Saturday of February, 2011, after the student workshops and focus groups had taken place. Parents were asked to fill out a consent form prior to the focus group. The parent group included six parents with two additional parents who sent in written responses to the focus group questions via email, as they were unable to attend in person. Therefore, the total number of parent participants was eight individuals. The parent focus group added valuable data to the themes recurring from the student focus groups. These recurring themes will now be discussed, beginning with the student focus groups.

**Data Sources**

Table 3 displays the type and amount of data collected.
Table 3

*Type and amount of data collected during study*

<table>
<thead>
<tr>
<th>Focus Group</th>
<th>Audio file length in minutes</th>
<th># of transcribed pages</th>
<th># of field notes pages</th>
<th># of written reflections</th>
</tr>
</thead>
<tbody>
<tr>
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<td>21</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Student FG 2</td>
<td>30:12</td>
<td>14</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Student FG 3</td>
<td>45:51</td>
<td>16</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Parent FG</td>
<td>95:00</td>
<td>34</td>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>

**Focus Group Data**

*Student focus groups.*

Student focus group data was collected from three separate focus groups held Saturday January 08, 15 and 22, 2011. Observations were recorded by the note-taker in addition to digitally recording all sessions. Themes emerging from the three student focus groups will be discussed across all questions. Surprising findings will then be offered followed by analysis of the students written reflections. Finally, data collected from the parent focus group will be analyzed and compared to the themes emerging from the student focus groups. For a list of all focus group questions refer to Appendix A. Students were assigned an identification number for the student focus group transcripts. Pseudonyms were used for students and parents in order to protect the participants’ identity and to maintain confidentiality.
Theme Analysis

Leveling the playing field.

The first significant theme that emerged from all three student focus groups was the theme of leveling the playing field. When asked the question: “since getting your laptop what has changed about the way you feel about yourself?, students referred to their assistive technology as having the ability to make school work easier and afforded students the chance to catch up with their peers. Due to the support from the software, students expressed the idea that school was less frustrating and they did not fall behind as often:

Before I got my laptop it was kind of hard cuz [because] people made fun of me and I was falling behind a lot because I was extremely slow but since I got my laptop I have kept on top of things and not been falling behind (Student 22: 2/3). The laptop helps me keep up with the class because I don’t have to read it by myself, but now I am more, it reads to me, so I can be up in the grade level with them (Student 26: 2/1).

Students were asked if school was easy or hard for them and the majority referred to the presence of the laptop as key to schoolwork being manageable. Completing assignments and handing in work was another benefit of having a laptop. Students expressed pleasure in being able to “get stuff done now” (Student 21:5/3). One of the younger students who was a soft-spoken, polite boy used the analogy of the laptop as a mechanism to lift them up to the level of the other students:
With your computer, it makes school easier because say you have a few bars and the rest are level and high and your spelling and writing is down, the computer is like putting up a high jack up under the two bars and then lifting them up to level them up with everything else [using his hands to show what he meant]. So everything else is level (Student 22:5/1).

This student was referring to his marks and or ability in specific subjects and his ability to complete work in comparison to other students without learning disabilities. Although the literature speaks to the problem of students with learning disabilities overestimating their abilities (Klassen, 2002b), his feelings of self-efficacy are enhanced by the use of the computer and consequently, his confidence may be greater to attempt new tasks. All but one student claimed school was easier with the support of the computer. In contrast, this quiet, intermediate student mentioned that school was challenging, but worth it because he could be near his friends and felt he might have a more successful future by attending school:

It is challenging sometimes, it is challenging but it is usually, like it is worth a little bit of it because you can hang out with friends and like you are actually learning something and you will get somewhere (Student 25:5/1).

Not only did students feel better about being able to keep up with their classmates, they referred to the decrease in frustration with schoolwork because they had a personal computer to use to complete their schoolwork. Students suggested that the use of the laptop supported their work through getting it done faster which decreased their
frustration. The following comment demonstrates this leveling of the playing field theme

“It feels like school without my computer, I was always behind, I couldn’t catch up, stuff like that and now that I have it I feel like it is a lot easier and it is faster” (Student 28:2/1).

To which I replied: “Easier and faster. Would you say you were more frustrated before and you are less frustrated now?” This shy, thoughtful student then replied: “More frustrated before” (Student 28:2/1). Another student said:

Computers make it easier and less frustrating to write so you don’t really have to think about the things that you are not good at because the things you are not good at, the computer makes you feel better at them and helps you (Student 22:2/1).

An added benefit of using the laptop for writing was the reduced physical strain associated with handwriting, another aspect of leveling the playing field simply by using the keyboarding or dictating function of speech to text software. One student felt privileged to have a laptop when other students had to manually write their stories and assignments:

I feel good about it because I can catch up again and everybody else is jealous because they want to get their work done and their hands kind of hurt from writing and I like Dragon and I don’t have to do anything, it just writes for me (Student 26:6/3).

Although this study is specifically about assistive technology for writing such as WordQ and Co-Writer, students were not able to differentiate the specific purposes for each
program. Many of the participants also had Dragon Naturally Speaking on their laptops, a speech-to-text dictation software which allows the user to dictate their thoughts and words are automatically generated on the screen. The idea of leveling the playing field was a powerful motivator for the students in all focus groups and a key to increased self-efficacy which is the next theme emerging from the data.

**Increased self-efficacy.**

As discussed in the literature review, the importance of self-efficacy cannot be underestimated for students with learning disabilities. The theme of increased self-efficacy continually surfaced through student responses to the focus group questions. Students referred to increased feelings of independence, improved grades, feelings of inclusion versus exclusion, increased confidence from success with software applications, feeling less bullied, increased abilities to problem solve and generate new ideas, all outcomes self-reported from student use of the laptop.

When asked about what had changed about the way they thought about themselves since getting their laptop, the only female student participant referred to her new found independence for specific school-related tasks:

I can do more things by myself and when I am doing my homework at home by myself, my mom she would have to come over and help me with the words but now that I have my computer I can actually just have it read it to me so I can do it myself (Student 27:2/1).
Increased feelings of self-confidence were expressed through the completion of work and the pace at which school work could be carried out. When asked the question: How does using your laptop in school make you feel? one student replied:

It kind of makes me somewhat feel good that I can get things done faster and makes me feel happy that I am not so rushed and it is not just things bouncing around in my head and means handing in and getting things done (Student 22:7/1).

The confidence expressed in his statement speaks to the necessity for continued use of assistive technology for students with learning disabilities. Participants’ repeated statements about feeling good about themselves are crucial components of self-efficacy for a population who often struggle with reduced feelings of self-confidence (Burden, 2008). This student went on to talk about how the disorganized state of his desk before having his laptop contributed to his inability to locate his assignments to hand in. Now he says he feels “a little bit spoiled” (Student 22:2/1). Another student who often expressed himself with vivid facial expressions along with his responses reported that the computer:

… makes me feel smarter, not dumb. Because I feel like I can’t learn anything when I write. With the computer I feel smarter which I am because I am smarter than everyone else in my class, in my school (Student 23:2/2).

His increased confidence is clear, without consultation with his teacher of course, this critique is based solely on his self-report but his parents also attested to his increased confidence with school-work. His parents indicated that his grades were slowly
improving since the work is harder in Grade 5 and he is expected to explain his answer in
more detail which takes more effort than in younger grades when the right answer was
sufficient (Parent Focus Group (PFG) transcript, p. 14). Another older student referred to
himself as “practically a computer expert” and bragged that he can fix anything on your
computer if it breaks (Student 24:6/2). The theme of increased self-efficacy with the
benefit of improved confidence can be heard in the following comment. When asked how
students feel when given a new assignment:

Last year when we got, we had 2 assignments we had to do, we did one on
habitats where animals lived and we did one on a country on Canada and I did
Quebec and I really did feel confident about the 2 projects...yeah I am really
confident with projects but if it was a 5 page essay on medieval times I
wouldn’t want to do that because I have already done that (Student 27:10/1/2).

Another student continued with this theme by speaking about how he felt before he had
his laptop: “I feel good because it is easier [using the laptop in class] it is better than
writing and failing all the time” (Student 23:6/1). Clearly, in this student’s estimation, life
at school is much better as a result of being given a laptop to work with. As one
participant stated earlier, the computer allows him to bypass the areas he was not strong
in and helps him to focus on the things he is good at. He talked about his strengths at
problem-solving and art and creating and building things.

The process of learning to write has been labeled a complicated process with “an
ill-defined problem” (Bruer, 1993, p. 218). Contrary to the application of the scientific
method for problem-solving in science or a mathematical formula, writing offers a myriad of problems requiring the application of a number of strategies to find solutions. By becoming problem-solvers, these students with learning disabilities are developing necessary strategies to become skilled learners simply by the fact they need to learn how to “work around” (PFG, p. 27) a problem to solve it. As one Grade 5 student with a strong sense of self-advocacy stated:

There is other things to life than being good at everything there is other things that you can be better at then just everything, cuz [because] if you are good at everything there is not really anyone, [who is good at everything] then it makes things too easy to live, you need challenges or else you can’t live or work too well. People need challenges or else they can’t survive (Student 22: 3/1/2/3).

This idea of becoming a problem-solver was also reiterated by many parents and will be discussed again in the parent focus group section.

_DeCREASED TEASING AND EXCLUSION._

A factor that may have contributed to the students’ expressed increase in self-confidence was some reported that teasing from other students decreased after receiving their laptops. When asked if he was the only student in his class with a laptop, a Grade 7 student who came across as a quiet, self-assured student, explained that he was happy not to be the only student in his class with a laptop “Because if everybody is different than you that is sort of bad because like you won’t fit in and stuff and you would have a hard time” (Student 25: 6/6). However, other students suggested that they felt special as the only student with a laptop in either their class, or their entire school. In both cases, the
main theme was the fact that students felt either special to have the laptop, or supported by the presence of others with a similar situation. None of the students felt negatively about using a laptop in class. Additionally, their increased efficiency in reading and writing may have been a factor in the students’ perceptions of being teased less often:

It also helps me improve on my reading and writing, like now my friends used to say what is this word and now I am able to recognize it faster so they can’t really pick on me as well cuz [because] I am a little bit better at reading and writing (Student 22: 2/6).

Increased independence, increased self-confidence, focusing on their strengths, becoming problem-solvers, and feeling included and less teased are all areas included in the broad category of increased self-efficacy. Throughout the focus groups, this main theme continued to resonate with students as they openly shared about their experiences of using a laptop in school. The third and final theme that emerged from the student focus group was an ad hoc approach to access to technology, maintenance of equipment and teacher support.

**Ad hoc approach.**

**Barriers to use.**

As a recurring theme, that emerged in responses to many questions was an apparent ad hoc approach to how assistive technology was implemented in the schools. Ad hoc is defined as “lacking in generality or justification” (Collins, 2009). This approach became clear as students talked about the many barriers they faced in using their equipment regularly in class. Barriers included equipment failure, ownership and
upkeep, physical space for computer set-up, a perceived lack of teacher knowledge about software applications, opportunities to use their computer programs in every class, and lack of continued training on existing and new software for both student and teacher.

**Equipment malfunctions.**

When asked how does using your laptop in school make you feel, one of the first barriers students talked about was their frustration when their equipment malfunctioned. Laptops may not be available for the students due to repairs, other students using them or a perceived lack of teacher knowledge about trouble-shooting equipment issues. Students reported that equipment malfunctioned on more than one occasion. Equipment failure, printer issues, viruses, computers needing re-imaging were mentioned by every student in all three focus groups. From my personal experience, having worked as an assistive technologist in the schools, the solution to these equipment failures sometimes requires a simple fix to get the printer or the laptop to work. However, some technological knowledge is required by an adult to problem-solve and support the student while teaching them how to implement various solutions until the problem is solved “My printer always says it is always out of ink, but we have replaced the cartridges and it still says it is out of ink. Mine doesn’t want to work at all” (Student 26:8/6).

Another barrier was mentioned by one student who claimed he did not have his laptop available to him because other students were receiving training and required the use of his laptop:
They take it away some days because there are people getting new laptops at our school and they need mine to do training and they take ours and they take it to the library and those days I don’t have my laptop (Student 26:7/3).

This issue will be discussed further in the recommendations section in Chapter 5.

**Physical space in classrooms.**

The issue of the lack of physical space for using the laptop was a recurring barrier for most students. From requiring three desks for printer, laptop and work space to the actual lack of any space were all mentioned as tangible barriers that limited easy access to their equipment:

> In my class we have 4/5s squished together I have a little table that has my printer and my computer and that is all the space I have. I have no space to put my work down, whenever I am doing on my desk I have my mouse, and my computer and I have no room to put my paper (Student 27: 8/3).

Three students mentioned how their teachers made a special space in the classroom for their equipment facilitating their learning.

**Teachers’ software knowledge and support.**

Students also discussed the importance of having their teacher knowledgeable about their software applications. Often students had questions about specific functions within their software programs and were unable to get any answers from their teachers or support staff such as educational assistants (EAs). When asked what could your school change to make learning better for you, one student said:
I think if they could train the teachers about the software so that the teachers can help the kids more with their software instead of the teacher just sending the kids to the EAs or the principal if they have a problem. So the teachers can actually help out more. If they were trained a little bit so they knew about the programs so they know a little bit about them and they can just help out a little bit more (Student 22: 8/1).

Although in this student’s case there were educational assistants who were trained in the software available in the building they were not in his classroom. This student preferred to stay in his classroom perhaps to keep his focus, avoid distraction or simply to get a solution to the issue in a timely manner. The training of support staff on assistive technology programs is another area of inconsistency which will be discussed further in the next chapter under teacher preparation and knowledge of the software.

In addition to software knowledge, there seemed to be a lack of understanding about how to integrate the use of a laptop into the regular curriculum. Students stated that they felt their teachers did not give them opportunities to use their laptops for some subjects, for writing tests, or when they rotate to a different classroom:

Researcher: So let’s say you have geography, history, social studies; would you be using your computer for that?

Student 25: For history, sometimes but most of the time no, because it is in a different class [room].
Researcher: Oh, so if you move classrooms do you not take your computer with you?

Student 25: No, and that teacher doesn’t like, she likes us to copy down, but when we copy down she gives me a copy, so I will practice my writing or like we will do group stuff so yeah and I don’t use my computer for tests (Student 25:7/8/9).

As all responses were student self-reports, caution must be taken when reading only the students’ side of the situation. From personal experience with students, sometimes situations can be misinterpreted without clarification from their teachers. However, the parent focus group discussion also reported many of the same barriers that were mentioned by the students.

Students were anxious to share stories of teachers who had offered invaluable support in initially acquiring equipment and encouraging and inspiring students to pursue their learning. Two students shared stories of how their teachers encouraged them to seek out other potential areas of strength in sports teams and how this positive attention influenced their school experience. One participant wanted everyone to know how one teacher had inspired him by showing him all the ways the laptop could support his learning. His disappointment in her departure was palatable as he shared the difference in support he currently receives from his teacher. Although these stories were outweighed by the number of barriers students faced, mention must be made to accurately reflect the students’ responses.
Surprising Findings

A few of the responses to the focus group questions resulted in surprising findings based on my assumptions coming in to the research study. Based on prior experience from working with students with learning disabilities, I made assumptions about their self-perceptions as learners assuming some experiences would be negative. My standpoint as a researcher may be influenced by my identity as a woman with a physical disability which contributed to an underlying bias with negative connotations to issues of disability.

Self-perceptions as learners.

When asked how they would describe themselves as learners, words chosen to express their self-perceptions included: “happy”, “creative”, “hard-working” and “problem-solver”, “likes learning”, and feels “good about learning”. Students qualified their responses by expressing their need to see and hear material in order to understand it completely and they felt that they don’t remember as well as other students or are not as fast as other students. Overall, their self-perceptions about learning were positive or neutral, certainly not negative as originally assumed.

Tackling new assignments.

When asked how they feel when given a new assignment, students also positively expressed their approach to an assignment. Primarily, their feelings were subject-dependent, so if a subject was one they were strong in, they felt more confident. One student talked about his speech on the topic of dyslexia. He shared how he felt strongly about this topic which influenced his approach to the assignment:
I kind of feel good and it depends on what the subject is and it depends on what my idea might be. Say it is a speech we have to write about something we feel strongly about. I was pretty excited about that. I picked dyslexia as my subject because I have dyslexia and … it depends on what the subject is but I always try to get it done and sometimes if I don’t like it, it is just like another object to move through (Student 22: 10/2/3).

Students expressed excitement and confidence perhaps because of the support they know they have with assistive technology:

I just say time to boot up the computer and whatever the subject is like, say it is social studies wherever the topic is, I boot up the program that makes it easiest, like Kurzweil or Inspiration or Dragon or WordQ (Student 22: 10/6).

**Self-perceptions of diagnoses.**

The most refreshing results came from students’ responses to the question, what does it mean to have a learning disability. Most students were able to give a short, clear descriptor to reflect their understanding of their own learning challenges. Without any reference to assistive technology in the original question, one happy-go-lucky student referred to his learning disability in this way:

It doesn’t mean you can’t learn, it just means you have problems all you need is a little, like riding a bike for the first time, you need help, someone pushes you and that is pretty much what the computer does (Student 23:3/2).

Another student explained having a learning disability as just a different way of learning, another, that they just learn slower or can’t read as fast or write as fast as others. A few
students recognized that their challenges were not in every subject, they had areas of strength in specific subjects. However since areas of weakness were in reading and writing, these skills are required in almost every subject in school. One of the older students, who had used his computer for over three years, understood the fact that he had specific areas of difficulty:

I know how to get the answer but like geography and stuff I know how to get it just the writing to explain it that is like what I have trouble with (Student 25:3/4).

Not all students expressed a clear understanding of the meaning of the label and one participant who was reluctant to speak up during the discussion felt left out due to his learning challenges:

It feels like people treat me differently and that I am left out of most games and that since I had one [a learning disability] I used to have friends but when they found out they were basically done [with playing with me] (Student 26:3/2/3).

I asked this student if he felt his friends understood what a learning disability was and he responded that he didn’t think they understood. We talked a bit about how having a learning disability meant you are really good at some things. At this point in this focus group, my note-taker ably stepped in and shared her story of having a learning disability herself and offered encouragement to this student. She talked about how she discovered her learning disability enabled her to work harder and to be proud of his learning disability. Her presence in all of the sessions was invaluable when discussing the sensitive topic of living with a learning disability.
Inter-rater Reliability

An inter-rater reliability check was performed by a fellow Master’s student with teaching experience in assistive technology. She independently coded 3 of ten questions from the student focus group responses, and 3 of 8 written reflections and the entire parent focus group transcript. Inter-rater reliability is conducted in both quantitative and qualitative studies in order to determine the extent to which another individual agrees with what has been observed and/or rated by the researcher (McMillan & Schumacher, 2010).

Overall the themes emerging from the independent rater were highly congruent with themes I had identified. Her themes included ease of school burden which had sub-themes of growth in confidence, speed in school work and acceptance with peers. I had coded these as increases in self-efficacy. Her main themes of computer issues and resources with sub-themes of experience, computer problems and teacher time, physical space, and laptop assistance were coded in my main theme of an ad hoc approach. The overall theme of frustration was also imbedded throughout the student responses. The only new theme identified by the independent rater was the theme she titled, “curriculum area” with sub-themes of writing, reading and language and math. This may have been identified as a separate theme because she is a classroom teacher, and her focus may have been on specific curriculum areas in which the students required support from their computer software.
Student Written Reflections

At the conclusion of the workshop on WordQ and Co-Writer (Appendix B) students were asked to write a short reflection about how they felt while using the software. They were asked to write a few sentences about how their computer helped them. The reflections were then saved on a memory stick and transferred to my laptop and uploaded to QShare for safe keeping.

My note-taker and I observed the students while they were writing to record their use of Co-Writer or WordQ for writing support. Each student chose to use WordQ while writing their reflection. Each student had their word prediction function turned on so the words were available to them if they wanted to select a specific word from the prediction box. One student chose to turn off the speech synthesizer as he is used to leaving it turned off while writing. This student was the Grade 8 student who has been using the laptop since Grade 2 and was quite proficient. The students’ reflections were analyzed for content, syntax and grammar.

Content and syntax.

All of the students complied and wrote more than they were asked to write. When using a word prediction program, if the word chosen is at the beginning of the sentence or is a proper name, the program will automatically capitalize the word. It also automatically adds spaces between words and adds periods at the end of sentences if the user hits the space bar. The following sample demonstrated the proficiency of this student in his use of the software since he had been using it for over two years:
My name is [Capitalized first and last name]. I am 10 years old. I own a Mac. I play on the Mac and it’s fun. I like my pc better thought. (Student 23)

The student used capitals and periods in the correct places and the content made sense. The only problem is the last word, *thought*. The student was looking for the word *though*. He quickly heard all five words in the prediction box and selected *thought* and went to play a game with the other students who had already finished their reflection. If he had taken the time to listen to each word using the speech synthesis he might have discovered his error. Overall, the content of the sample reflections was adequate; only one student’s sample did not make a lot of sense. He was the newest user and had not had as much exposure to assistive technology as the other students:

I bob is my name. I like to eat pizza. It makes baseball team got hit one inning.

Have I a computer because it helps me to spell. (Student 26).

During the workshop, we had used an example with baseball to demonstrate the use of topic lists which was still on this student’s open document. He did not use the “read back” function to read his writing back to him in order to correct and edit his work. Additionally, it appears he is letting the software guide his word choice and not his own thoughts. As an observation, especially with novice word prediction users, they have a tendency to choose the word offered next by the program rather than try for their own word from their ideas. Again, the issue seems to be the time it takes to search for a word of their own rather than one which is readily available in the list from the word prediction. Taking time to revise their work is a common problem with students with
learning disabilities because their evaluation criteria are inaccurate as well as their ability to distinguish errors (Swanson et al., 2003).

**Grammar, spelling and punctuation.**

Most of the eight students’ written reflections were free from grammatical errors. The example mentioned above had the most errors. The following sample was written by a Grade 8 student who had used his laptop since Grade 2:

> The best gift I received was a PS3 from my parents. It was the best gift because I have wanted it for about two years. I like my computer because it makes everything faster. Also because it is easier to read, revise and check. (Student 25).

His competence with the program was evident. The following sample from a Grade 5 student demonstrated the higher level of word choice used by selecting a word from the word prediction box:

> I like my laptop because it helps me with school work. Many people are better riders [writers] then me but with all the software I am just as fluent as them. (Student 22).

This student is already aware of how the software can support his writing. However, he did not take the time to edit his work using the “read back” function of WordQ. If he had, he might have caught the error with the word *riders* instead of *writers*. His reflection had correct capitalization, punctuation and the added bonus of expressions of blossoming self-advocacy. His use of the word, *fluent* is interesting to note as it is one not often used by children. The written reflections demonstrated a tangible dimension to the focus group data further substantiating the benefit of word prediction software for...
struggling writers. As young learners master skills, “by over learning, the responses become integrated into one unit and the skill is then simplified and requires less attention for execution (Case, 1985, p. 75). With additional instruction and further practice, over time, these writers may produce more advanced pieces of writing.

**Inter-rater Reliability for Written Reflections**

The independent rater’s analysis of three of eight written reflections agreed with my analysis, noting the same difficulties with syntax, sentence structure, spelling, lack of application of the revision tool provided by the program. Her comment was the same as mine for the writing sample used on the previous page. The student choosing the word *fluent* also caught her attention as a word a student may not use on a daily basis. She also suggested this may have been a word this student had heard before from his teacher in the classroom or simply chosen the word after hearing the speech synthesizer reading out the choices of “fl” words in the list. The only difference in her analysis was the comment she made about one student’s sample with a lack of attention to completing their thought. The following section discusses the results from the parent focus group.

**Parent Focus Group**

A total of eight parental responses were received to the focus group questions with six parents participating in the focus group and two parents sending in their responses via email. The written responses from these two parents suggested similar concerns to those of the parents who attended the focus group in person. Naturally, their responses were shorter, and to the point, compared to the discussion that ensued from the
parents in the actual focus group. Both the mother and father of two of the student participants were in attendance. Childcare was provided for parents to facilitate their participation. The responses from the parent focus group added valuable data to the study when analyzed alongside the student responses. For a list of the questions from the parent focus group see Appendix A.

From the outset of the session, it became obvious that the parents needed to vent and share their stories. As a result, I had a difficult time keeping the discussion in line with all of the scripted questions. Therefore, similar to the student responses, the analysis also follows the themes which emerged from the session rather than a question by question presentation of the data. Careful attention needs to be paid to the premise that the responses are parental perceptions of systemic issues in special education not criticisms of the school system or individual teachers. As parents of students with disabilities, their struggles are palatable and given this venue to share their experiences, they expressed their gratitude in being given a chance to be heard.

A strong feeling of frustration permeated each theme emanating from parent responses. Parents discussed many of the same issues as their children supporting the themes from the student focus groups with additional clarity and tangible examples for further consideration. The main themes expressed included the inconsistencies of an ad hoc approach to special education, how assistive technology improved their son or daughter’s self-efficacy, and increased levels of parental advocacy.
Theme of inconsistency of an ad hoc approach.

Parents were frustrated with the ad hoc approach which affected many aspects of their student’s education. Areas affected by this ad hoc approach included: communication from teachers, administrators and school board officials regarding policy and processes for student diagnosis; acquisition and use of computer equipment; training for students and parents on assistive technology; and teacher preparation, understanding and application of computer software in the form of assistive technology.

Policies and processes.

One of the first areas of frustration to surface from the parent discussion was one parent’s discovery that her son was the only one in the group not permitted to take his laptop home for the purposes of completing homework:

George is not allowed to bring it [the laptop] out of the school and has to leave his at school and it has to be locked up every night so he has use of the special ed [education] stuff at the one school and goes back to his home school and he has to set it up and unlock it and everything else and it doesn’t travel with him (PFG, p. 17).

This parent was the only parent at the focus group whose child attended a public school; all the other parents had students in the Catholic system. Throughout the focus group the other parents continued to tell her about the benefits of their children’s home use of the computer software. This parent felt as though her son was being discriminated against by
the fact that the laptop was not allowed to go home with him. She likened it to being prevented from using a physical apparatus required for daily functioning:

28M: Here is your robotic arm but we are going to keep it at school so you can use it here.

Researcher: That is a really good example.

22M: A really good example, like here are your glasses but you can only use them at school.

28M: And he is frustrated like crazy and it drives me nuts how he can’t do his homework (PFG, p. 14).

By the end of the session, all the parents were sharing their contact information with this mother in order to support her pursuit of a solution with the school. This discrepancy in policy between the public and Catholic school boards demonstrated the inconsistency in service received by families. One family had decided to switch from the public to the Catholic system as they had heard there were better special education services:

22M: I wonder if there could be more communication between the school boards because as a person who has a child in the Catholic board and we only switched to the Catholic board specifically because my son is dyslexic. We felt there would be more resources there and we were right and we have been thrilled with the resources we have gotten. And so you know none of these kids should be disadvantaged. I am sure that is not the intention of the board but if
they realize … we are taking good care of it, nobody is breaking this equipment (PFG, p.5).

Regarding policies for diagnoses and deployment of equipment, parents also experienced inconsistencies. Some parents had been educated about the process by their child’s teacher, others happened upon the information by speaking with other parents:

22M: At the beginning of the situation, when I found out John was dyslexic I felt like I was out on a sea alone and I had to learn this thing and there was not a person around and anybody I heard who had a child who was dyslexic I tracked them down (PFG, p. 14).

Some parents reported that they had to pay privately for their child’s psycho-educational assessment; others were placed on the school’s list of students whose assessment was paid for by the school board. Of the eight participants, half paid for their child to have a private assessment rather than wait for their assessment provided by the school board. This number was confirmed by a follow-up email sent to participants. The reasons given for arranging a private assessment included the time to wait for a school board assessment and the parents’ wishes for a diagnosis. One parent did not understand how the computer was intended to help her child. When asked what, if any issues parents encountered when their child started using their laptop, one parent stated:

27M: At first it was the explanation of why she had use of a computer and the understanding of why by the other students especially because she received hers
part way through Grade 4 which is a little less common. This has really not changed much as the laptop is not used in class very often (PFG, p. 32).

Some parents had tremendous support from teachers when seeking a diagnosis for their child. Three families expressed gratitude for teachers who recognized students’ difficulties in their child’s education:

25M: I mean this happened in Grade 3 I had a great teacher that was an amazing teacher that identified him and if it hadn’t been for her, I can remember crying in her class please help my son because if you don’t I don’t know what I am going to do (PFG, p. 9).

Another mother talked about her son’s Grade 3 teacher: “George’s Grade 3 teacher, she was wonderful, she identified him and said we should do this, and we should do this and fortunately I was able to work with her on that” (PFG, 28M: p. 9). However, parents also added there were inconsistencies from year to year dependent upon the teacher’s comfort and understanding of technology. This is discussed in detail under the inconsistency of teacher preparation and comfort with technology.

Available resources.

Other issues regarding inconsistencies included the perceived discrepancy in available resources between rural and urban schools:

23D: If you are thinking about a rural public school, we just got Broadband wireless and that is great we have that functionality if you are someone who is midpoint north and you don’t have access to good Internet certainly the cable cell is totally out of option once you get a certain point. And the one option they offer
you and the one hurdle being your school following up with it during the day but even if they are and you logon and it takes so long the child gets discouraged (PFG, p. 4).

Parents from a rural school expressed concern that their children did not have equal access to newer computer technology. They perceived the computers were discards from urban schools: “I mean we don’t get the resources that the city ones do like the other schools in the board (PFG, 23M: pg. 3). Not only did parents report that they felt unequally treated in terms of resources, many also felt that their child had missed having a teacher who understood their child’s need for the computer in the classroom.

22M: Both of my kids have learning issues and there are no resources there. I get this blank face from the special ed [education] teacher like they have never heard of a special ed [education] issue; these people are not equipped to deal with these kids who have learning disabilities. Bright kids, talented, capable (PFG, p. 6). This parent was the one who moved her son to a Catholic school and is now considering also moving her daughter due to their positive experiences. One parent passionately expressed her concern for inconsistencies:

23M: Frankly I don’t care if you make $200,000 or $20,000 those kids are both in the boards. You are all paying equal taxes for the same thing and all those kids Catholic, public, whatever they should be allowed to have those resources …if you get enough of these kids that [say] “I just don’t want to be here anymore, I
just can’t do it”, … they give up, by giving them the resources … you never know where that next brilliant mind is going to come from (PFG, p. 5)

**Teacher preparation and comfort level with technology.**

Some parents had positive experiences with classroom teachers but these were often inconsistent and depended on the classroom teacher’s comfort with the technology. Teachers are often re-assigned to other grades or other schools from year to year:

27M: Make sure they are using the laptop in any possible learning situation. I find that the teachers may not fully understand how the programs work so they find it almost bothersome to have to prepare information for one student in such a fashion that it can be used with the assistive technologies provided to the students (PFG, p. 30).

28M: His Grade 4 teacher [was an] awful teacher, terrible very narrow focus and this is the traditional way and this is how we are going to get through it. His Grade 5 teacher, a blessing, absolutely a blessing, she is wonderful (PFG, p. 5).

Blame should not be placed on teachers necessarily, much is due to the preparation and training for technology use in the classroom as this parent aptly explains:

23D: You almost in a way feel bad for the teachers, we have an expectation, we are legitimate to have that expectation, you are only as good as your training and you are only as good as what you have been given. Going back to the mechanics analogy if you are not given the tools to fix the vehicle, you can’t change the tire without something to loosen the lug nuts in a way that is a piece of the puzzle (PFG, p. 16).
Using the current terminology, special education courses are not mandated as a requirement for certification by the Ontario College of Teachers. Individual teachers must acquire their special education courses by taking an elective during teacher preparation or through additional qualification courses (Ontario College of Teachers, 2009). Elective courses still remain as the main source of information about students with learning disabilities for teacher candidates. Education on assistive technology programs is another area of specialty teachers are often expected to do on their own time or as elective courses during their teacher education. The Internet age, or information age, as explained by Gates (2000) is “the center of attention for businesses, governments and individuals around the world and has changed the way we learn” (para. 2). The requirement for familiarity with the Internet is not going to diminish in the years to come:

23M: The Internet is not going away, laptops are not going away some point in time all kids are probably going to have a computer and the fact that they are bringing in smart boards and can plug in the whole school year to the smart board. In our school it is mostly young teachers …. are really open to the new technologies the principal is young too … and are adapting their classrooms to accept these new technologies and it just blows my mind because here we are as the country school. I just think they are doing such a disservice by not stressing the fact that adaptive technologies are here to stay (PFG, p. 15).
Increased training and education is one solution to effectively solve this issue. More about the implications for educators will be discussed later in the recommendations in Chapter 5.

*Training in computer software.*

From personal experience, as an assistive technology instructor for the local school boards, most teachers attending training sessions were excited to learn how the programs worked and how they could integrate the use of the programs into their classroom curriculum. However, the majority of teachers, nor support staff was given release-time from the classroom to participate in the training in either school board. During the year that I worked as an assistive technology instructor, it was primarily the Catholic boards that paid for supply teachers so the student’s teacher could attend training with the student and sometimes with the parent. Some parents reported they were invited to the training with their child; others were not aware of the training or missed the information through miscommunication with the school:

22M: When John got his laptop there was training for his programs and I attended all three and that was very helpful to see what the programs do. And now that the funding for the training [is gone], he was supposed to have 2 days of training this year but that has been cut. So the resources have been cut off through the board but I am so grateful we were able to come to the workshop (PFG, p. 14).

One family talked about the difficulty of living in a rural area, but working in the city preventing them from attending training sessions during the work day. If evening sessions had been offered they might have been able to attend. This family reported the
information their son received from the workshop offered through this study enhanced his knowledge of program features and presented new features which he has used frequently since. The only other training venue mentioned by parents was a single workshop sponsored by the local Learning Disabilities Association on assistive technology.

The need to teach the teachers was a recurring theme throughout the discussion:

25M: I have to admit teaching the teachers themselves is really important. …It was a teacher that sparked the interest in my son and finally I realized that something was wrong. I think educating the teachers is really important. Advocating as a parent obviously is important but teaching the teachers like Joan was saying. Do you want teachers that aren’t even aware? ….. unless you have one teacher that can spot it (PFG, p 8).

**Theme of increased self-efficacy.**

Of all the themes emerging from the parent focus group, the increase in self-efficacy was most closely linked to the study’s objectives of understanding student self-perceptions. Parents commented on increased self-confidence and self-esteem, increased independence and problem-solving abilities as beneficial outcomes from students’ use of computer software.

*Increased self-confidence.*

Parents recognized the increase in their child’s self-confidence, especially in those students who had their computers for a longer period of time. The literature is clear about the learning curve required to become an expert in new areas; however once mastery is achieved, self-efficacy overflows into other areas (Troia et. al, 2010). Parents used the
term self-esteem and self-confidence interchangeably. For the purposes of this analysis, all of these constructs will be included in the overall theme of self-efficacy. The parent of this Grade 7 student shared how much using the computer to support his school work has improved his self-esteem. His mom said:

25M: As far as self-esteem goes, I understand the struggles with self-esteem; it would be a screaming match with me for hours and hours. [before he had the computer]. But ok you feel for that but you know what I can guarantee you it will get better because it builds character, it does. It does because his self-esteem has improved immensely because he knows he can do it he has the tools to do it and his grades have improved immensely he came home and said: “I got an A- in 2 assignments yesterday I got a C+ in my art but who cares about art he said, his self-esteem has improved dramatically because of the laptop but it also builds character (PFG, p. 11).

As parents discussed the different expectations from one grade to another, one set of parents used the example of their son whose marks actually declined with the use of the laptop because he is now required to expand and explain his answers in more detail than in former grades when his marks were higher. They acknowledged the fact that these new skills are important and appropriate for their son to work at the Grade 5 level and would improve his self-confidence over time:  

23M: See because I pushed and he got his laptop in January of last year his Grade 4 teacher was amazing so he loved Grade 4 he had a great time and he was doing
very well his marks dramatically improved with the laptop. But because Grade 5 is the defining year and in Grade 5 they have to pontificate more they have to put more in there and because Ken is more intelligent he will read a question like this well the answer is 10 and he has no idea he can’t tell you how he did it but it is right. That was great in Grade 3 and 4 but

Researcher: Because you have to explain your answers now.

23M: That’s right and that’s where the problem is so he is still at a B average so his average has gone down (PFG, p. 10).

Increased independence.

One of the by-products of computer-use for their children was the increase in their child’s ability to work more independently. Some parents observed their son or daughter asking for help with homework less often:

27M: She is definitely more confident in her work. She sees how the computer makes the work much easier and that the programs can assist her with things that she would have previously had to ask for parent/teacher assistance on. She is much more able to complete her work on her own (PFG, p. 10).

Another parent used the analogy of the laptop being equivalent to her son’s right hand in terms of its necessity for his success in academic subjects. This statement demonstrated the crucial role the software plays in his achievement at school. This novel independence was also mentioned by the students themselves. Although they still require support, once they understand what is required, they are able to more independently perform school
related tasks. One student identified the necessity of the laptop for both her teacher and herself:

Probably if I didn’t have my computer to work on it would be really hard and I would be like having my hand up a lot and asking my teacher like um what was that? We have to do [what] again? I forget and I can’t read that work I need help and when she also has the 23 other students to look after and the grade 4’s and the other grade 5’s it is a little difficult for her (27:7/1).

The independence provided by computer-use adds to feelings of confidence which in turn increases self-efficacy, all contributing to more positive self-perceptions as learners.

**Increased problem-solving.**

As parents recognized the difficulties inherent in learning new computer programs, they also identified the benefits of learning new skills. Additionally, learning how to live with a disability produced problem-solving skills which would continue to help their children even in post-secondary endeavors. Deemed as “work arounds”, parents felt their children would have an advantage due to their learning disabilities:

23D: Elementary to high school is repeat after me then when you get into university it is..

Researcher: Critical thinking

23D: It is why do you think that and if you are the person who has had the internal journey and you have had to find ways of getting around problems and work arounds and we all know these kids are good with the work around. They try to hide it initially but I am just going to try this little trick …it is sad that
they have to do that but the silver lining of that is you learn to be quick on your feet (PFG, p. 27).

Having a child with the label of learning disabled, or a child with ADHD, parents have also learned to view disadvantages as advantages:

28M: We have to reinforce[to] them that the tools they are given now are not to weigh them down they are actually going to help them….So that when I am talking to George I am saying you are going to have better strategies but it may not mean an awful lot to him but what I am always trying to reinforce to him is that I have to struggle too when I am doing my class work as well and he sees that but it is not to weigh them down it is allowing them…. they actually have the advantage (PFG, p. 28).

My note-taker also shared her struggles being labeled as learning disabled and how one teacher taught her valuable strategies which she currently uses in her Master’s of Education studies.

**Increased parental advocacy.**

As parents of students with learning disabilities, the participants identified their roles in various ways. These different roles were described as a “pit bull”, a “thorn in their side”, an “advocate” and “hyper-vigilant”, as necessary attributes of their parental identities. Parents assumed these roles out of necessity to ensure their children received the resources and services they felt they deserved. In discussing their roles, parents concluded these roles took effort and tireless attention to advocate for their children.
Parents gave themselves the label of “pit bull” when describing their efforts to convince the school boards or administrators of their children’s need for equipment, assessments or timely provision of equipment “I am a pit bull and he is my kid and if I had let go they wouldn’t have done what they needed to do either” (PFG, 25M: p. 9).

Parents spoke about having to fight for their child to be given their equipment at the end of the school year when administrators were planning to wait until the following fall. Even though this family had a fairly positive experience, they still needed to be hyper-vigilant when administrators were ignoring the dyslexia aspect of their son’s diagnosis:

23D: …. there have still been issues talking about the IEP, he is dyslexic and he has ADD and here is where our issue came… the psychologist came back and said he has dyslexia and we can’t really address the dyslexia until we address the ADD because we need to get him in that frame of mind. And the only criticism I have of them is they read ADD. You can take a pill for ADD but you can’t take a pill for dyslexia, there is no prescription that is going to make a D stop looking like a B.....You are not even officially acknowledging the dyslexia even though you have had a piece of paper in his file for over 2 years stating that he is dyslexic and we are having to go in and argue and amend the IEP when it has been there since day 1, it is just the difference of one sentence, not even the difference of a paragraph (PFG, p. 7).
One mother described herself as a “thorn in their side”, referring to the vigilance required to maintain the administrator’s attention to their concerns. Parents felt that participating in this study was an act of advocacy to encourage other parents to get involved:

23D: Isn’t that why we are all here though because we know maybe if we are all sharing our experiences and we are at least trying to cooperate wherever possible… we see kids interacting with our children and you can see it a mile away I mean maybe if you don’t have the direct personal experience with it. Everything makes you hyper vigilant once you have the personal experience and the awareness (PFG, p. 8).

Other parents felt privileged to advocate for their children saying many children have no one to speak up for them. By sharing their stories, not only did their own advocacy increase, but the self-advocacy of their children increased. By recognizing challenges caused by their disabilities, students’ self-advocacy was beginning to appear as demonstrated by this student’s comment:

Student 22: 10/3 I picked dyslexia as my subject because I have dyslexia. … It is just like a snow plough when you have ice blocking and you need to plough it. You just have to move the obstacles out of the way (p. 45).

Finally, other benefits of assistive technology identified by parents included the speed with which their children could finish assignments, organizational tools to keep track of assignments and the support their children offered to novice users. The ad hoc
approach to special education, improvements to self-efficacy and the advocacy demonstrated by the parents were all main themes from the parent focus group.

**Inter-rater Reliability for Parent Focus Group**

The independent rater’s main themes from the parent focus group included: communication, access, advocacy and programs, and assistive technology which logically mapped onto my main themes of frustration, ad hoc approach, improved self-efficacy, and advocacy. Again, as with the student responses and written reflections, the independent rater’s findings overall concurred with my analysis.

**Conclusion**

The findings from the student focus groups, students’ written reflections, and the parent focus group all contributed to the analysis of self-perceptions of students with learning disabilities. Capturing the students’ voices and the parents’ observations of their children, along with their feelings on issues related to use of assistive technology provide an insider’s view otherwise not documented in the literature. By speaking directly to those involved, discussion regarding their specific experiences provided a picture of the situation facing families with elementary children with learning disabilities. A more detailed discussion of these results now follows with links to relevant literature.
Chapter 5: Discussion

“Power can be taken, but not given. The process of the taking is empowerment in itself” (Lewis, n.d. para. 1). Following the presentation of the data in Chapter 4, in this Chapter, I will suggest possible interpretations of the data based on relevant literature. By anchoring the findings to the literature in the field, a clearer understanding of the self-perceptions of students with learning disabilities as learners and writers is sought. However, as noted in Chapter 2, the research in this area is limited. This chapter will begin by addressing themes from both the student and parent focus group responses and will be interpreted with potential explanations from the literature. The last section will suggest recommendations and implications for further research in the field of education.

Recurring Themes

Leveling the playing field.

One recurring theme from both the parents’ and students’ responses was the self-reported benefit of using assistive technology to facilitate equal opportunity for student participation in academic subjects. Students commented on how school seemed easier for them after having their laptops and they felt they were able to catch up to their peers. Possible explanations for school being perceived to be easier may be the reduction of cognitive load the technology provides the student, the support for spelling and grammar offered by various software applications, the bypass for handwriting offered by keyboarding, and the organizational benefits of a computer to keep track of assignments.
**Benefits of assistive technology.**

**Reduction of cognitive load.**

Students and parents reported that the ability to focus on writing without worrying about spelling and grammar enabled students to feel they were able to get more work done. These self-reported findings are likely due to the reduction of cognitive load supplied by the assistive technology. As discussed in the literature review, the more automatic a task becomes the less cognitive load is required to complete a task such as writing, by accessing already formed schemata (Bruer, 1993). The richer the schema the faster one is able to process knowledge already encoded into long-term memory (Anderson, 1994). Students with learning disabilities already have compromised working memory due to their inability to maintain a number of items at one time (Swanson et al., 2003) which can make the task of writing much more difficult. Cognitive load theory suggests by lowering the level of mental energy required to process a given amount of information, greater energy can be directed towards crucial learning activities rather than those which are adjunct to learning (Cooper, 1990).

For example, the support of the word prediction software may alleviate the cognitive load required to simultaneously sound out words, comprehend word choice, spell the word, and then decide if it makes sense. The software provides these benefits for the student by offering choice of the correct word in context with example sentences for many homonyms and words with alternate meanings. For example, if a student was searching for the word *their*, he or she would be offered the choice from the three different meanings of the word: *their*, *there* and *they’re*. When the student hovers over
the word with the mouse, the word is placed in proper context in a sentence. The trick for students with disabilities is to take the time to avail themselves of this function. Often they do not slow down to take this step as observed in the workshop and throughout my teaching as an assistive technology instructor.

**Better academic outcomes.**

Findings with regard to better academic outcomes are again, self-reported by the students and their parents. Student 22 quoted earlier in Chapter 4 knows his spelling is an area of weakness, but he also knows his computer can aid in this area and in his case, he was grateful to have the opportunity to catch up to his peers. His mother can attest to the fact that he is less frustrated at school and appreciated the support offered by the technology. Another parent reported her son’s grades had improved dramatically with the support of the laptop:

> It does because his self-esteem has improved immensely because he knows he can do it he has the tools to do it and his grades have improved immensely he came home and said: “I got an A- in 2 assignments yesterday I got a C+ in my art but who cares about art he said, in English and his self-esteem has improved dramatically because of the laptop but it also builds character (25M: PFG, p. 11).

One student reported to his mother that he got an A-on an assignment, which had never happened for him before. Other comments suggested that by completing work on time, students’ grades increased. Additionally, more difficult academic tasks were
perceived by the students as more attainable with the support of the software. These findings as self-reported by the students and their parents suggested their academic outcomes may improve with continued support from the software, and other crucial factors such as explicit instruction and training in the use of the software.

This finding is similar to the literature discussed in Chapter 2. If asked to verbally speak about a topic, often students with learning disabilities have little difficulty with content generation. However, for a written task, the issues of spelling, grammar, punctuation, and the conventions of writing take precedence and the written product is generally shorter and poorly organized (Graham & Harris, 2003; Swanson et al. 2003). One of the key components of education for these students is explicit instruction in writing strategies coupled with the support of the technology. As documented in the literature, the “software is meant to support instruction, not replace it” (Lewis, 2005, p. 327).

**Reduced handwriting with increased keyboarding.**

Subsequently, students commented on their ability to get their work completed faster which could be related to a reduction of handwriting for assignments which the use of a laptop provided. However, as mentioned in the literature review, the increased requirement for keyboarding can add a new issue for students. One parent felt her child would benefit from more keyboard practice, facilitating her ability to write her own tests instead of requiring a scribe (27M: p. 19). The purpose of this study was not to prove word processing was better than handwriting, but rather to suggest the cognitive load for this population can be reduced by introducing keyboarding as a bypass strategy to the
laborious task of handwriting for some students (Peterson-Karlan et al., 2008). The other issue is legibility for students who have poor handwriting; one student mentioned, now his teacher can read what he writes.

**Benefit of increased organization.**

Finally, the organization offered by the computer as self-reported by the students and their families may facilitate quick retrieval of assignments and projects for students with learning disabilities. More than one student and their parents commented on how this side benefit of a computer has helped students to locate their work to hand in to their teachers. This in turn may contribute to their perception of leveling the playing field and catching up to the class. The quality and quantity of their assignments may not be equivalent to that of their peers, as observed from the students’ written reflections and personal experience with this population. Simply being afforded the opportunity to hand in their assignments on time is perceived by students as achieving the standard. However, their work may not be at the level of their peers or at grade level, but they are confident in the fact they were able to find their work and hand it in whereas before they had their laptops, their assignments were lost, forgotten, or misplaced:

I feel good, it is kind of, it is more like, not exactly like a person but it is like somebody is scribing although you have to do more work than just saying stuff. It’s makes things a lot easier [with] like you have assignments you have to get done it just helps you get organized (Student 22:6/1).

My desktop says John’s stuff and then I go into that file and then there is nothing in that file and there is social studies and spelling and other things and whatever
unit I am doing I open it up and I go to it and go to Grade 5 and open the file I want (Student 22. 6/3).

Researcher: So you are appreciating the way the computer can help you stay organized and not lose stuff. So before you had your computer what did your desk look like?

It’s just I wasn’t handing things in on time (Student 22. 6/4).

Researcher: Because you couldn’t find it?

Yes (Student 22: 6/5).

The provision of assistive technology facilitated multiple benefits academically including the students’ self-reported feelings of working at a level equal to their peers, the feelings created by this phenomenon contributed to increased feelings of self-efficacy which was another major theme throughout the parent and student responses. However, as discussed in the literature, often students’ self knowledge is inaccurate and requires support from their teachers to more precisely judge their abilities. This phenomenon was discussed in the section on miscalibration in the literature review.

**Increased self-efficacy.**

Both the students and their parents talked about the benefits of using assistive technology with the outcomes of increased self-efficacy, independence, and problem-solving abilities. In my opinion, one of the most important themes related to students’ continued academic success is the increase in self-efficacy.
As highlighted in the literature review, self-efficacy is predicated on the concept that as we build confidence in one skill area, the overflow into other areas will enhance lower competency skills. The most effective method to attaining self-efficacy is through achieving mastery of an activity because successes build a robust belief in one’s abilities (Bandura, 1986; Davidson, 2003). As individuals attempt new tasks and succeed, their fear of attempting another more difficult task in the future is reduced. Bandura (1986) believes this is due to the control they now feel they have over their environment. Difficulties with writing can have a negative impact on students’ self-esteem and motivation and may contribute to their avoidance of writing tasks, limit their work to the required length, and avoid using words they cannot spell (Forgrave, 2002). By elevating self-efficacy, these difficulties can be minimized.

*Achieving mastery of software programs.*

The determination of both the students and their parents to persevere in spite of set-backs was palatable from their responses. After the school board discontinued assistive technology training due to budget cut-backs last year, one mother was so determined for her son to complete his training in new software; that she hired a private tutor to support his mastery of the programs. Both mother and son recognized the powerful support the technology offered for success in spite of his dyslexia and the importance of explicit instruction in its use. Raskind and Higgins (1995) concluded that students with learning disabilities need extensive instruction and monitoring for specific software applications to be effective tools for learning.
**Visual Representation of Findings**

Subsequently, the value of achieving mastery lies in the impact of a students’ optimism when attempting challenging tasks (Klassen, 2002b). When one is an efficacious person, achievement and better learning result from the motivational effects of self-efficacy and may cause a student to expend greater effort to succeed (Davidson, 2003). Figure 2 represents a model of the potential benefits of increased use of assistive technology as reported by students and their parents from this study. The causes of the increase in reported levels of self-efficacy are beyond the scope of this study, as are the relationships between each reported benefit of assistive technology (AT) use.

![Figure 2. Potential benefits of assistive technology (AT) use](image)

*Figure 2. Potential benefits of increased assistive technology use as reported by participants (Schock, 2011)*
The opposite result may occur if a student has lower levels of self-efficacy. Their reduced feelings of self-confidence might lead to reduced attempts at problem-solving because they may feel they have less control over their environment, and may be reluctant to attempt more challenging tasks (Davidson, 2003). Subsequently, a student with lower self-efficacy could potentially have lower motivation to try new things and might abandon a difficult task altogether. The necessity for maximizing self-efficacy for students with learning disabilities is clear.

**Self-perceptions as Learners**

The students referred to themselves as “happy”, “creative”, “hard-working”, “likes learning”, and “feels good about learning” when asked how they would describe themselves as learners. Most of the descriptors used were positive. Other comments with a more negative outlook included: “not fast”, “needs help”, and “doesn’t remember as well as others” as phrases used to explain how students felt about learning. The literature on the self-concept of students with learning disabilities cautions researchers to “recognize the heterogeneity of the population and the multi-dimensionality of the self-concept in order to gain a fuller understanding” (Burden, 2008, p. 190). By focusing on specific areas of one’s self-concept, Burden suggests a more accurate picture can be obtained. Most meta-analyses on the self-perceptions of students with learning disabilities have found little difference between their non-academic self-concept and those of their normally attaining peers (Burden, 2008; Sideridis, 2009; Tabassam & Grainger, 2002). This may be due to a focus on global issues of self-concept rather than
specific aspects such as self-efficacy; learned helplessness and locus of control (Burden, 2008). In this study, students were asked how they felt about themselves as learners, therefore referring to their academic self-concept not their overall self-concept.

The student responses from this study had a refreshing air of authenticity and honesty as compared to labels provided in the literature which represented these students with negative connotations (Klassen, 2002a). The students’ descriptions of themselves as learners answered the first research question. However, as documented in studies by Burden (2005) and Frederickson and Jacobs (2001), one’s academic self-concept can increase, especially in students with an internal locus of control. The “internalisers”, who use ability, and effort should have had a greater likelihood of subsequent academic success than those who were “externalsers” or those who saw success or failure as outside of their control (as cited in Burden, 2008; Tabassam & Grainger, 2002). Figure 2 represents this concept graphically, demonstrating the importance of supporting students’ academic self-concept.

This increase in students’ self-efficacy was confirmed by students’ parents who concurred that their children had increased levels of self-confidence. Self-confidence is defined as: “one’s realistic confidence in one’s ability, judgement, powers (Collins, 2009). It is a synonym for self-esteem which is conceptualized as one’s judgement of their own self-worth whereas self-efficacy is the judgement of one’s capability (Davidson, 2003; Schunk & Pajares, 2009). As discussed earlier, the benefits of self-efficacy can increase motivation to attempt more challenging tasks. Another potential
explanation for students’ self-perceptions from the literature is the possible overestimation of their abilities (miscalibration) and is discussed in the next section.

**Inaccurate student estimations of ability.**

Students with learning disabilities may inaccurately estimate their self-efficacy from faulty task analysis or from a lack of self-knowledge; both are problems shown to be prevalent with learned disabled students in general (Klassen, 2002a). Therefore, caution must be used when evaluating their self-reported increased achievement from participants’ responses from this study.

The students’ positive statements about their learning were opposite to portrayals of students with learning disabilities in the literature. From reading articles which described these students as those “suffering from learning disabilities” (Burden, 2008, p. 188) or those with “deficits” (Kinross, 2010, para 16), I was pleased to hear the positive descriptors from the students themselves suggesting a greater level of self-knowledge was present. Their responses reflect their experiences which cannot be disputed as their voices are authentically represented in the discussion from the focus group. Another common theme among the students’ and parents’ responses was the inconsistent approach to varied aspects of assistive technology use at school and at home.

**Ad hoc Approach**

One of the most disheartening themes to emerge from both students’ and parents’ responses was the inconsistent approach to acquiring equipment, training for students, parents and teachers, and the perceived lack of teacher knowledge of special education populations and benefits of assistive technology for these students. Barriers to use
included: access to psycho-educational assessments; permission to take equipment home; equipment malfunctions, and the requirement of physical space to effectively use the laptop in class.

**Access to psycho-educational assessments.**

Half of the parents from the focus group acquired a private psycho-educational assessment for their children as they did not want to wait for an assessment funded by the school board. The waiting list for assessments was deemed too long by parents who were desperate for assistance for their children. In some Ontario communities, the wait list for assessments is as high as 700 children (Kurek, 2011, para 3). In the Halton District School Board, over 260 assessments will be paid for this year which is in addition to the 250 usually performed in a school year. The increase is due to additional funding for a gifted special education program (Kurek, 2011, para 6). For some families the cost of a private assessment would be prohibitive and therefore, unfair for less fortunate families. By having their assessments done privately, the families in this study were able to access special education services for their children much faster than if they had waited for their child’s name to be first on the waiting list. From the school’s point of view, continued cuts to funding for special education over the past decade may have resulted in difficult decisions for administrators in allocating dwindling funds.

Under the current medical model, without a diagnosis from a psycho-educational assessment, students are not always provided instruction to meet their specific learning requirements. Teachers and school administrators identify students using the Individual Education Plan (IEP); however, it is the assessment by a registered psychologist which
confirms a diagnosis and opens the door to equipment funding, referrals to other specialists, and mandates accommodations be made for the student:

A psycho-educational assessment can be used to identify an individual’s profile of strengths and needs in order to help them achieve their potential while realizing their goals. Such an evaluation also provides substantially more information than more traditional group testing and can tell about a person’s IQ or intellectual ability, attention, and social-emotional functioning - things that are not generally assessed by schools or employers (Glatt, 2011, p. 1).

One mother obtained a private assessment twice, once for her son with dyslexia and once for her daughter with a physical disability. One parent indicated that her insurance company covered 80% of the cost of the assessment. She believed that many parents were not aware of this and asked that school officials share this information publically (27M: personal communication). These findings concur with Dyson (2010), whose parent participants related similar struggles in obtaining an initial assessment for their children with a learning disability, as well as consistent diagnoses.

The benefits of having an assessment completed for a child who may be struggling, far outweighed the cost of waiting, or not having an assessment performed due to financial constraints according to the literature. The necessity of an early diagnosis is imperative for students with learning disabilities. The time of a child’s diagnosis and how it is explained can be crucial factors in students’ acceptance of their disability (Burden, 2008; Ingesson, 2007; McNulty, 2003; Palombo, 2001). Researchers have found
it is “during their early and middle school years children later identified as dyslexic are likely to call into question their intellectual abilities and to lose motivation as a result of their unexplained difficulties” (Burden, 2008, p. 192). Acquiring an early diagnosis is of utmost importance for these children and their families to support their ongoing success and for educators to tailor instructional strategies to the child’s learning style early in their education. However, once again, the current model of service provision relies on the labeling of students in order to facilitate the process contraindicating the social model of disability. With the increasing numbers of students requiring assessments, school boards are under increased financial restraint and therefore, the responsibility for increased funding to pay for assessments is the Ontario Ministry of Education’s.

Access to equipment.

The inconsistencies between school boards in terms of their policies regarding equipment going home with students caused stress for some families in the study. This problem was reported by one parent with a child in the public school board. This may be a preventable barrier for parents as seen in this research by the ease with which the problem was dealt with by one of the Catholic school boards some students attended. Both school boards required parents to sign a waiver, guaranteeing their commitment to take care of the equipment and their promise to pay for any damages to the equipment that may occur. A solution for all school boards might be to allow the equipment to travel with any student to facilitate optimal learning in all environments. As one mother said, “it feels as though they are being discriminated against” (PFG, p. 11). However, one reason offered for a school board’s policy of restricting equipment from going home was
the abuse and damage to the equipment (personal communication from an Occupational Therapist contracted by one school board). Caution must be taken when interpreting the results from the parents’ reports as the school administrators in these cases were not interviewed to provide further confirmation of the facts in this situation.

Additional barriers.

Other barriers were mentioned by families including the sharing of equipment, students who were not permitted to use their laptops to write tests, and lack of physical space to use the equipment effectively in class. The situation of one student, who had to work without his laptop because another student was using it for training, was hard for the parent, to understand. Perhaps one laptop could be purchased as a neutral laptop to be used by students in this case, as well to be used for testing or when laptops are sent away for maintenance. In this case, students who require this device for their learning would not have to go without.

The problem of a lack of physical space is another barrier that would seem to have a simple solution. From the Special Education Funding Guidelines: Specialized Equipment Amount (SEA) document published by the Ontario Ministry of Education, the provision of space for specialized equipment is mandatory (2010, p. 6). Over and over again as I travelled to various schools, I heard teachers refer to the lack of space in classrooms and portables for specialized equipment.

A systematic approach to ongoing maintenance of the laptops might prevent these barriers if carried out consistently. Perhaps one administrator could be assigned to be the designated individual responsible for the tracking of maintenance problems,
planning ahead for testing and training sessions so students may always have the use of a laptop when necessary.

**Access to equipment for homework.**

Overall, students and parents identified the benefits of having laptops with assistive technology programs available for use with homework. Parents commented on their child’s independence in completing assignments due to the support the software programs provided for homework. As one parent said:

I am not sure if that is just our school, but there is loads of loads of homework. They have to be organized; the teacher literally dumps their desks and makes them get organized. It is totally different as far as his grades the laptop has immensely improved everything (PFG, 25M: p. 11).

Another parent suggested the homework process was less difficult for her daughter with the support of the laptop’s software, as well as the added benefit of increased independence, “She definitely is more willing to participate in homework as it is much less arduous for her with the aid of the computer. She definitely likes being more independent in completing the work” (27M: p. 17). Additionally, this parent referred to her daughter’s willingness to participate in homework tasks with the support of the laptop. This was also mentioned by other parents. The task of completing homework was more independent than previously was the case when their children relied solely on assistance from their parents.
Increased independence and more positive attitudes towards homework may lead to increased confidence to attempt homework tasks otherwise thought to be impossible by the student. And this is the essence of self-efficacy. The value of assistive technology for school and home is evident in the responses from parents and their children in this study. Without the support of the laptop at home, conflicts over homework completion between parent and child continued to take place:

And say you know what, I want the laptop home with him because every night I am fighting with him and every night he is going backwards and I am throwing my hands up in frustration I am a single mom I don’t have another partner to say I need you to deal with this… (PFG, 28M: p.14).

This single mom was encouraged by another parent whose son had been using his laptop for three years:

Just so you know it will get easier, because Cody was exactly like that and with that tool, with that computer, that is his voice and by Grade 7, I can guarantee you it will get better but you have to advocate for that computer that is a given (PFG, 25M: p. 14).

The situation is critical for this single mom and her son as she felt his success being hindered without the programs available to him at home. The option is available to parents to purchase any of the software for use at home; however, the cost may be prohibitive for this family in their current financial situation. A systematic approach to
the present ad hoc situation of inconsistent policy between school boards will be discussed further in the recommendations section.

**Training in assistive technology.**

Training issues included the lack of ongoing training for students due to budget cut-backs, lack of communication from the school for parents regarding training opportunities, and training for teachers in the use of assistive technology. In evaluating over fifteen years of research on the use of assistive technology, MacArthur et al. (2001) reported on several studies which suggested the mere exposure to assistive technology is not sufficient to noticeably improve students’ literacy skills or competence. Additionally, careful attention needs to be paid when matching appropriate technology to the learner to ensure desired outcomes (Raskind & Higgins, 1995).

Parent responses documented their lack of consistent training opportunities in the software. Since parents are often assigned the task of assisting their children with homework, their knowledge and understanding of the technology is also imperative. Parents of students with disabilities are already under stress from many factors, as discussed earlier, therefore, it is inherent on school boards to offer training to parents so they can support their children as successfully as possible. Edyburn (2000) identified parents as the strongest advocates for their children and are often the reason their children are given assistive technology. This was definitely the case with the parents from this study who described themselves vividly as mentioned in Chapter 4. If training could be offered in the evenings or weekends, perhaps more parents could attend, given their work schedules often preventing attendance at daytime sessions. Without explicit teaching of
reading and writing skills, along with prolonged instruction and practice with technology, its benefit to the student cannot be realized.

**Perceived lack of teacher knowledge.**

More than one student and parent commented on their teachers’ perceived lack of knowledge of the assistive technology programs, understanding of the benefits to students with learning disabilities and technological expertise to trouble-shoot problems with the equipment. Possible explanations for the reported discrepancy in knowledge among teachers may be the elective nature of special education courses in Ontario teacher education programs, the wide range of choice for additional qualification courses for teachers, and the increase in the complexity of today’s classrooms with the added learning curve to learn and implement new technologies in their classrooms.

Currently in Ontario, special education courses are not mandatory in teacher education programs across the province. A general introduction to all exceptionalities is often offered to all teacher candidates; however, specialized courses on individual disabilities may only be chosen as an elective depending on the course selection at the different Faculties of Education. In 2006, the Learning Disabilities Association of Ontario (LDAO) submitted a response to the Ontario College of Teachers (OCT) to provide input to the OCT’s annual report, *Preparing Teachers for Tomorrow*. This response strongly urged the OCT to mandate educational psychology courses with content about the child developmental process with specifics about children with exceptionalities (LDAO, 2006, para 1). Parents and advocates for students with
disabilities have been lobbying government to make these courses mandatory for all teachers graduating from teacher’s education programs.

With the increase in diagnoses of exceptional students, teachers need the foundational understanding of the myriad of different disabilities represented in today’s classroom. At present, a teacher’s choice of a special education course during their teacher education program may be solely based on personal interest. After completing a Bachelor of Education program and becoming a member of the OCT, many teachers can elect to take additional qualification (AQ) courses sponsored by OCT. Whether to increase their knowledge, their employability, or their career progression, AQ courses also differ in content, quality, and quantity across providers.

Not only are teachers often unprepared for the varied exceptionalities in their classrooms, few courses on assistive technology are offered. Bryant and Bryant (1998) believed assistive technology should be incorporated into teacher education programs and should include pre-service experiences in schools that have elaborate assistive technology resources with extensive teacher expertise.

Teachers need support to obtain current knowledge in the growing field of assistive technology, but also require ongoing upgrading of these skills. “Expert support should be available not only during the acquisition of assistive technology, but also during implementation and training of staff and students, and for follow-up evaluation of students’ progress” (Forgrave, 2002, p. 125). Teachers need to be trained to integrate effective instruction with assistive technology to maximize student success with a
systematic approach for the acquisition of new skills and not be expected to learn these skills on their own time. Edyburn (2000) concurred with the premise that recent advances in the field of technology are not being employed as widely in schools as they should be.

**Teacher stressors in Ontario classrooms.**

Although not the focus of this study, the situation for Ontario teachers bears investigation related to the demands currently placed on classroom teachers. During 2004, the attrition rate for full-time teachers was 30% during their first five years of teaching with a 10% turn-over rate annually for full-time teachers (Brackenreed, 2008). Canadian teachers cited the lack of support to adjust to the demands of the classroom as the most common reason for leaving the profession. Brackenreed (2008) conducted a study of 269 teachers from northern Ontario school boards on perceived levels of teacher stress and coping skills. Among the desirable supports identified in the study, teachers wished for adequate time for planning, support personnel, manageable class sizes and composition, classroom resources, sufficient training, and mentorship and leadership from school administration. Although committed to the benefits of the inclusive classroom, teachers felt ill-prepared from pre-service and in-service teacher education to meet the demands of the wide range of student need represented in their classrooms:

In the last twenty years, the severity and range of special needs has increased dramatically. Personally, I feel that most of these children were very manageable in the regular classroom if support in the form of an EA was provided. However, from 1995 to the present, the Ontario provincial government has taken billions of
dollars out of education. The result has been that many special needs students are in classrooms and there is inadequate support available to them. The impact of this situation on classroom teachers is profoundly stressful. Teachers are coping with a completely intolerable situation (Brackenreed, 2008, p. 141).

Potential solutions to address this situation will be discussed in the recommendations section of this chapter; however, the responsibility for additional support and education for teachers rests on the shoulders of the Ontario Ministry of Education.

**Surprising Findings**

One of the findings that surprised me, the positive feelings of students regarding their learning challenges, was of direct relevance to the purposes of this study. Perhaps as the literature suggests, these students are still young enough that they are unaware of their challenges in comparison to others in their class. However, this seems interesting, given the students’ own comparisons to those with fewer learning challenges.

It means to me that I just learn slower than others and because I have a learning disability I just, I don’t read as fast or write as fast as others so it is not really different from anyone else but I just have a learning disability and I just can’t read and write as fast (Student 27:3/1).

This young student was diagnosed as having a non-verbal learning disability and she was in Grade 5. She came across as a happy, fun-loving girl who said she loved having a laptop since it made her feel special and her friends are jealous of her.
Another student compared having a learning disability to riding a bike, the support offered by the computer helped him to get along in school. Another student did not like being excluded from games but was the only one to mention being left out due to his learning challenges. His mother expressed concern that the troubleshooting he is required to do with his laptop takes away from the positive support it can provide. His teacher’s lack of understanding of how to help him has also contributed to his negative feelings at school. Through the workshop and student focus group, he met another boy who attended the same school and they enjoyed spending some time together.

I expected to hear about more students facing exclusion based on their label and the stigma attached to the use of the laptop in class as discovered in the literature (Kinross, 2009). This was not reported by the eight students in the study. Needless to say, the presence of the laptop did not seem to bother these students, at least not to the level they were able to identify verbally through the single focus group interview session. Their positive responses could be attributed to the subject effect called the Hawthorne effect. This phenomenon can occur when research subjects may increase their positive behaviour simply because they are aware that they are receiving special treatment (McMillan & Schumacher, 2010). Or, more likely, the students’ positive responses may be attributed to the modeling of the advocacy demonstrated by their parents which is documented throughout the parent focus group interview transcript. Although this phenomenon was not directly investigated in this study, the data suggests this as a plausible explanation.
One student commented on how he felt privileged to attend the workshop since his ongoing computer training through the school board had been discontinued. His responses may have been more positive due to his gratitude for participation in the workshop. However, the data shows these students had parents who demonstrated strong advocacy for their children and their understanding of the students’ own learning disability was deeper than just receiving the support of the laptop. Students’ responses demonstrate what the parents articulated in the parent focus group about the framing of a learning disability as a “gift” or a means to attempt more challenging tasks in higher education (PFG, p. 27).

The other surprising finding was the students’ approach to being given a new assignment. Most of their responses were positive and subject-dependent. From the literature, the approach to school is positioned as difficult and hard for students with disabilities (MacArthur et al., 2001; Swanson et al, 2003). I did not expect to hear they looked forward to new assignments. Again, the positive outcome of increased self-efficacy could account for this finding, or their growing sense of self as younger elementary students. The one student from Grade 8 had Asberger’s syndrome and had very minimal answers to the focus group questions. He referred to himself as hard-working and when asked how he felt about a new assignment, he suggested the use of his laptop alleviated any stress that might be generated.

Finally, one outcome some of the students referred to that was unusual was the reduction in the amount of teasing they received from other classmates. Contrary to what
I expected, having the support of the laptop allowed them to participate more in class and helped to advance their knowledge:

Before I got my laptop it was kind of hard cuz people made fun of me and I was falling behind a lot because I was extremely slow but since I got my laptop I have kept on top of things and not been falling behind (Student 22:2/3).

This student mentioned he now knows more words and is able to contribute more in class. He is unaware of any additional teasing that may be present due to his use of a laptop or due to his label of being a student with dyslexia.

**Advocacy of Parents and Students**

One of the gratifying themes to emerge from all student focus group responses was the self-advocacy developing in the students. Having the students share their answers with each other also contributed to their own self-advocacy as they witnessed others with similar disabilities in the workshop persevering with their learning challenges. As one student said of another, “I have something to say, I know what he is good at (points at John) wording things, very good at that” (Student 23:3/3). This student gave the other student a lovely compliment which was totally spontaneous.

Participants with more negative references to their learning identities were supported by the positive example of the others in the student focus group. The parents’ argument was that their strong advocacy on behalf of their children shouldn’t have to take place. They felt that equitable treatment for all students should guarantee their children access to the curriculum without a fight on their part. However, from their self-reported
experiences, advocacy and vigilance seemed to be required to maintain services and ensure continued progress in their children’s education.

**Written Reflections**

The students’ writing samples did offer valuable insight into how these students used their software for a specific writing task. Some of the students seemed pleased to be able to show what they knew already about the word prediction program, WordQ. Those that had used it for over a year, jumped in to the writing assignment with their word prediction function turned on.

During the workshop, students were introduced to a simple three-step visual reminder. The reminder was laminated on a 3.5 by 5 inch index card and given to each student as a tool to remember to turn on their word predictor, to listen to the usage examples, and to edit their sentences by using the “read back” function. Given the short period of time students had for the writing task, overall, the reflections demonstrated their ease of use with the software. As discussed earlier, more explicit instruction over a longer period of time is recommended in the literature. A longer time is preferable to impart a stronger knowledge base regarding the benefit and functions of word prediction software for these students. As mentioned in the findings chapter, a few students did not take the time to use the “read back” function to edit their work, ignoring a readily available tool that could enhance the quality of their writing. This may be explained by a number of factors. When the students had finished their writing sample they were invited to go back
to the games room to have a snack and a break before the focus group began. I noticed some of the boys rushing to complete their writing so they could join the others.

Another factor may have been a reduction in motivation to write since the setting was not a school setting; it took place on a weekend and was being assigned by a stranger. When students have a purpose for writing which they value, they are more likely to put forward a sustained effort (Williams, 2002).

From their writing samples it was still clearly evident that these students were struggling writers and suggested that continued use of technology to support the writing process is necessary. Although the emphasis of this study was on finding out about their self-perceptions as learners, the use of the assistive technology writing programs was a secondary purpose.

Research Design Advantages

As mentioned in the literature review, focus groups have been identified as one of the few research tools available to both obtain data from children and are best suited to research dealing with sensitive issues with vulnerable populations (Bickman & Rog, 1998; Dickson-Smith et al., 2008; Eder & Fingerson, 2001; Morgan, 1996). By providing the researcher with direct access to the language and concepts of the participants, focus groups facilitate a means of observing the structure of a group’s interactions and a window into their experiences. As students with learning disabilities have been labeled as such, the focus group was created to be a safe place to share their experiences. The focus
group did in fact encourage children to express their views and experiences which created powerful data sets of personal testimonies (Eder & Fingerson, 2008; Smithson, 2000).

During the parent focus group, the findings were similar to Dyson (2010) who also found in her study with parent focus groups, “the study elicited a range of provocative issues regarding the effects that a child with LD has on the family’s life as validated by the parents” (p. 53). The students and parents had “space for discussion and reflection and time to explore issues in a more in-depth way in a focus group setting than might be the case in more routine dialogue” (Smithson, 2008, p. 364). My note-taker and I felt privileged to hear first-hand how the students felt about themselves as learners. By creating a small group of children, the numbers outweighed that of the moderator and minimized any power imbalance (Conroy & Harcourt, 2010; Eder & Fingerson, 2008).

Additionally, this research study invited children to participate in research “with” them as participants, rather than performing research “on” them as children with learning disabilities (Conroy & Harcourt, 2010). Parents were encouraged to ask their children if they would like to participate in the study encouraging their cooperation and assent to the research beforehand. By including the parents in their own focus group, responses were generated from the parents’ perspectives providing further understanding of their family life and experiences with the school in relation to their children’s learning disability. “In groups, parents realize they are not alone, gain knowledge about the disabilities, and learn new coping strategies” (Schechtman & Gilat, 2006, p. 276). Lessons learned from the
interpretation of participant responses have led to a number of potential recommendations for educators and school administrators.

**Recommendations**

Throughout the data analysis and interpretation, four distinct recommendations emerged for consideration. These recommendations are in response to the existing model of service provision (medical model) that is used in the school system that still uses such terms as “special education”. These recommendations are: increased opportunities for students to practice with software applications; creation of a systematic process for school boards to manage equipment provision, use, and training; the introduction of mandatory special education courses for teacher preparation programs; and finally, better systems for communicating and supporting parents of students with learning disabilities.

**Practice to increase automaticity.**

As previously mentioned throughout the discussion section, students need practice to become proficient in any skill taught at school. Specifically, students with learning disabilities need increased practice in the technologies that support their learning. A task analysis approach to learning, such as Case’s (1978), as mentioned in the literature review, is a teaching method well suited to individual differences of students in today’s classroom.

Miller’s (1956) theory of chunking has relevance today for young writers. He suggests that it is in the early stages of skill acquisition that a child normally has to monitor several external stimuli at a time and coordinate a number of discrete responses. By over learning, the responses become integrated into one unit and the skill is then
simplified and requires less attention for execution. This creation of automaticity allows for space within the coordination capacity to be used for integrating the newly consolidated basic skills with other skills. With any type of new learning, whether it is mastering a new computer program or a new piece of music, the more practice we have with the skill, the more the task becomes automatic. Automaticity reduces the cognitive load placed on the working memory stores in the brain. Keyboarding is one such skill requiring mastery to increase automaticity and one necessary for any student using a computer. By increasing teachers’ awareness of the necessity of keyboard practice, all students could benefit from improved automaticity. However, as technology advances, the use of iPads with touch screens may preclude even the necessity for keyboarding skills in years to come.

**Systematic policy and procedures for equipment and training.**

The ad hoc approach to equipment acquisition, maintenance, and training is a situation that may have a reasonable solution if school boards adopt a more systematic process. In the area of special education, the Ontario Ministry of Education’s *Guidelines for Identification Placement and Review Committee’s* (IPRC), document details the process that needs to take place for students to receive services. The process is primarily in the hands of administrators specifically, the principal, once parents make contact requesting an IPRC. Subsequently, the principal is responsible to oversee all aspects of the process, contact parents, arrange meetings, and follow through on recommendations (Ontario Ministry of Education, IPRC, para. 1).
After an IPRC takes place and a student is identified as exceptional, an Individual Education Plan (IEP) is written. “An IEP identifies the student's specific learning expectations and outlines how the school will address these expectations through appropriate accommodations, program modifications and/or alternative programs as well as specific instructional and assessment strategies” (Ontario Ministry of Education, IEP, para. 2). The IEP identifies any accommodations a student may require in order to succeed at school. These accommodations can include assistive technology, support from a special education teacher, and any number of learning supports to meet the student’s IEP learning objectives. The principal is then expected to assign one teacher to oversee the development, coordination, and monitoring of the IEP (Ontario Ministry of Education, IEP Resource Guide, 2004). Preferably, parents are to be included in the process and informed of meetings and IEP reviews.

Although this process does appear be systematic, many parents in this study commented on flaws in the system which negatively affected their children. From personal observations, schools often share principals or vice-principals who are delegated to oversee the special education needs of the school. Often this is as a result of reduced funding for administrator’s and limitations externally imposed on individual schools. This approach may be the cause of some of the issues mentioned by parents, primarily, the inconsistent approach to all aspects of their children’s provision of assistive technology. If one individual were responsible and accountable for the equipment, perhaps parents and students would have a better experience. Current practice assigns one
teacher to take an inventory of equipment; however, if this person was consistently responsible for all aspects of the equipment, gaps in the system might be prevented from occurring.

The important role of the principal with regard to setting the tone for a school’s culture and its inclusive practices is highlighted by Stanovich and Jordan (1998). Their Canadian study of 33 elementary teachers in 12 schools demonstrated the “strongest predictor of effective teaching was the subjective school norm operationalized by the principal’s attitudes and beliefs about heterogeneous classrooms” (p. 221). From teacher and principal interviews and questionnaires, this study confirmed the importance of the principal’s role in shaping the inclusive nature of a school and the effectiveness of teaching methods (Stanovich & Jordan, 1998). By directing staff development to interventionist attitudes (those who view students’ behaviours as ameliorated by interventions as opposed to residing within the individual student), teacher effectiveness can be enhanced (Stanovich & Jordan, 1998).

Given the increasing diversity within classrooms, this approach is of greater importance today. The interventionist attitude is equivalent to the foundational principle of the social model of disability mentioned in Chapter 1, a key underlying assumption of this study. This is one recommendation aimed at improving the ad hoc approach to special education presently used in the schools and experienced by the participants that emerged from both the students and parent focus groups.
**Mandatory special education courses.**

Although a social model of disability would be more inclusive, since the existing situation does not embrace this model, the terminology used in these recommendations is what is currently used in the field of education. As discussed earlier, special education courses are not mandatory at all Ontario teacher education programs. Some programs offer elective courses on specific exceptionalities based on individual interest, but they are not mandatory. Most programs include a general introduction to exceptionalities during the first semester. Following teacher certification, the responsibility for acquiring specific knowledge of various disabilities is left up to the individual teacher during an additional qualification (AQ) course. In 2007/08 more than 192,000 students were identified by an IPRC as exceptional pupils and an additional 96,600 students who were not formally identified but were provided with special education programs and services (Ontario Ministry of Education, 2010, para 3). Given these large numbers, courses targeting the learning needs of all students with exceptionalities are crucial.

Many teachers, once receiving their certification, choose the AQ special education courses to increase their appeal to potential employers, as well as the desire to improve their own teaching practice. From personal experience, I have known teachers in their tenth year who have not taken any special education courses and are at a loss to support the diversity of students in their classrooms. This inconsistency could be solved by the Ontario College of Teachers (OCT), the agent responsible for accrediting Faculties of Education, or the Ministry of Education, responsible for funding and policy-making for education in Ontario. Additionally, by increasing the opportunity for teachers to take
courses about assistive technology, the benefits of these supports could be demonstrated. Courses would also reduce unfamiliarity for teachers who will encounter students with a variety of disabilities in their teaching career.

_Special Education Transformation_ (2006), commissioned by the Ontario Ministry of Education, recommends the completion of a mandatory half course on special education before issuing an Ontario teaching certificate, and funding for professional development related to special education and the development of resources related to special education. This report’s recommendations include: “improved parent collaborations and the creation of a multi-ministry framework to support an integrated service delivery for students with special needs” (Ontario Ministry of Education, 2006, p. 145). If teachers are provided the necessary tools to support special needs students, the situation in Ontario might become less stressful for all concerned. A shared responsibility for changes to teacher preparation needs to be adopted:

Classroom teachers experience a great deal of stress in dealing with students with special education needs. However, teachers are dedicated to helping all students learn and they will continue to meet these challenges provided they are given the much needed support (Brackenreed, 2008, p. 144).

**Improved communication with parents.**

One of the most difficult aspects of the parent focus group was hearing how frustrated some parents were with the situation at their local school. When asked if they had heard of any additional supports in the community for parents with children with learning disabilities, they only mentioned the local Learning Disabilities Association.
This agency has struggled to remain viable with a 60% reduction in government funding over the past two years (Learning Disabilities Association, 2010, para. 1).

By creating a forum for parents to share information, similar to the model mentioned by Turnbull and Turnbull (2001) in the literature review, an ongoing supportive community could be created. Perhaps an online community could be started by the local Learning Disabilities Association with a parent advisory group to oversee its functioning. This virtual community would have the benefit of being available at home via the Internet and offer parents anonymity if they preferred. Perhaps the school boards could collaborate to save on expenses and offer joint workshops to facilitate a larger number of parents’ training needs at one time. School boards could even share resources and offer joint sessions to parents, further reducing barriers to training for parents.

Another venue for parents to gain important information was suggested by one mother who shared how helpful it was for her to become involved with the parent council at her son’s school. This enabled her to keep her finger on the pulse of activities affecting her son and provided an outlet for her advocacy. Other parents suggested school boards could make the documents related to special education funding and provision available online or appoint one individual to be responsible to communicate this information to parents in a format they could understand, rather than give the impression that this information was privileged or secret (PFG, p. 23). Providing families with information regarding the length of time for assessments, or the necessary information with which to secure a private assessment are all pieces missing from the puzzle. Homework
assignments housed through an online portal such as Moodle could offer parents an accessible environment to help their children at home which was a common concern among all parents. Moodle is a Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). It is a free web application that educators can use to create effective online learning sites (Moodle Trust, 2011, para. 1).

Increasing opportunities for keyboard practice and training in new software for students will enhance the automaticity required to become a skilled computer user. Coupled with a systematic and consistent process by which school boards manage individual education plan outcomes will create viable solutions for improvement to the issues suggested by the participants. Future changes to teacher education and preparation could include a mandatory course about inclusive education to address the inconsistency in teachers’ education. Finally, creating additional supports for families to help them to navigate through this difficult diagnosis, would ease their frustration and offer immediate support to new parents from those with experience.

**Implications for Future Research**

Implications for future research include: the necessity for researchers to continue to involve children as active participants in research; replicating this study with a larger sample size; adding teacher interviews and classroom observation; creating a workshop for teachers and parents on specific aspects of software applications, and providing
ongoing resources to teachers on the integration of assistive technology in classroom curriculum.

**Children as research participants.**

Inviting students with learning disabilities to participate as active members of a research project was indeed a gratifying experience and one that, in my opinion, should be replicated in future research. The process of including children in research studies who live with disability invites a more accurate representation of their experiences as opposed to asking adults how the child feels and aligns with the social model of disability.

We believe that while the intent of many researchers may be to work in partnership *with* young children, as is reflected in the spirit of these theoretical frameworks, some practice continues to reflect a mind set of researching *on* young children. (Conroy & Harcourt, 2010, p. 158).

The literature reviewed for this study located few research studies including children as knowledge-makers and yet the power of their authentic voice being represented through the data is evident from this study. Their representation was a powerful reminder to adults that students do have a lot to say when it comes to their education; they simply want to be asked.

**Larger study.**

To infuse additional validity and rigor to the results of this study, conducting more focus groups with four or five students would be a future direction. The students in this study were compliant and enjoyed sharing their stories, as well as meeting other students who used laptops and shared similar learning challenges. If the study were to be
carried out in a school setting, other students may have been able to attend without the added complication of extra-curricular activities taking place on a weekend. Analyzing a larger number of responses would allow the researcher to discern patterns and recurring themes more accurately. The research study would need to incorporate a longer timeline to gain ethics approval from the school boards and allow for additional transcription time.

**Teacher and administrator focus groups.**

If time had permitted, the input from students’ teachers and document analysis of students’ school records would have provided additional data points to confirm or negate findings from this study. Interviews with administrators would have informed the issues arising from the parent focus group. I would have appreciated speaking to the teachers to hear their perspective of having a student in their class using assistive technology. Future studies could combine student, parent, and teacher focus groups to gather additional data from all sources. The transcription time of the focus group sessions would be substantial and more appropriate for a PhD thesis rather than a Master’s thesis. Additionally, classroom observation sessions would provide additional qualitative data.

**Workshop for teachers and parents.**

Another potential study could be the creation of an assistive technology workshop for teachers and parents. The parents from this study asked for a workshop which they could attend to give them an overview of the programs, their purpose, some tips for use at home, and some practical hands-on practice with the variety of assistive technology programs suggested for their children. While working as an assistive technology
instructor, teachers requested additional training and support in the use of assistive technology programs.

**Handbook for teachers.**

Finally, from my personal experience, teachers told me they would like practical tips on ways to integrate assistive technology into their daily classroom routines. By providing teachers with a variety of strategies and ideas for use, the likelihood of the programs being used by teachers might increase. A resource handbook could be created for teachers arranged by grade and curriculum strand. With the speed at which the technology is changing, attention would need to be focused on providing teachers with the most recent information as possible. A follow-up study could be conducted to observe the viability of the strategies with suggestions for improvement to the handbook.

I was unable to find any webinars or tutorials for teachers about assistive technologies on the Ontario Ministry of Education website. Under *Related Information*, there is a link to the Special Needs Opportunity Window (SNOW) where parents, educators, and therapists can find fee-based workshops about various assistive technologies (SNOW, Adaptive Technology, 2011, para. 1). However, these were not easy to locate and required a concentrated effort to find information. The Ontario College of Teachers website lists Additional Qualification (AQ) courses on special education in which a wide range of information is covered with little specific to assistive technologies. If a teacher were to take the *Special Education Specialist* course, evaluation of applicable technologies is required, however; the nature of these technologies is not readily available (Ontario College of Teachers, 2003, p. 5). The University of Ontario Institute of
Technology’s (UOIT) teacher education program includes courses on *Individual Needs & Diversity* and their AQ courses offer a course on *Integration & Computer Technology in the Classroom* with examples of assistive technology and evaluation practices when using information and communication technology with students (UOIT, Faculty of Education, Course offerings, 2011). An online webinar course could be created to meet this expressed need of teachers currently working with exceptional students.

**Conclusion**

Throughout the planning, data collection, and analysis of this study I attempted to keep the following in mind, “Two cardinal issues emerge when planning qualitative research with children, one of feasibility and the other of trustworthiness, the qualitative equivalent of objectivity, reliability, validity and utility” (Ronen, Rosenbaum, Law, & Streiner, 2001, p. 76). By gaining the students’ and parents’ trust, the study’s focus groups produced powerful testimonies of the experiences of the participants and allowed the reader to see the world from their perspective. To ensure trustworthiness of this child-centered study, as cautioned by Ronen et al. (2001), I tried to maintain objectivity, consistency, and credibility with the hopes that the results from the study could be transferable to a future study with additional families.

Having listened carefully to the participant responses, I attempted to remain unbiased in my interpretation of the data, looking for recurring themes between the parent and student focus groups. However, as a passionate advocate for students with learning disabilities, and as a woman and mother of children with disabilities, I realize these roles
positioned me as a researcher with a strong concern for the participants. By connecting the findings to a thorough review of the literature, the conclusions may be interpreted more accurately.

Another valuable addition to this study was the note-taker’s personal experience. As a student with a learning disability, her presence and contributions to the focus groups added a layer of richness that could not have been obtained without her involvement. She presented the students and their parents with a living role model as a student pursuing her dream of higher education, in spite of many roadblocks along her way.

The analogy of assistive technology as a curb cut for writing was intentional. Curb cuts were created for one population to encourage accessibility and their use has extended to a variety of consumers. Likewise, assistive technologies have been created for a specific student population but their benefit extends to a broader audience. Word prediction software can bypass the time consuming processes of proper spelling and word choice for struggling writers. Students who are learning English as a second language, students with attention difficulties, and students with learning disabilities can succeed with the support of this flexible technology.

Within a universal design for learning framework, “curriculum design supports learning differences from the outset, as opposed to retrofitting pre-established curriculum” (Mariano, 2006, p. 39). By adopting universal design as a foundation, teachers can be equipped with the skills to help differentiate their instruction through carefully articulated goals and individualized materials, methods and assessments (Rose
The adoption of assistive technology within the classroom will provide students access to otherwise inaccessible learning materials. The playing field is leveled, as suggested by the participant responses and the self-efficacy of students with learning disabilities reportedly increased to position them to attempt more difficult learning tasks.

The role of the parents of students with any disability needs to be acknowledged as valuable and worthy of inclusion in program planning by school officials. When parents are given a chance to help, their contributions can assist the school’s resource staff in creating an effective team. Often as a child’s strongest advocate, parents can come alongside the school’s resource staff to work together to support the student. By working together, the focus becomes the well-being of the student rather than individual agendas. Perhaps unintentionally, school officials in their busy schedules may forget to notify parents, or communication is halted and parents feel alienated and alone.

If policies and processes are transparent and clearly explained, the power of the parents’ advocacy can be channeled into better support for the student. Individual teachers need the support of administrators to support their efforts to include students with learning disabilities in classroom routines. Proper teacher preparation and ongoing updating of skills and support are required for teachers and students to be successful:

Canadian educators appear to recognize the benefits of the inclusive approach, but cite clearly stated concerns: the need for appropriate pre-service and in-service teacher preparation, logistical and personal support from administrators, and an appropriate and reasonable workload (Brackenreed, 2008, p. 133).
Attention by government officials to the ad hoc approach may bring about the necessary changes for families of students with learning disabilities. Further research into the benefits of assistive technology will enhance the situation for this population. Throughout the analysis of the focus group data, writing samples, and literature reviews, the answers to the research questions from this study have been discovered. Students shared their self-perceptions of themselves as learners, parents shared how the assistive technology is used for homework, and students shared how they felt about using their laptops in class. Witnessing how powerfully these students have been affected by the benefits of using their technology, both my note-taker and I were moved beyond words as we listened to each student share their journey of living with a learning disability.

Qualitative studies add rich dimension to the story behind the numbers and bring a holistic perspective to research in education. As researchers we need to take the time to listen to those who live daily with the situation being studied. In this study, time and effort were taken to listen to eight students and their parents producing a rich account of their personal experiences offering us a window into their world. In the future, it is imperative for qualitative research studies to continue to seek out the experiences of those most affected by the phenomenon being studied.
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Appendix A
Focus Group Questions

Student questions:

1. Often when we meet someone for the first time, we might describe ourselves in a certain way to get to know these people better. I want to understand what you think of yourself as a learner. What word or words would you use to describe yourself as a learner?

2. Everyone here has been given assistive technology, how has your self perception changed since getting your technology? Has it made doing your school work any different? How? What has happened or what has changed?

3. What does it mean to have a learning disability?

4. If I were to walk into your classroom on Monday, would I see you using your computer? If not, when would you be using it? For what? Which class?

5. Would you say school is easy or hard for you? Why? Tell me what is easy or hard?

6. How do you feel about using your technology/laptop in class?

7. How does using your laptop in school make you feel? Tell me more about that?

8. What could the school change to make learning better for you? If you could change one thing to make learning better, what would that be?
9. Without telling us the name of the teacher, I want everyone to think about something a teacher has done that made using your laptop or computer programs easier to use in class?

10. Tell me how you feel when being given a new assignment in class and why?

   Maybe you might feel confident, nervous, scared?

**Parent questions:**

1. Tell me about your son or daughter’s experience using technology at home?

2. Are you aware of any differences in how your child uses their laptop/computer at home and at school?

3. Since your child has started using assistive technology are there any changes in the way they feel about themselves as learners?

4. How do you feel your son or daughter’s self perceptions have changed, if at all, by using assistive technology for writing?

5. If they have not changed what barriers might be contributing to this?

6. How could educators better support your child’s use of their laptop, i.e. WordQ or Co-Writer? Do you have any examples to share?

7. From your perspective, what could you change about your child’s learning environment at school to help your child’s self perceptions as a learner improve?

8. What issues did you encounter when your child started using their laptop? If these issues have changed, how have they changed?
# Appendix B
## Workshop Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:10 - 10:10 am</td>
<td><strong>Workshop: Secrets to Success</strong>&lt;br&gt;Introduce concepts:&lt;br&gt;  - How word prediction can help  &lt;br&gt;  - How word prediction &amp; speech synthesis can help  &lt;br&gt;  - Matching the program to fit your skills  &lt;br&gt;  - Demo of a few programs, Co-Writer, Write OutLoud, WordQ using the writing prompt: The best gift I ever received was......&lt;br&gt;Create new users if necessary for each student on their laptop&lt;br&gt;Introduce tips:&lt;br&gt;  - Easy as 1, 2, 3: Explain each symbol of Mnemonic  &lt;br&gt;  - Predict it, hear it, choose it, review it, correct it, write it  &lt;br&gt;  - Practice, trial &amp; error, keyboarding, proofreading, editing  &lt;br&gt;  - Back-up &amp; try another vowel, topic lists, usage examples  &lt;br&gt;  - One hand while learning to use prediction box  &lt;br&gt;Writing prompt for demonstration &amp; practice: The best gift I ever received was......&lt;br&gt;  - Demonstrate  &lt;br&gt;  - Practice  &lt;br&gt;  - Edit  &lt;br&gt;  - Revise  &lt;br&gt;  - Share if comfortable  &lt;br&gt;Students will write a brief reflection using word prediction tools about their feelings experienced while using the software. Save all reflections on usb stick.</td>
</tr>
<tr>
<td>10:10 - 10:45 am</td>
<td>Snack and team building games</td>
</tr>
<tr>
<td>10:45 - 11:50 am</td>
<td><strong>Focus group</strong>&lt;br&gt;Explain best practices for focus group session:&lt;br&gt;  - Only one person speaking at a time  &lt;br&gt;  - Speak clearly and identify yourself for the recorder  &lt;br&gt;  - Confidentiality outside of the group  &lt;br&gt;  - No unkind comments</td>
</tr>
<tr>
<td>11:50 - 12:00 pm</td>
<td>Clean-up/pack up laptops/Handouts and take home items</td>
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</tbody>
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