The Experiences of Students with Intellectual Disability and their Teachers During the Implementation Process of an Augmentative and Alternative Communication Device: A Case Study

By

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ABSTRACT

The purpose of this study was to describe the experiences of students with intellectual disability (ID) and their teachers throughout the implementation process of an augmentative and alternative communication (AAC) device. Two students and three teachers at an arts-based school for adults with developmental disabilities were trained by a speech and language pathologist on how to use the device. The students were selected by the teachers because they had limited ability to produce speech, and it was thought that they would benefit from using the device. The three teachers made up the school's faculty, and the speech and language pathologist was selected based on her expertise working with people with developmental disabilities.

Self-determination theory (Deci & Ryan, 1985) framed the study, and, it guided the observations and discussion of this thesis. Student experiences were explained through the lens of this theory, but teacher experiences were more applicable to Guskey's (1989) model of teacher change. This framework was used to interpret the experiences of the teachers.

Data were collected through direct observations and teacher journals throughout the implementation process, and semi-structured interviews, post-implementation. A total of 10, one-hour observations per student were conducted between January 15, 2013 and March 11, 2013; with one additional observation of an unplanned follow-up session that lasted one-and-a-half hours on May 8, 2013. The researcher observed student communication and engagement before, during, and after the device was brought into the class. The implementation steps included: introduction and experimentation with the AAC device in-class; teacher-only training; in-class student coaching and modeling; and withdrawal of SLP support.

This study found that that there were practical and logistical challenges with AAC device implementation for both students and teachers. Limited time for in-class training, strategic planning, goal-setting, and financial resources, such as funds to hire supply teachers so that teachers could observe in-class training, were barriers to implementation. One student, more than the other, used the AAC device to communicate throughout the study. Recommendations emerging from the study included more purposeful advance planning, goal-setting, developing teacher pedagogical knowledge prior to implementation, and collectively-planned in-class training sessions for students and teachers.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

In recent years, technological advances have led to increased development and use of assistive technologies upon which many people in our society rely (Chen & Price, 2006; Lancioni, Sigafoos & O'Reilly, 2013; Morrison, 2007). Assistive technologies, ranging from computers and hearing aids to eyeglasses and wheelchairs, have been used by people of all ages and abilities to support their learning and have been necessary for those people who have a particular disability (Stead, Ito, Smith & Anderson, 2010; White, Wepner & Wetzel, 2003). Of the many types of assistive technologies, augmentative and alternative communication (AAC) devices are typically used to support people with limited or no verbal output skills. Speech-generating devices are a type of AAC device that allow the user to press an icon or word on an electronic device (often a tablet computer), which then electronically converts input into speech. People with intellectual disabilities often experience challenges communicating, and speech-generating devices have been used to support their communication.

AAC devices have not always been used in schools due to a lack of knowledge and support from teachers and educational assistants (Cheslock, Barton–Husley, Romski & Sevick, 2008; Dorman, 2001). Educators who work with those who use AAC devices are usually trained on how to use and implement the assistive technology (AT), but this has not always transferred into practice (Cheslock et al., 2008; Maor, Currie & Drewry, 2011; Torrison, Jung, Baker, Beliveau & Cook, 2007). It is thought that one of the limiting factors is that educators have not had adequate or relevant training, motivation, or resources to support the integration of technology into their environment (Cheslock et al., 2008; Dorman, 2001; Torrison et al., 2007). Studies have suggested that further empirical study of

professional development processes be conducted to inform the dissemination of procedures and practices that contribute to the positive integration and implementation of AAC devices in the classroom (Cheslock et al., 2008; Torrison et al., 2007).

To respond to this call for research on the implementation process of a speech-generating device as a communication tool for people who have an intellectual disability, this study described student and teacher communication in the classroom, teacher training sessions, and efforts for in-class integration of such a device. As my autobiographical signature demonstrates, I am well positioned to conduct this research.

Autobiographical Signature

I have been fortunate to be immersed in environments in which people with disabilities have been treated with the respect that all people deserve without discrimination. I have been strongly influenced by my parents—an occupational therapist and a special education teacher and consultant—who have instilled in me strong values of supporting others. One of the ways that I believe people can be supported is by listening to and learning about them; and by helping them develop the skills and strategies they need to maximize their potential. Because this might be a greater challenge for people with developmental disabilities, I am especially interested in this population.

As a young adult, I spent many years working with children with learning disabilities, autism, and physical disabilities. As an adult, I worked as an educator and as a learning strategist with university students who have a disability. In order to develop more knowledge in this area, I decided to pursue a Master of Education (M.Ed.) degree. In my first semester, I began working as a research assistant for the Queen's Community Outreach Centre and was fortunate to be involved in a study that would later become the basis for my thesis. That study

was to look at the effectiveness of staff training on AAC devices and at how such training affects student learning. Fortunately, this was very close to my area of interest when entering the M.Ed. program, and I am using the data collected in that study for this thesis.

The writing of this thesis emerged from an ongoing interest in supporting people with intellectual disabilities, and the belief that AT can be instrumental in doing so. I have seen many people who were able to express themselves and demonstrate what they know through AT, and I hoped that this thesis would help me gain a deeper understanding of how AAC devices can be used to support communication for people with intellectual disabilities and how professional development can play a role.

Rationale for Study

In the educational system in Ontario, it is common practice to have technology in almost all classrooms. Radios, CD players, MP3 players, and desktop computers are becoming a thing of the past, and are being replaced with SMART™ boards, data projectors, and multiple laptop computers and tablets that can be used by students and teachers (Watson, Itl, Smith & Anderson, 2010; White et al., 2003). When these resources were first introduced into classrooms, there appeared to be problem with the availability and accessibility of the technology, and its implementation and integration into instruction (Chen & Price, 2006). Earlier studies that examined this issue found that while computers were being placed in schools, teachers received neither sufficient training (i.e., operational skills) nor professional development (i.e., pedagogical strategies) (Chen & Price, 2006; Dorman, 2001; Hardy, 1999; Morrison, 2007) to implement the tools fully. Recently, a number of studies described the myriad ways in which technology can be implemented in classrooms and schools to help students access information and learn (e.g., Chen & Price, 2006). Of significance to this study

is that much of the extant literature in this area found that the importance of teacher training cannot be over-estimated and ultimately that it outweighs the impact of many other factors that contribute to successful integration of technology into the classroom (Chen & Price, 2006; Dorman, 2001; Morrison, 2007).

Many students who have a disability are able to access their own personal computer or other AT devices through the school board or external funding (Morrison, 2007; Watson et al., 2010). Studies have found that AT can help students who have a disability to be more successful in their learning when working independently (Maor et al., 2011; Watson, et al., 2010). Although technology holds potential to help all students learn, little is known about the successful implementation process of integrating AT into instructional settings for disabled students, or the barriers to and enablers of effective implementation (Maor et al., 2011; Torrison et al., 2007). Studies examining the implementation of AT in the classroom for students who have a disability are limited, and those that focused on AAC devices for students who have an ID, even rarer (Cheslock et al., 2008; Snell, Chen & Hoover, 2006; Torrison et al., 2007); thus this study may contribute to and fill particular gaps in the body of knowledge surrounding implementation of technology in special needs classrooms.

Purpose

The purpose of the study was to describe the experiences of students with ID and their teachers throughout the implementation process of an AAC device. An AAC device (specifically a speech-generating program used on a tablet computer) was implemented in one classroom in an arts-based independent school for adults who have an ID, and used by two students whose ID affected their ability to produce speech. The student participants and their teachers received instruction from a speech and language pathologist (SLP) about specific

operational skills and instructional strategies for the AAC device. Teacher and student participants also received instruction about specific strategies for effective applications of the AAC in the classroom to support multiple levels of communication among the participants, teachers, and peers. The researcher described the perceptions of the teachers, and speech language professionals about the ways in which the AAC device supported communication, and engagement for the students with ID in this unique setting.

The following questions defined the scope of this research:

1. What patterns of communication were evident in the classroom prior to the implementation of the AAC device?
2. What were the steps in the implementation process?
3. Who and what supported and impeded the implementation of the AAC device?
4. How did teachers describe changes to engagement in classroom activities and interpersonal communication in response to AAC device implementation and training?

Frameworks

This thesis focused on teacher professional development and implementation of a new tool (the AAC device) into the classroom, as well as on how students used the device to communicate and participate in classroom activities. These two separate foci led to the adaptation of two different frameworks; one conceptual, and the other theoretical, to frame the study. A model which outlines teacher attitudes and perceptual change in relation to professional development, first described by Guskey (1989), was used to consider the experiences of teachers. Deci and Ryan's (1985) self-determination theory informed the interpretation of students' engagement throughout the implementation process.

Introduction of Conceptual Framework

Guskey's (1989) model was chosen because it suggested that teachers who see positive results in their students after changing their teaching—often as a result of professional development—were motivated to continue this approach to teaching and participate in ongoing professional development about the innovation. Guskey (1989) first noticed that teachers were influenced in their teaching by their perceptions of student learning and student success. He proposed a sequential model that explained how teachers' attitudes and perspectives change. Teachers participated in professional development; implemented what they learned; noticed positive changes in their students; and as a result, developed new perspectives on teaching and learning (Guskey, 1989). Through the experience of teaching and obtaining desired learning outcomes, teachers adopted new methods of teaching and discarded those that did not work. This model also asserted that change takes place over time and through experience, which means that professional development must also take place over time while applying new knowledge to practice. Recommendations arising from this model are to provide teachers with continual feedback and follow-up sessions to training (Guskey, 2002). The factors outlined in this model of teacher attitude and perceptual change were considered in the design of the study, and were also used in data collection, analysis and interpretation.

Introduction of Theoretical Framework

Deci and Ryan's (1985) self-determination theory was selected because it purports that people, in this case the students, become more engaged in learning with increased self-determination, and, because one's ability to communicate increases three factors in self-determination: autonomy, competence, and relatedness. Self-determination theory is a type of

motivation theory which has been used to describe learning. When self-determination is increased, motivation is heightened, which often affects engagement and learning. Students who are primarily non-verbal and taught to use a speech-generating device may be given a tool to increase self-determination, and, likewise, their pre-existing level of self-determination may play a role in how the tool is adopted and used (Deci & Ryan, 1985; Reeve, 2012). In the design of this study, self-determination theory was used to describe the importance of implementing an AAC device in order to provide students with ID a tool to communicate and enable engagement and participation in learning activities.

Overview of Thesis

In the first chapter of this thesis, the rationale and purpose for the study that was conducted were described. The second chapter reviews published literature that relates to this study: self-determination theory, implementation of assistive technologies into classrooms, and the complexities of conducting research about people with IDs. In the third chapter, I discuss the measures taken to uphold confidentiality, adhere to ethical standards, and efforts to obtain participant perspectives as accurately as possible. Data collection and analysis, and trustworthiness of the data collected are also described. The presentation of data and findings of the study appear in the fourth chapter. Finally, the implications of this study, my own perspective on the study, and suggestions for future research are shared in the discussion chapter.

CHAPTER TWO: REVIEW OF LITERATURE

Introduction

This chapter reviews the literature that is relevant to the present study: that seeks to describe the implementation process of an AAC device in a classroom for individuals with ID. The theory guiding this study, self-determination theory (SDT), is described first because it is influential in structuring this thesis. Literature about teacher change in practice is discussed second. Classroom implementation of common technology is well documented, and an overview of this body of literature is then provided. Next, literature which provides information specific to the implementation of AAC devices is discussed. Finally, literature about including people with severe intellectual disabilities in research studies is presented. Each of these sections also explains the importance of reviewing this literature in relation to the purpose of the study.

Self-Determination Theory

Self-determination theory (SDT) is a motivation theory, and was first posited by Deci and Ryan (1985). This theory consists of five micro-theories and has application to numerous and distinct fields of study. The entirety of SDT was difficult to apply to this study because of its complexity, and particular aspects were selected by the researcher based upon their relevancy to the students with ID. The fundamental tenets ascribed to the theory assumed were applicable, as was a specific micro-theory called Cognitive Evaluation Theory.

SDT is built on the premise that everyone has both intrinsic and extrinsic factors which influence motivation (Deci & Ryan, 1985). These factors, which include goals, beliefs, and values, can be influenced by external sources, but are essentially intrinsic. Deci and Ryan (1985) suggested that such factors can be attributed to a person's sense of three

basic needs: autonomy, competence, and relatedness. According to Deci and Ryan (1985), a person's natural tendency toward satisfying these three needs drives and motivates behaviour, and in this case, learning. This section outlines SDT and its application to the classroom. It explains that SDT is applicable to the present study because integrating the AAC device into the classroom experience of the participants might facilitate self-determination.

Self-determination in The Classroom

Deci, Pelletier, Ryan, and Vallerand (1991) applied SDT to educational theories and practices to explore how to foster student learning. In order for a person to have a sense of self-determination, choice is imperative. This is because without choice, behaviour is regulated only by external factors, such as rules and expectations, and autonomy would not be present. A major factor in the development of self-determination is internalization (Deci et al., 1991, p. 328). Internalization is described as a process in which external sources that influence and motivate a person become internal. Even if a topic or task is not interesting to a person and there is little intrinsic motivation to learn, it can become internal through that person's desire to be socially accepted or to progress in a community such as a school, work, or an event. In other words, external influences become internalized, thus impacting one's perceived sense of autonomy, competence, and relatedness, which are necessary for self-determination to develop.

According to SDT, a social environment is one of the factors that impact the degree to which a person feels self-determined (Deci et al., 1991; Vansteenkiste, Lens & Deci, 2006). The classroom environment, or any social setting, can either support or inhibit one's ability to feel a sense of autonomy, competence, and relatedness (Deci et al., 1991). The expectations of the teacher, as well as the social situation within the classroom are external factors that can

become internalized, thus affecting motivation. The need for autonomy is the driving factor in self-determination. In order for student participants in this study to develop self-determination, it would be imperative that they are able to communicate their choices in the classroom. If a student is able to tell the instructor what he wants, or to answer a question, he is demonstrating competence in his environment. Being able to communicate with many people by using speech, even if it is with an AT, is likely to influence relatedness. As such, it is suggested that the use of AAC devices by people who have an ID and cannot otherwise communicate verbally could help them to experience enhanced self-determination. AAC devices are a major contributor to a person's ability to self-advocate and to develop a sense of both autonomy and competence (Krogh & Lindsay, 1999; Ward & Mayer, 1999). Thus, it is important that both students and teachers are trained effectively in using AT, and therefore researching ways to implement such a device effectively in the classroom may add to the extant literature.

The development of positive interpersonal relationships has been studied by Deci et al. (1991), and is said to be a factor influencing self-determination—although intrinsic motivation remains the key. People within a classroom environment are important in influencing learners' motivation and self-determination; thus, teachers who are willing to participate in an extensive training program, which includes training their students, about ways to use an AAC device are likely supportive of their learners (Torrison et al., 2007).

Deci et al. (1991) outlined a number of practical, evidence-based ways to promote and support students' sense of competence, autonomy, and relatedness. Perceived competence can be supported by teachers by providing positive, specific feedback; praising students for choosing to complete a task, rather than doing it because they are required to; and, giving

choice in the first place. Deci et al. (1991) found that the teacher can play a large role in student motivation, whether it be positive or negative in fostering self-determination.

Student Engagement and Self-determination Theory.

Reeve (2012) used Deci's and Ryan's (1985) self-determination theory as a foundation to explore student engagement in the classroom. He suggests that the classroom environment can either inhibit or promote student engagement, which, in turn, influences motivation and learning. Reeve (2012) posited that student engagement is an indicator of student motivation, which can be measured because engagement, unlike motivation, can be observed. He argued that motivation is an intrinsic quality or state, and cannot be seen objectively. Engagement, on the other hand, can be seen in one's behaviors and actions, such as: using strategies; asking questions for deeper understanding; and staying on task. These can be observed in the classroom, and may be influenced by the classroom environment.

Reeve (2012) briefly discussed five micro-theories that are part of SDT to further explain how the theory applies to learning, but focused on one in particular that applies to engagement: Cognitive Evaluation Theory. Reeve (2012) suggested that people are driven naturally to have their basic psychological needs met, and the level of motivation toward meeting these needs can be seen in behaviour, or, more specifically, engagement. Cognitive Evaluation theory expands upon self-determination theory by arguing that external factors can be predictors of intrinsic motivation (Deci & Ryan., 1985; Reeve, 2001). Examples of such factors are: recognition for performance in school; being able to ask questions and being listened to; and receiving positive, constructive feedback from a teacher or peer. This is relevant to the present study because it supports the theory that students who have an ID and are given a tool to help them communicate will have a greater chance of being engaged in

their classroom environment. Increased communication is likely to influence motivation and learning in positive ways (Deci et al., 1991). Successful implementation of AAC devices may allow a student to demonstrate that extrinsic motivators influence learning, as evidenced by increased academic socialization within the classroom. An AAC device is a tool that has the ability, when implemented effectively in the classroom, to impact the factors outlined in the mini-theories, and thereby influence self-determination as a whole. Reeve (2012) helped to identify ways in which self-determination can be observed in others. These observable behaviours include being on task and asking questions, and will be applied to the findings of this study.

Promoting self-determination in the classroom. Reeve (2012) asserted that engagement is a determinant of motivation, and that teachers should focus on fostering engagement in learning, rather than motivating students to learn. One study examined student and teacher perspectives about motivation and engagement through interviews (Reeve, 2012). This study found that teachers were not able to detect student motivation effectively, but that they were able to detect student engagement accurately (Reeve, 2012). It concluded by recommending that teachers focus on fostering engagement in the classroom because it is more measurable than motivation, and because teachers can actively promote student engagement through instructional strategies. Using language and including in discussions that give students a sense of autonomy is one way that this type of engagement can be supported. In applying these strategies within any classroom, it would be necessary that students are able to express themselves regularly, which for some, would mean being able to use AAC devices effectively. Another way to help students to become self-determined learners is to monitor student engagement in learning tasks over time. This can be done through classroom

observation, as well as by student self-reporting which in turn can positively affect students' autonomy because it is assumed that their perception is valued. Reeve (2012) believed that fostering autonomy in these ways positively influences student engagement, and ultimately increases student motivation.

Summary

This section provided an overview of the aspects of self-determination theory that are relevant to the present study. Autonomy, competence, and relatedness can be affected by one's ability to communicate in the classroom, which can be facilitated by an AAC device. Student engagement can be affected by instruction and it can be observed by teachers in the classroom.

Teacher Change in Practice

The goal of implementing an AAC device into a classroom cannot be realized without modifying the practices of teachers. Implementation requires integration of instructional strategies which support student engagement and communication. In most cases, this means that the teacher has to adapt his or her teaching so that the device can be optimized. Teacher change in practice through professional development has been studied, and researchers have found that there are both barriers and enablers to change, but, there are few consistencies amongst them (Bradshaw, 2002; Guskey, 2002). Guskey's (1989) model of teacher change has been used to discuss this phenomenon. Successful professional development which leads to teacher change in practice, a change in student learning outcomes, and resulting in a change in teachers' beliefs is discussed in this section.

Guskey (2013) analyzed 13 published lists that outlined characteristics of effective professional development, and he sought to synthesize these data to determine if a checklist

could be made. He searched for consistencies across lists, and found that practices vary among educators, and, that many recommendations for effective professional development are contradictory. For example, he noted that time and resources are necessary, but he also asserted that effective professional development can take place with limited time and resources. Regardless of these contradictions, there were factors that were common among reports of successful teacher change. These were "enhancement of teachers' content and pedagogical knowledge" (p. 749), time, resources, collaboration among teachers, and in-situation training. In an earlier paper, Guskey (2002) discussed elements of successful professional development, which is a component of change in practice, but emphasized that it is not the deciding factor. The essential piece is that teachers are able to witness improvements in student outcomes. This is what changes the teachers' beliefs about effective instructional strategies, resulting in change that endures.

Professional development is the first stage in Guskey's (1989, 2002) model. To change teachers' beliefs and attitudes about their teaching effectively and to continue to the second stage, a change in instructional practices, teachers must be involved in the planning. Collaboration among teachers and "district-level personnel" (Guskey, 2013, p.749) will increase the opportunities for teachers to learn. Teachers have reported that collaboration with colleagues assists in their personal development of skills and strategies needed to implement new practices (Bradshaw, 2002). Teachers have also reported a need to develop specific strategies to reach their personal goals set for training. These goals should be based on needs assessments conducted throughout professional development (Guskey, 2013).

The second stage is change in teacher practice (Guskey, 2002). In order to increase effectiveness of integrating new instructional strategies, on-site support is essential and must

be ongoing (Bradshaw, 2002; Guskey, 2013). This is particularly true when implementing technology into the classroom because the tool being used is often unfamiliar to the teacher and complex in nature (Bradshaw, 2002). With successful instruction comes the third stage—a change in student learning outcomes. These can be determined based on traditional assessments, such as tests and assignments, but can also be observed in terms of student behaviours, such as increased engagement or improved attendance (Guskey, 2013).

After teachers recognize a positive change in students' behaviour or performance, teachers are most likely to change their beliefs and attitudes about their instructional practices (Guskey, 2013). This prevents a temporary shift in practices, which might be a result of excitement about a new tool, for instance, and, encourages long-term adoption of new strategies. Changing teacher beliefs and attitudes so that they can support student learning on an ongoing basis, is the ultimate goal of professional development.

The first step toward changing the practices of teachers so that they are able to accommodate students of all abilities is successful professional development. In this study, teacher training was examined closely. Factors of effective professional development and stages of teacher change were described in this section. This literature was used to discuss the findings of this study.

Implementation of Assistive Technology

In this section, studies which examined the implementation process of AT for people with disabilities will be discussed. AAC devices are a type of AT, and patterns found in AT implementation are relevant to the aspect of the study which looks at the integration of technology into the classroom. Here, AT implementation is discussed in general terms. Many people use AT and it is easily accessed worldwide (Chen & Price, 2006; Morrison, 2007;

Lancioni, Sigafoos & O'Reilly, 2013). AT has the potential to be used by people of all ages to support their learning, and AT devices are often necessary for people who have a disability (Stead, 2009; Watson et al., 2010; White et al., 2003). Assistive technologies can be life-changing for people who have a disability, but they are not always used to their full potential due to a lack of knowledge and support from others (Cheslock et al., 2008; Dorman, 2001). People who work with those who use AT are often trained on how to use and implement particular AT devices; but this does not necessarily mean they are able to integrate the tool into practice effectively. It is thought that workers, including teachers and social workers, often do not often have adequate training, motivation or resources to support the integration of such technology into their environment (Cheslock et al., 2008; Dorman, 2001; Torrison et al., 2007). Developing an understanding of past barriers to implementation is important to this study because it seeks to explore and share teachers' experiences with and perceptions of the implementation process of a specific AT. This section provides a brief history of high-tech AT introduction into mainstream learning environments, followed by an overview of effective AT implementation strategies.

History of Assistive Technology Implementation for People with Disabilities

There are many assistive technologies currently available to people who have a disability, and many are designed for a specific challenge, whether visible or not. Examples of assistive technologies include wheelchairs; text-to-speech software on a computerized device; pens with an audio-recording device built in; eyeglasses; and laptop computers (Lancioni, Sigafoos & O'Reilly, 2013; Stead, 2009). Although it is important that professionals are aware of how all assistive devices operate, this section will discuss only high-tech computerized devices because of the foci of the study. High-tech devices, such as

portable computers and speech-generating devices are more recent developments and are still changing continually (Stead, 2009; Lancioni, 2013). Due to the complexity and changeability of this type of technology, ongoing, effective training is critical for successful implementation. With the relatively recent development of computers, much has changed for people with disabilities and for the people who communicate and interact with them, such as social workers, educators, families, and community members. Researchers have found that when computers are first introduced into schools, teachers are not equipped with the operational skills or instructional strategies to properly integrate them into practice (Chen & Price, 2006; Dorman, 2001; Morrison, 2007). Because of these and other studies' similar results, researchers sought to remedy this situation through further investigation (Bausch & Ault, 2008; Cheslock et al., 2008; Dorman, 2001; Hardy, 1999; Torrison et al., 2007; White et al., 2003). Two major findings came out of such research: AT can increase performance and learning of people with disabilities when implemented effectively; and targeted professional development has an effect on the implementation and integration of AT in educational and community settings.

A number of studies support the claim that AT has the potential to help people with disabilities to be more successful (Cheslock et al., 2008; Maor, Currie & Drewry, 2011; Morrison, 2007; Torrison et al., 2007; Watson et al., 2010; White et al., 2003). An excellent example of an AT that has the potential to have great success is a speech-generating device. These are devices that allow the user to either type phrases or touch picture symbols and the device 'speaks' aloud (Stead, 2009). Students who are otherwise unable to communicate can learn how to use such a device, but require support during implementation. One longitudinal qualitative study found that a speech-generating device could be used by participants who had

developmental disabilities (Torrison et al., 2007). Over the course of one year, despite initial increases in communication, the device was not integrated into practice for either the teacher or the people with disabilities. Barriers to implementation included teacher attitudes toward using the device; a lack of ongoing support for teachers; and insufficient knowledge about programming the device (Torrison et al., 2007).

A qualitative study by Torrison et al. (2007) described the role of staff training in the use of AAC devices to enhance communication for adults who have an ID and experience difficulties in speech production. Over a period of one year, researchers observed four adults, each of whom had an intellectual disability, as they used an AAC device. They also surveyed staff, provided training on the use of Boardmaker™ (a low-tech, picture-based AAC device), conducted observations using checklists, and, conducted post-study surveys with SLPs. Data were analyzed by grouping data from observations, surveys, and checklists, and looking for similar themes across participant responses. While there were some gains in communication skills for some of the adult students, the gains were not as impressive as the researchers and trainers had hoped. The researchers pointed to flaws in implementation to explain the weak effects. Insufficient time for staff training, specifically on how to use the AAC device in a class or lesson, was identified to be the biggest challenge. Additionally, staff perceptions that the device would make lessons easier for them were proven wrong, as the implementation required more thoughtful, time-consuming planning. Staff reported that barriers to implementation related to their own time, workload, and the quality and nature of the training that they received, rather than issues related to the students. While changes in pre- and post-study attitudes of staff were positive, the researchers did not indicate whether this was a change resulting from the implementation process. Researchers recommended that a speech

and language pathologist (SLP) conduct the training, that the AAC device be upgraded, and that more time be spent using the device. No specific duration was suggested, but the study recommended that training last longer than two weeks, as it had in their implementation process. This study by Torrison et al. (2007) was instrumental in the design and implementation of this study, because it helped me to focus on the implementation process of the AAC device and the device's influence on communication, as perceived by the teachers and students who used it in their classroom. As Torrison et al. (2007) recommended, a high-technology AAC device was used in the present study, and an SLP was included in in-situation training.

Professional development for educators has been reported in studies as a significant factor in the outcome of ACC device implementation (Cheslock et al., 2008; Chmiliar & Cheung, 2007; Morrison, 2007; Torrison et al., 2007; Watson et al., 2010; White, Wepner & Wetzel, 2003). There were few published studies with this focus, but the findings and recommendations of those studies were instrumental in the design of this one. In one study, participants who had limited verbal abilities used speech-generating devices to share their perspectives about using AAC devices and discussed areas in which they would like to see further research conducted (O'Keefe, Kozak & Schuller, 2007). Participants used their AT to describe their perceptions of overall implementation and usage, and researchers found that one of the major concerns was to find better ways for "clinicians to support clients in selecting AAC [speech-generating] devices and organizing vocabulary to meet the needs of the individual" (O'Keefe et al., 2007, p. 94).

Another study sought to understand the knowledge and backgrounds that educators across Alberta possessed about AT implementation (Chmiliar & Cheung, 2007). Two-

thousand online surveys were sent to educators of exceptional students, and 70% of respondents reported that they had never participated in professional development which focused on AT. The number of teachers who were not satisfied with their personal skill level with the AT that was used in their classrooms was 86%. Reports of the survey were that the barriers to effective implementation were attributable to teacher professional development, but details were not provided. The results of this study led to the development of an online course that targeted Special Education teachers. Components of the course included discussion forums, an AT lending library, virtual practice using the technology, and online modules. Although this course was highly accessible to educators because it was offered online, and, it provided background knowledge and virtual practice, researchers concluded that individualized situated training that is focused on specific technologies is required for successful implementation. This literature is relevant to the present study because it reinforces the need for targeted, in-situation professional development. The method of the present study followed the advice that out-of-context training can be beneficial to teachers, but that it is not sufficient by itself.

In 2013, it is likely that there are many teachers who are familiar with technology, having grown up with it and having used it many times. So what is it about assistive technology that differs in such a way that workers require specialized training? One of the reasons is that communicating through AT is typically much slower than natural speech, vision and hearing, and people who work with users of AT should be aware of this (O'Keefe et al., 2007**).** Additionally, when workers are aware of how to use AT and become more comfortable and confident as a result, they are more likely to integrate it into their practice (O'Keefe et al., 2007; White et al., 2003). Trouble-shooting has been found to be a major

concern for workers who are expected to remedy any issues with the technology on demand. Knowing how to do so with confidence could help workers integrate AT into daily activities (Torrison et al., 2007; White et al., 2003).

It is unfortunate that it is necessary for researchers (Barzegarian & Sax, 2011; Cheslock et al., 2008; Hardy, 1999; Stead, 2009; Torrison et al., 2007) to need to make an argument for increased, more effective, long-term professional development because AT is essential to some people with disabilities although from a business standpoint, the argument against it is logical because professional development is costly.

Government and community agencies where workers are engaging with people with disabilities are typically responsible for professional development of their staff (Stead, 2009). Funding is often limited, or even unavailable, in spite of the fact that policies may exist which promote ongoing professional development. Resources such as AT and training for professionals are limited (Stead, 2009; Torrison et al., 2007). Additionally, studies show that workers are often resistant to professional development in AT due to a self-reported lack of confidence and not enough time (O'Keefe et al., 2007; White et al., 2003). If barriers can be overcome and professional development is conducted effectively over time, it is likely that organizations will save money. If professional development is designed in such a way that it helps workers to develop self-confidence and see the value in spending time acquiring new knowledge and skills, it may allow the opportunity for inclusion of people with disabilities through the use of AT.

Effective implementation of assistive technology. Effective implementation is characterized by the full integration of AT into course design, lesson planning, instructional strategies, and assessment practices; and provides opportunities for the user to maximize her

learning potential and communicate their knowledge. Studies that examined AT implementation have proposed that professional development be ongoing, long-term, and on-site (Torrison et al., 2007; Zhou et al., 2012). These are important factors in professional development; and have been shown to increase effectiveness of AT implementation. On-site training, sometimes called on-the-job coaching, encourages the educator to apply knowledge to her workplace, likely using or interacting with the person who uses the AT, while under the guidance of the training professional. It can transform over time from simple observation of the training professional, to supported practice, to independent integration. This method of teaching and learning is commonly reported in the literature as a necessary strategy for AT implementation (O'Keefe et al., 2007; Torrison et al., 2007; Zhou, Ajuwon, Smith, Griffin-Shirley, Parker & Okungu, 2012). Other professional development instruction might include group discussion, lecturing, providing written materials, case studies, and hands-on practice. A number of sources have recommended that post-secondary institutions offer a course on AT for students who might encounter AT users in their practice (Barzegarian & Sax, 2011; Stead, 2009; Zhou et al., 2012). Although there are studies that describe important factors in professional development (Barzegarian & Sax, 2011; Stead, 2009; Torrison et al., 2007; Zhou et al., 2012), few studies describe a specific method, such as a checklist of objectives, that increases the likelihood of effective, long-term implementation (Bradshaw, 2002).

Summary

In this section, literature that describes what is known about implementation processes of AT in classrooms was presented. Studies have found that it is not always easy to implement AT into the classroom, and that factors which influence effectiveness include length of training, available funding, and time. Much of this knowledge can be applied to

more specific forms of AT, but few studies have been conducted specifically on AAC devices for people with IDs.

Implementation of AAC devices

Research has been conducted in the area of augmentative and alternative communication (AAC) for people who have an intellectual disability (ID), but the few studies that have been published focus on teacher and user training (Cheslock et al., 2008; Torrison et al., 2007). Torrison et al. (2007) found that the implementation of AAC devices can be affected when teachers and users struggle to understand how to use the technology, and they recommended that further research be conducted specifically on professional development. There are few studies that seek to describe staff and student instruction on AAC devices and how it influences communication, and this gap in research has been one impetus for this study (Cheslock et al. 2008; Krogh & Lindsay, 1999; Torrison et al., 2007). Determining how to use AAC devices effectively is important for adults who have an ID, as well as for the people who work with them in a supportive role. Effective use of AAC devices is an important contributor to motivation and learning for people with disabilities because it allows people to better communicate; and it helps teachers to interpret student needs, goals, and thoughts (Cheslock et al., 2008; Snell et al., 2006; Torrison et al., 2007; Ward & Meyer, 1999).

This section provides an overview of the relevant literature, beginning with studies that examine the elements of successful and failed implementation of AT for people who have disability. The importance of strategic training in AAC devices and studies that recommend further research in this area provided a strong foundation for this study and are reported next.

Barriers and Enablers of Implementation

Studies that examined the implementation of AT in classrooms have found that the main factor in successful implementation is ongoing instruction on the device for both teachers and students (Bausch & Ault, 2008; Chen & Price, 2006; Chmiliar & Cheung, 2007; Morrison, 2007). Chmiliar and Cheung (2007) researched and described the implementation process of AT in classrooms for students with a variety of disabilities affecting their ability to learn. The barriers to effective implementation that were identified included: negative teacher attitudes toward using the technology; teachers' low comfort level in using the technology; inadequate teacher training; and the absence of ongoing support or instruction for teachers. Ongoing professional development; a commitment to the device by all members involved, such as teachers, students, and administrators; and engagement in research which supports the use of AT were determined to be contributing factors to effective implementation (Chmiliar & Cheung, 2007).

Millar, Light, and Schlosser's (2006) meta-analysis of literature published from 1975 to 2003 describes the use and effectiveness of AAC devices as communication enhancement tools for people aged two to 60 who have a developmental delay. By examining a cohort of distinct studies conducted over a long period of time with similar findings, the meta-analysis of literature demonstrated that AAC devices are effective in assisting people who have an ID to communicate by using an AAC device (Millar et al., 2006). This literature review found that many studies have concluded that AAC devices are successful in helping users communicate effectively, and that there were no studies which found that AAC devices decreased communicative abilities. It identified a need to examine the link between AAC usage and speech production in children and adults who have a communicative disorder as a

result of a developmental delay because reliable studies that focus on this population are very limited (Millar et al., 2006). Additionally, Millar et al. (2006) found that there was a lack of literature that both describes the long-term impact of implementing AAC devices, and the "…factors that may influence the effects of AAC intervention" (p. 259). This meta-analysis is useful to the present research in that it provides strong evidence that AAC devices can be used effectively to assist people who have an ID to communicate.

The Need for Teacher and Student Training

A study by O'Keefe et al. (2007) used a qualitative, case study method to identify research priorities in the use of AAC devices for people with disabilities. The study influenced the present study because it sought the opinions of people with disabilities who use AAC devices, as well the perspectives of those who work with them. The present study initially sought the perspectives of the participants with disabilities, but unfortunately these data were both limited and contradictory. As a result, the researcher was unable to interpret student data accurately, and it was not included. Additionally, teacher journals and interviews provided data about the students with disabilities as O'Keefe et al. (2007) recommended obtaining the perspectives of those who work directly with the students.

In the study by O'Keefe et al. (2007), case sampling was used to recruit participants who either used an AAC device to communicate due to a disability or the people who work with them. The majority of the participants who used the device had cerebral palsy, although a particular disability was not part of the criteria. Participants included six people who used AAC devices as their main method of communication, and seven people who worked as facilitators at either an AAC support group or clinic. Participants were divided into four smaller groups to ensure effective communication and to limit the necessary time spent in

conversation due to the fatigue that often occurs with AAC device usage. Two groups comprised of three people (each of whom used an AAC device), and two groups comprised of three and four people, respectively, who work to support AAC users were formed. Two focus groups were held for each group of participants: an initial focus group and a follow-up focus group, each lasting three hours. Data were analyzed by a number of researchers to achieve a high degree of inter-rater reliability. Researchers identified emergent themes based on transcripts from initial focus groups. After themes and categories were identified, researchers facilitated a second focus group so that participants could review the data. These transcripts were analyzed to validate or look for changes from initial focus groups. Finally, a questionnaire was distributed to participants, which asked them to rank the themes and conclusions that were drawn from focus groups.

The researchers found that people who used AAC devices identified six research priorities, while facilitators identified seven. Among the priorities reported by O'Keefe et al. (2007) based on recurring themes across participant groups were to: "…design more formal training programs for those who support augmented communicators (p. 94);" and to "…determine the best and fastest ways for AAC clinicians to support clients in selecting AAC devices and organizing vocabulary to meet the needs of the individual (p. 94)." These studies are relevant to the current research because they identify a need for further research, as well as a methodology that respects the autonomy of AAC users. O'Keefe et al.'s (2007) study implemented the same methods it was trying to explore through research. It explored the views of all members in the study, and gave an accurate portrayal of their opinions. This study verified data with all participants twice after the initial data collection. This article helped me in my work because it models appropriate research methods.

Summary

The reviewed research expresses a need for formal training and to identify strategies to support people with disabilities in using AAC devices, and was used in the development of this study. Secondly, this particular body of research incorporates both the perspectives of the persons who use AAC devices, and the persons who work with them. The studies reviewed were used to report research findings and discuss necessary supports for implementing the use of AAC devices for people with disabilities in various settings.

Including people with ID in Research

In this section, literature which describes characteristics and behaviours that people with ID commonly share, as well as information that researchers who have worked with people with ID have published are outlined. Two groups of characteristics that are most relevant to this study are highlighted: communication- and cognitive-based behaviours and social interactions. The first part of this section provides a rationale for including people with ID in research. The second part describes characteristics commonly found among people with ID. Finally, challenges to researchers of including people with ID are discussed.

Including People with IDs is Beneficial to All

Studies have found that both researchers and participants believe that research about persons with intellectual disabilities (ID) is likely to improve the quality of life and learning for this group of people (Iacono, 2006; Mactavish, Lutfiyya, & Mahon, 2000). Persons with disabilities which impair their communication have not always been included in research or given the opportunity to contribute to the academic community because of their challenges with communication (Mactavish et al., 2000; McDonald, Kidney, & Patka, 2013). For researchers who studied people who have an ID, collecting trustworthy data from these

participants was challenging due to certain behaviours commonly found in people with ID (Bowman & Plourde, 2012). In order to collect accurate data and provide persons with ID the opportunity to be heard, researchers have needed to be aware of these challenges and the ways in which they can be accommodated.

People who have been in vulnerable situations due to war, disability, and illness have not always been treated with respect by the research community (Dalton & McVilly, 2004). Studies, such as the infamous Willowbrook School study that deliberately infected children with ID for medical research, have taken advantage of people with ID and harmed them, resulting in distrust and anger from this population and from those who care about them (Dalton & McVilly, 2004; Krugman, 1986). During research studies, it is possible that people with ID are treated without respect due to their vulnerability. Some people have argued against conducting research with them directly, or, for limiting their participation in research only to those who can give full consent independently (Iacono, 2006). Although this would protect them from direct harm caused by research, the long-term effects would mean that people with ID would be almost entirely absent from research. Exclusion would likely cause harm to people with ID because research is needed to support all human needs and interactions, especially those who are most vulnerable or voiceless (Dalton & McVilly, 2004; Iacono, 2006). The benefits of conducting research about people with ID outweigh the potential risks associated with such research because without any empirical knowledge of this often excluded population, they can be marginalized and outcast from society. Without evidence-based information, it is difficult to make improvements to teaching, learning, and interventions that have the potential to enhance participation and life experiences of

individuals with ID (Iacono, 2006). Knowing how best to do this and how to share the perspectives of participants with ID was essential to this study.

Characteristics of People with ID

In this section, common characteristics and behaviours of people with ID that have been reported in published studies are described. It is important to be aware of the behaviours that have been commonly reported in the past, noting that these behaviours may not be present in all people with ID, and that they exist to varying degrees depending on the individual. Two overarching categories of characteristics will be discussed, which are those related to social, emotional and practical factors, and cognitive abilities which affect communication. The aim of synthetizing this information is to help the researcher work with people with ID in this study, and to develop an awareness of how to elicit and report participant perspectives in order to include people with ID in this study.

Cognitive abilities and communication challenges of people with ID. Intellectual disabilities range from mild to severe and affect people's abilities in a variety of ways. All persons with ID have limited intellectual functioning and adaptive behaviour, which affect cognitive abilities, social awareness and skills, and self-management (Bowman & Plourde, 2012; Vicari, 2004). A diagnosis of ID is determined based on psychometric testing and assessments by psychologists. While recognizing that all people, including those with ID are individuals and have their own personal characteristics, many persons with ID share some overarching characteristics (Hodapp & Dykens, 2007).

Persons with IDs usually have limited short- and long-term memory; difficulties producing or comprehending language; impaired visuospatial abilities; delayed processing; difficulties with executive functioning; and some combination of these depending on the

person and the specific disorder (Goodman & Linn, 2006; Hodapp & Dykens, 2007; Vicari, 2004).

Language skills are typically affected in people with ID, and there is a wide range of ability that varies with the individual. Many people with ID are able to develop pragmatic language skills, but are unable to develop a strong understanding of how to construct words and grammar, while, for others, the reverse is true (Hatton, 1998). To varying degrees, people with ID may be able to take turns in conversation, respond to questions and comments, and carry on conversation pragmatically, but not at an abstract or deep level (Hatton, 1998). Direct questions may be understood and answered, while open-ended questions often present a challenge to people with ID and result in confusion (Mactavish et al., 2000). This is because people with ID have limited long-term memory and delayed processing abilities, and so connecting new language and experience with 'previously developed' language and experience is very difficult (Goodman & Linn, 2006). The common result of these language challenges has been that people with ID, whether or not they had difficulty with speech production, were often passive conversation partners, adopting a responsive communication pattern in which they tend to agree with all that is said to them (Hatton, 1998).

Memory and ability to pay attention are commonly affected in individuals with ID, which makes teaching, learning, and daily living challenging (Bowman & Plourde, 2012; Vicari, 2004). Having limited long-term and working memory means that prior experience and knowledge cannot always be accessed, making it difficult to build upon what is known, make connections, and become and stay engaged (Goodman & Linn, 2006). Paired with slow processing skills, limited memory makes learning new information extremely challenging because incoming information can be overwhelming or not understood, and when it is

understood, it is not known in connection to other things or on a deep level. Interviewing in qualitative research aims to obtain deep, narrative descriptions, which are very difficult to obtain when interviewing people with ID (McMillan & Schumacher, 2010). Unfortunately, participants' perspectives were not shared in this study because they would have made data less trustworthy; thus the perspectives of researchers' and teachers were relied upon for information about students.

Executive functioning is another area in which people with ID are affected because of their cognitive limitations (Goodman & Linn, 2006; Nunnimen, Lehto & Ruoppila 2001). Executive functioning skills are those used to plan, strategize, operate self-control, and solve problems. People with ID have struggled with these processes because of their limited memory and delayed processing abilities, which can in turn affect their behaviour. Impulsivity is an example of a resulting behaviour seen in people with ID, as they might not be aware of or have thought of the potential consequences of their actions. This challenge with self-control can affect research because it means that people with ID typically need to see the value in their actions directly, and might not value the research if it is not interesting to them or they cannot see the immediate connection of the research to their life (Goodman & Linn, 2006; Nunnimen et al., 2001). This is another reason why it is helpful for the researcher to know the participants with ID so that the researcher can be deliberate in connecting research topics and questions to personal interests of the participant.

Cognitive abilities of people with ID affect their ability to communicate, learn and process information; and, their executive functioning. Because of the challenges faced in these areas, behaviours which affect their daily lives can be observed in people with IDs. These behaviours also tend to interfere with their participation in research. It is essential that

researchers develop strategies to overcome the effects of the cognitive abilities of research participants with ID.

Social and emotional characteristics of people with ID. In this section, social and emotional characteristics of people with ID are discussed. Pragmatic skills are affected in people with ID, meaning that practical, daily functioning is usually different from people who do not have ID. Although a distinction between cognitive and pragmatic abilities is being made in this section, the two are related, and can be affected to different degrees depending on the individual.

Many people with IDs exhibit characteristics which are thought to be adaptive behaviours for existing in a complex, fast-paced world (Goodman & Linn, 2003). A lack of engagement or sustained focus in social situations and on specific tasks has been reported, and the complexity of maintaining focus is thought to be a factor (Goodman & Linn, 2003; Hodapp & Dykens, 2007). The lack of sustained focus or engagement occurs because people with ID process information at a slow speed and their level of understanding is limited. New information takes longer to become understood and it is not usually understood deeply. This makes learning and engaging with others a challenge for people with IDs because focusing is hard work (Goodman & Linn, 2003). This characteristic should be considered by researchers when disinterest in an activity is perceived. Due to long-term memory deficits in people with ID, attention span is typically short and memories may not always be accurate (Gudjonsson, Murphy & Clare, 2000).

Bowman and Plourde (2012) wrote a review of literature about people with ID which sought to describe how to help people with ID learn pragmatic skills. The paper argues that all adult learners, including those who have ID, share the need for self-determination and

lifelong learning skills in order to make learning meaningful. People who have ID benefit from supported employment, which is often funded and overseen by community agencies that focus on integrating people with ID into society. These jobs are important because community involvement and fulfilling personal goals are strong motivating factors for learning for all people, especially those with ID (Bowman & Plourde, 2012). A number of teaching approaches are also reviewed, which include making connections to practical experience, and providing opportunities for tactile learning, which can be applied to researching people with ID.

A study that described the perspectives of people with ID on their own participation in research found that participants "reported wanting to benefit directly by learning new things related to achieving their goals or improving their lives, having new experiences, meeting new people, having something to do, and helping others learn about people like them" (McDonald et al., 2013, p. 219). Participants volunteered to participate in the study after recruitment posters were distributed to community agencies that worked with people with ID. All 12 participants had an ID. Individual interviews and focus groups were held, and three major themes emerged from these data. Firstly, participants reported that research about people with ID was important because it improves their quality of life. Secondly, participants shared that they were marginalized from society because many of them were not literate. They noted that they were not aware of many studies that took place in their community, and that researchers should select recruitment methods that were accessible to all. Finally, participants reported that they were more likely to participate in research if recruited by a person that they trust. They felt that trust was gained when someone listened to them and when they were confident that their perspectives would be shared in research to ultimately

improve the quality of life for people with ID. This study was valuable to the present study because it helped the researcher understand how to develop a rapport with the participants.

Some researchers have found that people with ID seem to be particularly focused on working toward their own goals; usually focusing on themselves and other people with ID because of their practical and concrete way of thinking (Bowman & Plourde, 2012; McDonald et al., 2013). For example, a student might become engaged with an activity (such as a sport) because their closest friend is involved, but would not have played without the incentive of spending time with that friend.

Another reported characteristic of people with ID is passivity, which is usually observed as lack of initiative and lack of assertiveness (Dyken & Hodapp, 2001; Goodman & Linn, 2003). An example of this is waiting to be asked a question, rather than making a comment or request independently. A concern with this kind of passive nature is that people with ID might not admit when they do not understand something; agreeing because it is easier than admitting they are unsure. One study that sought to describe the role of social information processing (SIP) in behaviour for children with ID found that SIP was a contributing factor in passive behaviours. They found that children with ID encoded verbal cues differently than those without ID: those with ID encoded more negative cues, which suggests that this could be the cause of submissive and passive behaviour which were also more prevalent (Van Nieuwenhuijzen et al., 2004).

Depression has commonly been found in people with ID, which seems to be the cause of another set of commonly reported characteristics, such as irritability and fatigue (Hodapp & Dykens, 2007). One study which sought to determine the prevalence of depression and anxiety in adults with ID found that there is a comparatively high rate of depression and

anxiety compared to adults who do not have an ID (Hermans, Beekman & Evenhuis, 2013). The study had more than 200 participants with ID, of whom 16% reported symptoms of depression. In older adults with ID, depression rates increased. It is believed that depression in people with ID is related to the level of perceived success an individual has in society (Dykens & Hodapp, 2001), and so it makes sense that depression would increase as people age if they are not in a supportive environment that promotes autonomy. Depression and anxiety can affect motivation and engagement, again, impacting research outcomes by threatening the accuracy of the data. This is important for researchers to realize when conducting research with persons with ID because establishing a strong rapport with participants, thus making them more comfortable and decreasing anxiety, is essential for obtaining authentic perspectives (McMillan & Schumacher, 2010).

Commonalities have been found amongst people with ID regarding their social and emotional behaviour. A lack of engagement and sustained focus, agreeability and passivity, and depression and anxiety were discussed in this section, and examples from the study on AAC implementation were provided. These, along with the challenges faced by researchers because of cognitive impairments in people with IDs, have the potential to make researching this population difficult. In addition to the characteristics of people with ID, ethical and practical issues should also be considered.

Challenges Faced by Researchers who Included People with ID as Participants

Both ethics and practicality play a critical role in including people with ID in research. Ethical approval is a required part of research and it helps to protect participants from harm of any sort. As a part of gaining ethical consent, the researcher must demonstrate that she will be able to obtain consent from participants, which is especially difficult when studying people

who are deemed legally incapable of giving informed consent (Iacono, 2006). Additionally, being able to obtain data and make it accurate, consistent and trustworthy are difficult because of behaviours found in persons with ID, which presents a practical issue for researchers. If these two challenges are unknown to the researcher, consensual participation and reliable data could be questionable.

Ethical challenges of including people with ID in research. Gaining consent is a critical piece of the research process when it involves humans (McMillan & Schumacher, 2010). It is presumed under most circumstances that the person(s) who consent have the mental capacity to understand the risks involved in the study, and so ensuring that the participant has read the letter of information and had the opportunity to ask questions before consenting is a typical concern of the researcher. When conducting research with people who have ID, it is not always clear the extent to which the participant comprehends everything involved in being a research participant because of their intellectual deficits, and often times another party needs to provide consent for that person (Cameron & Murphy, 2007; Dalton & McVilly, 2004; Mactavish et al., 2000).

Issues around consent can begin before the study has obtained ethical approval because of government regulations and other policies which are meant to protect individuals from harm, but instead result in eliminating certain populations from research (Dalton & McVilly, 2004; Iacono, 2006). Iacono (2006) argues that ethics and research committees are generally becoming too conservative in their selection and approval of studies, and that this is a form of discrimination against those groups being protected. It is presumed that participants with ID are unable to make an informed decision because their disability limits their ability to understand the risks involved in participation (Iacono, 2006). When procedures become too

restrictive, this population can be left out of research, and this can have consequences which negatively affect potential participants and researchers. If people with ID are not included in research, empirically-based theories and policies about people in this category cannot evolve and their needs and opinions will be excluded from society. Research participants who have ID can be included in research when consent is obtained from both the participant and her family or support worker; when the results are shared before publication; and when the potential benefits of the research outweigh the potential risks (Dalton & McVilly, 2004; Iacono, 2006).

When conducting research on persons who have ID, there are methods, deemed ethical, for gaining consent (Charlton, 1998; Dalton & McVilly, 2004; Iacono, 2006). "Surrogate consent" (Dalton & McVilly, 2004) occurs when a family member or worker provides consent for the participant, and is a common process in this type of research. The concern with this is that it marginalizes participants and devalues their perspectives (Iacono, 2006; Dalton & McVilly, 2004). "Supported decision making," however, seems to be the optimal method of obtaining consent (Iacono, 2006). This is a process in which the researcher, with the support of the participant's family, provides as much information to the participant as possible, and a decision is made collaboratively based on the participants' best interests as to whether or not she will consent (Dalton & McVilly, 2004). These methods should be considered when researchers are designing a study for ethical reasons, as well as to include participants with IDs in research as much as possible.

Practical challenges of including people with ID in research. Conducting research about adults with ID brings forth some unusual challenges because of their vulnerability, and, obtaining consent can be an issue. It is not always practical or possible to provide a

"supported decision making" model because of the resources required to hold such a meeting to guide the person with ID through the process. Additionally, to collect accurate data by helping the participant feel comfortable and relaxed, it is recommended that the researcher invest time with the participant so that they are familiar with one another (Cameron & Murphy, 2007). Again, it is not always feasible for the researcher to make a large time commitment with each participant before data collection begins, thus limiting the study.

Another challenge that the researcher faces is in providing supports for the participant who has ID. For example, due to the challenges with verbal comprehension faced by people with ID, questions asked of participants must be understood; which can be encouraged by providing visual or concrete aids and examples during interviews. Additionally, participants might require accommodations, such as AT, short interviews or observation periods spread out over a longer period of data collection, numerous breaks, and extra personnel—all of which can be costly and impractical. Each of the challenges faced by researchers has the potential to impact the logistics, the results, and the trustworthiness of the study. The first step in avoiding these potential difficulties is by learning about conducting research on people with ID, and by adapting strategies to each research environment so that the research study is trustworthy and accurate so that, ultimately, people with ID can be included in research.

Summary

This section outlined the complexities of conducting research about and with people with ID. It included practical challenges which limit the ability of the researcher to obtain and share participant perspectives, primarily if the participants' language is affected. Ethical challenges faced by the researcher are also discussed.

Conclusion

In this section, literature that relates to the purpose and method of this study were reviewed. The theoretical and conceptual frameworks—self-determination theory and teacher change—were described first. Literature which relates to the implementation of AAC devices for people with Intellectual Disabilities (ID) in the classroom, as well as literature pertaining to the conceptual framework of this study, was reviewed. Finally, studies that considered the complexities of using people with ID as participants in research were also included.

CHAPTER THREE: METHODOLOGY

In this chapter, research methods are described and explained in connection with the purpose of the study: to describe the experiences of students with IDs and their teachers throughout the implementation process of an AAC device. The methodological framework for choosing a qualitative, case study approach is outlined to explain why this is the most appropriate way to collect data to answer the questions that define the scope of the research. The design of the study is then described; followed by data collection methods and organization of data. Data trustworthiness and data analysis are also discussed. Finally, known limitations to the methodology of the study are described.

Rationale for Qualitative Case Study Approach

The purpose of qualitative research is to describe human occurrences as they exist in a naturalistic environment, so that the findings can be applied in practice (McMillan & Schumacher, 2010; Munby, 2003). A qualitative research approach enabled an in-depth, comprehensive view of the use of the AAC speech-generating device as a communication tool in a classroom for adults who have ID. The purpose of the proposed study was to describe the experiences of students with IDs and their teachers throughout the implementation process of an AAC device, which was accomplished through observations, journal analysis, and interviews—all qualitative research methods.

Case study was an appropriate research method to meet the purpose of this study because case studies are intended to provide an in-depth analysis or exploration of a unique occurrence, situation, or person (Creswell, 2009; McMillan & Schumacher, 2010). The case that was described is that of strategic implementation of the device and student communication in a specific context.

Ethical clearance

This study began after the researcher completed her certificate of research ethics (see Appendix A), and the study was cleared by the Queen's ethical review boards (see Appendices B and C). Included in the ethics proposal were all letters of information and consent forms (see Appendices C, D, E and F), which were then read and signed by the participants or their guardians, and returned to the researcher. The following method was then carried out.

Research Design

Context

This study was conducted at Inclusive Art School (INARTS)—an independent, not-for-profit, arts-based school for adults with intellectual disabilities. The school's mandate was to provide adults with intellectual disabilities the literacy and social skills they needed to reach their highest potential using the vehicle of arts-based curriculum and activities. On any given day, there were between 10 and 30 students in attendance, three teachers, two administrators, varying numbers of educational assistants for students who required specialized care, and up to six volunteers at the school. There were two classrooms (one main typical classroom and the other, an art room) and one studio. Students and staff moved between these rooms throughout the day. Activities carried out at the school included creating visual art work, singing, dancing, literacy and media arts lessons, and occasional field trips into the community. The environment was, overall, relaxed: lessons were flexible and responsive; students could enter and exit the classrooms as needed; and teachers integrated student input into lessons as they were happening. The people who worked at or attended the school were a small community who welcomed outsiders and supported one another.

Teachers at the school were dedicated to student success, and were the first to propose to the university that a related study of the impact of AAC devices on student learning take place. The goal of the original study was to describe the effectiveness of AAC devices on communication and literacy skills for the students with ID. Assessing both communication and literacy skills in the original study would have made it much more complex, and the deadlines of the project did not permit for such a large-scale study. From beginning to end, that study lasted only seven months because a poster about the study had to be presented at a previously scheduled event. The same data were used in both studies. I worked as a research assistant at the Queen's Community Outreach Centre on this project and it both inspired the present study and provided the data collected for this thesis. I immersed myself in the environment early by attending classes intermittently for four months before beginning formal observations. During this time, I played a similar role to volunteers—helping students with their work as needed. When data collection began, I believe I was no longer an 'outsider,' which strengthened the authenticity of the participants' behaviour reported in this study.

Steps in Implementation Process

The implementation process was designed collaboratively by the researcher, the Queen's Community Outreach Centre (QCOC), one of the teachers at INARTS, and the SLP. It followed past studies' recommendations, which were to provide teachers with ongoing, long-lasting, in-class training by a professional with expertise in AAC devices (Cheslock et al., 2008; Torrison et al., 2007). The first step was when INARTS applied for and was granted funding through the QCOC to hire a research assistant (myself) and an SLP, and to purchase the tablet computers on which software was installed to make it an AAC device. I

then met with Jana (pseudonym), a teacher at INARTS, and the Acting Director of the QCOC to plan the following implementation process.

SLP recruitment. As the literature suggested (Cheslock et al., 2008; Torrison et al., 2007), an SLP who was experienced and knowledgeable about AAC devices was the ideal candidate for conducting training on the device. Ongoing, intensive training and implementation was also recommended, and so this study followed these recommendations closely. The SLP was selected because of her expertise in AAC device usage and her willingness to participate in the study. She was not able to commit to more than three hours per week because she was employed elsewhere, and instead of the preferred training, which would have taken place in-class on a daily basis, training took place for a maximum of three hours weekly for eight weeks.

Planning the implementation process. The SLP collaborated with the researcher and with Jana at INARTS to design the implementation process of the AAC device. The SLP observed both teachers and students for four hours, and met with the teachers to discuss student communication and involvement in class activities. The SLP worked with Jana to configure the device based on observed language used in class by all students and by the teachers. Once completed, the device had seven folders with up to 30 icons or sub-folders within. For example, an image of a face, with the word "feelings" underneath was a folder that contained more images of faces with different expressions, which included "I feel angry" or "I feel sad," which were said aloud when pressed. To illustrate, someone using the same program, Proloquo2Go™, could press the "comments" folder, and then a new page would open with different options, such as "awesome" and "cool" (see Figure 1).

Figure 1. Example of an AAC Device Screen Adapted from "10 most expensive iPhone apps" by N. Kakkar.

At the same time as the device was being configured, the researcher observed the students and teachers during classes for four hours total. Communication patterns and engagement in classroom activities were observed in students. Teaching methods and interactions with students were observed in teachers.

Teacher training sessions. Two teacher training sessions took place outside of class time, during which the SLP and her assistant demonstrated how to use the AAC device and how to program the device, and discussed some teaching strategies. These took place on February 7, 2013 and February 28, 2013, and lasted three hours and one hour, respectively. At the time that the first training session took place on February 7, 2013, the AAC device had been introduced to the students without any professional training for two weeks. Neither the teachers nor the students had prior experience with the device. On February 5, 2013 the SLP began training the students during class. When the second teacher training took place on February 28, 2013 the device had been in the classroom for one month. This training session was a discussion between the teachers and the SLP, during which time the SLP encouraged

teachers to ask questions or bring up challenges that they faced in implementing the device up to that point.

In-class training sessions. In-class training sessions took place over a three-week period, between February 5 and February 21, 2013 for between one and two hours at a time. The goal of these was to provide both students and teachers with guidance in using the device in class, but ultimately focused primarily on students. During these sessions, the SLP and her assistant worked with students and coached them in using the device. The SLP would press an icon at the appropriate time, and then the student would follow.

Follow-up in-class training session. As a result of requests which arose from both teachers and the SLP during their interviews, an additional training session took place on May 8, 2013. This was an in-class demonstration of how to incorporate the AAC device into the classroom so that all students were able to participate fully. The SLP and her assistant planned and implemented a lesson for the entire class, using the SMART™ board to facilitate games and activities which allowed the students to choose whether or not to use technology to participate. This lesson was an adaptation of the literacy-based Current Events lesson typically taught by teachers.

Participant Selection

Purposive sampling was used to select participants in order to gain a deep understanding of a specific population (McMillan & Schumacher, 2010, p. 138). The participants in this study included two students who have ID and three teachers from an arts-based school for adults who have various developmental disabilities. The teacher and student participants were selected by one teacher at the school, named Jana, in the original study conducted in partnership with the QCOC. The two students were selected because they had

little to no ability to produce comprehensible speech, and their teachers believed that they would be able to learn how to use the AAC device to support communication. The three teachers who participated were the entire teaching staff at INARTS, and were recruited by one of the teachers who proposed the study. The SLP was selected by the teacher, Jana, based on the SLP's knowledge of and experience working with people who use AAC devices, as well as her availability.

Participant Backgrounds

One of the student participants, Tom (pseudonym), was a man in his late forties who had been attending INARTS for over 10 years. He had many friends at the school and a close professional relationship with his teachers. His intellectual disability severely limited his ability to produce speech, and most of the words he said were approximations. He appeared to comprehend instructions by doing what was asked of him, such as passing a pencil or fetching his snack. His awareness of time schedules was demonstrated in class when he would signal to the class after looking at his watch when it was time to move to the next activity. Although he was easily distracted and interrupted myself and others at times, Tom was pleasant to work with and often had a smile on his face.

The other student participant, Mary (pseudonym), was a woman in her late fifties who had been attending INARTS for approximately five years. She was friendly with many students and staff at the school most of the time, but had moments during which she was angry and would lash out at others by kicking or pinching. Her intellectual disability limited her speech but she was able to form short, simple sentences. She was able to speak few words clearly, and after getting used to conversing with her and hearing her talk, I found that her speech was somewhat comprehensible. She was able to tell me that she was angry, for

instance, and I could piece together the reason by forming a sentence out of the three or four words she said; which she would then confirm or deny by saying "yeah" or "no." She had keen interests in specific things, such as stuffed animals and her purse, and rarely went without these things. Overall, she was quite friendly and talkative, despite the difficulties some might have in understanding her.

One teacher, Christine (pseudonym), had been working at INARTS as the music and art teacher for over a decade. She was familiar with the students and appeared to have close connections with them. When I observed her, she taught her students by giving examples, providing clear instructions, and allowing students many opportunities to be 'hands on.'

Another teacher, Jana (pseudonym), had been working at INARTS for approximately five years and used her specialized knowledge and experience in teaching and technology to teach media arts. She had a strong rapport with the students, and was energetic and friendly. Her observed teaching was characterized as describing activities 'step-by-step' and encouraging students to follow her guidance.

Diana (pseudonym) taught literacy, and had been working at INARTS for over eight years. She led many guided reading sessions with her students and incorporated visual arts into her classroom activities. For example, she asked students to illustrate their favorite scene in a book after she completed reading to them. Diana was observed to be enthusiastic in her teaching and engaged in helping student learn; demonstrated by positive, energetic instruction and responses to student progress. She appeared to be eager to support her students as best as she could by adapting class content and discussion to meet individual interests and needs.

The SLP, Susan (pseudonym), was an experienced registered practitioner who worked primarily with children. She was one of the few AT specialists in the region, and was able to

apply this expertise in a new context. She appeared to be liked by both staff and students at INARTS, and was quickly adopted into their community. Both students and staff greeted her enthusiastically, initiated conversation with her, and allowed her to participate fully in class discussion and activities. Students would ask me or their teachers where Susan was on days that she did not attend.

Data Collection Methods

Data triangulation was achieved through interpretation of three sets of data: observations, journal analysis, and teacher, SLP, and student interviews. Interview data were provided by students, teachers and the SLP to enable a range of perspectives, which increased the reliability of the data (Stake, 2010).

Data collection was preceded by 10, three-hour periods of researcher immersion in the environment over four months to reduce the impact of having an 'outsider' collecting data. As qualitative research seeks to understand a case as it exists naturally, this was important in diminishing the effect of the researcher on the environment when gathering data; especially during observations (Creswell, 2009, p.175; Stake, 2010). Increasing the comfort level of the researcher, the participants, and the other students who were present but not part of the research, helped to make the researcher's observations as authentic as possible.

Observations

Observations were chosen as a primary data collection method because they allowed for 'in-the-moment' recording and made it possible for the researcher to record events which may be difficult for participants to articulate at a later date, especially students who have ID (Creswell, 2009). "Unusual aspects can be noticed during observation" (Creswell, 2009, p.181) that participants might not be cognizant of, such as how students respond to teachers

and subtleties of instruction. Observations were critical for this study because there were known challenges with interviewing people with ID, namely, these participants were hard to understand and struggled to recall past events.

Observations took place from January 15, 2013 to March 11, 2013 with one follow-up session which was observed on May 8, 2013. All in-class observations took place at INARTS during class time. Observations were grouped into six sections, outlined in Table 1.

Table 1

Observation Foci of Each Stage of Implementation

Stage of implementation	Focus of observation	Participants present	Date observations took place	Duration
Pre-implementation of AAC device	To observe and record student and teacher communication during class time	Teachers and students	January 15, 2013	2 hrs
			January 17, 2013	3 hrs
Segregated teacher training on AAC device	To observe and record details of teacher training by SLP	Teachers, students, SLP	February 7, 2013	3 hrs
			February 17, 2013	1 hr
In-class implementation of AAC device	To observe and record a) student and teacher communication during class time b) details of implementation process	Teachers, students, and SLP	January 18, 2013	1 hr
			January 22, 2013	1 hr
			January 31, 2013	1 hr
			February 2, 2013	1 hr
			February 5, 2013	2 hrs
			February 12, 2013	2 hrs
			February 20, 2013	2 hrs
			February 21, 2013	1 hr
Post-implementation of AAC device	To observe and record student and teacher communication during class time	Teachers and students	March 4, 2013	1 hr
			March 11, 2013	2 hrs
Follow-up in-class training demonstration	To observe and record a) student and teacher communication during class time b) details of implementation process	Teachers, students and SLP	May 8, 2013	1.5 hrs

Direct data collection through observations of students and teachers during regular classes, as well as during training, contributed to the research by allowing comprehensive and rich narrative descriptions (Creswell, 2009; McMillan & Schumacher, 2010). Data were recorded using both descriptive and reflective notes, with demographic notes recorded at the beginning of each observation period (Creswell, 2009, p. 180). Observations were both general and specific in nature. In general, the researcher looked for student engagement and communication before, during, and after the AAC device was implemented (see Table 1). Additionally, the researcher described the staff and student training on the AAC device by the SLP. The researcher observed specific communication patterns, including student participation in class discussions and activities; how the device was being used in class (both by the teacher and the student); the students' demonstrated ability to ask and answer questions; and the type of communication between teachers and students.

Teacher Reflection Journals

Additional data were collected through journal analysis, specifically through teacher activity logs, which contributed to the multiple sources of data used to gain a deep understanding of the case being studied (Creswell, 2009). The participating teachers were invited to submit a weekly activity log, in which they made anecdotal notes about the effectiveness of the training, how staff and students used AAC in their classrooms, and how students responded to the device. These were read on a weekly basis by the researcher as a means to guide the focus of observations and interviews, using an emergent research design (Creswell, 2009, p. 176).

These journals were put into a binder and organized into sections based on the implementation stage in which they were written. Teacher journals were re-read at the end of

the data collection period and manually coded. The researcher recorded recurring patterns and themes were established.

Interviews

In order to increase rigour in the study, individual interviews were conducted at the end of the formal observations in March of 2013. Semi-structured interviews were conducted with each participant. The interviews were key informant interviews, since each participant had unique specialized knowledge about the implementation process (McMillan & Schumacher, 2010). The teachers had access to observations that the researcher did not, as they were immersed in the environment every day of the week. The SLP's knowledge of the implementation was different from the other participants and from the researcher because of her specialized background in speech and language communication. Additionally, the student participants were asked to share another perspective different from the teachers and the SLP, since they were the ones using the device both when observations were taking place and when they were not, and had no specialized knowledge of or previous experience with the device.

Interviews were audio or video recorded to ensure accuracy, and they were transcribed verbatim by the researcher. Student and teacher interviews took place in a quiet space at the school to increase the comfort level of participants, and the SLP chose to be interviewed at the Faculty of Education at Queen's. To help "protect human subjects from being hurt" (Stake, 2010, p.126–7), all recordings were kept on a locked computer, and pseudonyms were used in transcription.

Unfortunately, data from the student interviews were not included in the findings of this study. During their interviews, both students made comments that contradicted other

statements they made during the same interview. They did not appear to understand or have answers for most of the questions asked. The researcher believed that she could not include this data in the findings because the responses made by the students were unclear. Interpreting this data would not be ethical because it is unknown the extent to which the students' opinions were shared.

Student interviews. Students were invited to use their speech-generating device during the interview, and in order to capture body language and sign language, interviews were video-recorded. To include and interpret participant perspectives, as well as to validate data, video-recording was essential because of the students' ID (McMillan & Schumacher, 2010, p. 363). Parents and guardians of the two student participants were invited to attend these interviews to provide emotional support, but they did not attend. An interpreter, who was familiar with the students and how they communicated with and without the device, was present during the interview to assist in facilitating communication. The interpreter was a former teacher of the students and was recommended by the teachers at INARTS because she was reported to be familiar with and comfortable to the student participants. The duration of these interviews was 13 minutes for Mary, and 17 minutes for Tom.

Teacher interviews. All three teachers participated in an individual interview with the researcher at the end of the formal observation period. For their convenience, teachers were asked individually to choose the time and location of their interviews, and all were held in their office at INART. Interviews consisted of eight questions, and lasted 28 minutes for Christine, 41 minutes for Diana, and 60 minutes for Jana. They were audio-recorded and transcribed verbatim by the researcher. The length of interview transcripts varied from 12 pages single-spaced for Christine, to 13 pages single-spaced for Diana, and 20 pages single-

spaced for Jana. Themes were drawn from these interviews and teachers were given the opportunity to meet with the researcher to confirm or edit their contributing ideas.

Speech and language pathologist interview. The SLP interview lasted approximately 40 minutes, and took place in a quiet space of the SLP's choosing at Queen's Faculty of Education. Five questions that focused on student communication and use of the AAC device, as well as teacher professional development were discussed with the SLP. The interview was audio-recorded and transcribed verbatim by the researcher. This transcript was 12 pages, single-spaced. Themes were drawn from this interview and the SLP was contacted to verify that her comments were accurately interpreted.

Organization of Data

Transcription

Interview recordings were listened to one time, and then transcribed verbatim into a Microsoft Word document by the researcher. After the initial transcription, the transcript was reviewed and compared with the audio recording to ensure accuracy. During transcription, names were changed to pseudonyms to protect the identities of participants.

Converting Written Data Into Electronic

Field notes were copied from the notebook in which they were recorded during observations at the site, and typed into a Microsoft Word document off-site at the end of the day after each observation. Re-recording these notes helped the researcher become familiar with her data and facilitated reflection on the data as it was collected. Researcher field notes of observations were also typed to increase ease of access to the notes.

Coding

Data from observation field notes, interview transcripts, and teacher journals were coded using word processing software. An inductive process was followed for the initial coding process. Previously transcribed interviews, and typed field notes were formatted such that there were two columns; one for the raw data and the other for researcher notes. Teacher journals were organized by author and date in a binder, and were used to support themes found in observation and interview data. The researcher re-read the raw data, and codes were formed based on emergent patterns within the data. The right hand column was used to record researcher notes and comments regarding emergent patterns and concepts, while raw data were highlighted in the left hand column.

Data analysis

The data collected in the study were analyzed qualitatively using an inductive data analysis procedure in which specific data from the interviews, observations, and supporting teacher journals were grouped into ever-broadening themes (McMillan & Schumacher, 2010). Inductive data analysis gives opportunity for participant input, as well as a "…comprehensive set of themes" (Creswell, 2009, p. 175). Qualitative research methods were an appropriate approach of meeting the purpose of the study: to describe the experiences of students with ID and their teachers throughout the implementation process of an AAC device. Deductive analysis was then used to explore the codes and themes which were generated by the inductive analysis process using the lens of self-determination theory. Specific patterns of communication and engagement were put into three main categories: autonomy, relatedness, and competence (Deci & Ryan, 1985; McMillan & Schumacher, 2010). Another lens through which the data were analyzed deductively was from the literature about past AAC device

implementation processes and teacher change. Findings from such literature were used to explore whether or not connections could be drawn between these previous findings and themes suggested in this study. The researcher continued this process, switching between the inductive and deductive methods, until she was able to describe the finding that students and teachers faced practical and logistical challenges which restricted the implementation of the AAC device.

Confidentiality

The participant identities remained confidential to the extent possible. Participants were known to the researcher who conducted the interviews, observations, and teacher journals. Only those involved in the data collection knew their true identities. The names were changed to pseudonyms prior to analysis and used in all reporting of data. It is likely that there were some identifying characteristics, since the school had just three teachers who were all participating in the study. Student participants were two of about 30 students in the school, and many of their characteristics were more difficult to distinguish from other students, but not impossible. All participants were given a letter of information (see Appendices D and E) and voluntarily participated in the study after signing the consent form (see Appendices F and G).

Limitations

Despite efforts to establish rigour, there were some foreseeable, potential limitations. There were a limited number of participants. The data collection period was relatively short, and if it had taken place over a longer period of time it may have better captured the long-term effects of the implementation of the device, thus providing a more exhaustive description. The tablet computer that was used as the AAC device is not designed for people

who have a disability, which meant that results may have been affected by the participants' limited motor skills.

Additionally, due to the nature of the participating students' disability, data collected from these participants during interviews was not reliable because students were not be able to use the AAC device effectively to communicate, or their cognitive impairments may have affected their ability to recall their experience using the software over a long period of time.

Trustworthiness might also have been affected in that the teacher participants had a financial and emotional connection to the results of the study. The setting in which the study took place is a not-for-profit centre, which relies primarily on donations and grants. If the research demonstrated that the program, or certain aspects of it, was effective in helping adults who have an ID, this could have a positive effect on funding. The emotional bias comes from the fact that all three teachers worked closely with students, and had a close professional relationship with them. Although this relationship was professional, it is likely that there was also a strong emotional bond between teachers and students, which may also have affected the reliability of their responses during interviews and in teacher journals.

Also, students who demonstrated increased engagement and learning in the classroom may have done so as a result of a number of other factors that influence learning, such as time spent in the classroom and development of relationships with peers in the classroom. This study took place in a specialized school that attempted to individualize a program for each student. This presented two potential limitations. Firstly, the implementation process of the device might not have been the reason for change because we cannot know whether the device could have been used without training. Secondly, results may not be transferrable to a broad range of classrooms or other environments.

All data were collected and analyzed by the researcher, making interpretations potentially biased by her beliefs, thoughts, and values. The researcher was aware of her biases from the beginning, and tried to be as objective as possible.

Data Collection Trustworthiness

This study was designed to be as trustworthy as possible by collecting data using triangulation. Data triangulation was achieved by using three different data collection techniques: interview, observation, and teacher journals. Interview data were collected from both students and teachers to provide a range of perspectives. Observations and interviews were conducted by the researcher, who sought to describe participant perspectives using these methods. The researcher was familiar to the participants, and so the observations were conducted under the typical conditions of the school. For trustworthiness, formal observations took place over a ten-week period, totaling ten hours per student participant.

Staff participant perspectives were recorded through interviews and teacher journals. Interviews were audio-recorded and transcribed verbatim, and themes from these interviews were reviewed by each participant to increase trustworthiness. Transcripts taken during interviews, as well as the researchers' interpretations of participant perspectives, were given to the SLP and teacher participants to review in order to member check.

Summary

This chapter described and provided details of the method of the study. First, the rationale for a qualitative, case study approach was described. Next, the process for obtaining ethical clearance and ensuring the safety and privacy of participants was outlined. The research design, which included the context of the study, the steps in the implementation process, participant selection and participant backgrounds, was then detailed. Data collection

methods, which included observations, journal analysis, and interviews, were described next. The organization and analysis of data were explained, and finally, limitations of the method were articulated. The method of the study, for which details were provided in this section of the thesis, was chosen carefully by the researcher to ensure the most accurate and realistic data possible were collected and that participant perspectives were shared.

CHAPTER FOUR: PRESENTATION OF DATA AND KEY FINDINGS

The purpose of the study was to describe the experiences of students with IDs and their teachers throughout the implementation process of an AAC device. This study was guided by four primary questions.

1) What patterns of communication were evident in the classroom prior to the implementation of the AAC device?

2) What were the steps in the implementation process?

3) Who and what supported and impeded the implementation process?

4) How did teachers describe changes to engagement in classroom activities and interpersonal communication in response to AAC device implementation and training?

Data were collected using standard qualitative research methods of observations, interviews, and journaling (McMillan & Schumacher, 2010). Data were analyzed first by a process of induction, where patterns and themes were derived from data; and second by a process of deduction, where answers to the specific research questions, as well as explanations based on the theoretical and conceptual framework were sought (Creswell, 2009; McMillan & Schumacher, 2010).

In this section of the thesis, data will be presented in chronological order to reflect the sequential nature of the implementation process. Data will be used to describe the patterns of communication and engagement that were present in the class before the AAC device was brought into the classroom. The teacher training will be outlined and perceptions of the teachers and the SLP regarding this training will also be reported. Thirdly, the patterns of communication and engagement, as well as the first steps in implementing the device will be

described. The data will then be used to describe the on-site implementation of the AAC device and the patterns of communication and engagement throughout this process. Finally, the use of the AAC devices after the implementation process is complete will be explained, including a description of how students communicated during this phase. All data is based on researcher observations, teacher journal entries, and teacher, SLP, and student interviews conducted post intervention.

Codes will be used in this section to improve readability. Please see Table 2 for details.

Table 2

Codes Used to Organize Data Type

Code	Meaning
ICOB	In-class Observation
TTTOB	Teacher Training Observation
BT OB	Follow-up Training Observation
C; D; J; or S	Christine; Diana; Jana; Susan
I	Interview

Before Implementation

This section describes the classroom environment in which this study took place and the patterns of communication that were evident in the classroom prior to the implementation of the AAC device. Perceptions of the teachers, the SLP, and the researcher are presented and are derived from teacher journals, teacher and SLP interviews, and researcher observations. First, the setting is described based on the researcher's first two observations, during which she sought to describe the school setting and the ways in which participants communicated

during classes. Student communication and engagement are then described through the lens of the researcher based on data collected from interviews with the SLP and the three teachers post implementation, and through direct observation field notes.

The School Environment

The environment in which this study took place was a positive, relaxed, and supportive school in which students and teachers appeared to be comfortable and happy. Students gave each other and their teachers high-fives and hugs on a regular basis, and at least one of these interactions was noticed in six out of ten classroom observations completed by the researcher [ICOB A, pp.4, 6, 7; ICOB B, p.1; ICOB E, p.3; ICOB G, pp.3, 6; ICOB H, p, 5; ICOB I, pp. 2, 3]. Start and end times of activities and lessons were flexible, and students could come and go from class as they pleased, so long as they stayed within the physical boundaries of the school. The school itself was located downtown in a small city, which allowed for many students to walk or take the city bus to school, as there was no school bus. The school was in a basement of a large building, but was bright nonetheless. There were large windows that looked onto the sidewalk, bringing natural lighting to the brightly coloured walls that were covered in student artwork. One of the classrooms, henceforth referred to as the 'primary classroom,' was set up with tables, a SmartBoard™ and computers along one wall. The visual arts classroom was set up with supplies easily accessible on shelves and tables, and a small workspace in the middle of the room. The dance and drama room was a large open room with windows, mirrors and curtains along the walls, so that the room could be transformed into a theatre with a stage This room also had a piano and sound system. Outside of the classrooms, there was a small hallway, an office, and accessible washrooms.

The routines. Each morning, students would trickle into the school one-by-one, and were often greeted enthusiastically by their teachers and their peers. At about 9:00 a.m., the class would begin by having a student choose a newspaper article from an online source, which was then projected onto the SmartBoard™ for all to see [ICOB A; ICOB B; ICOB C; ICOB E; ICOB F; ICOB G; ICOB H; ICOB I]. The teacher or educational assistant would facilitate a lesson during which students took turns reading the newspaper article aloud to the rest of the class. For students who could not read or whose speech was inaudible, the facilitator read slowly, while the student repeated to the best of her ability what was read [ICOB B; ICOB B; ICOB G; ICOB H; ICOB I]. Students volunteered to read, and although many were encouraged to participate, pressuring students to participate was never observed by the researcher. After about 30 minutes, when the article was finished being read, students were asked to summarize the article by answering "who, what, when, and where?" questions. This provided an opportunity for some students to work independently answering these questions, while others were given support and direction from staff and volunteers. For example, staff would sometimes scribe for students with mobility challenges, or spell out words for students to write [ICOB B; ICOB B; ICOB G; ICOB H; ICOB I]. Once this activity was completed, students were divided by the teachers into two or three groups to participate in either media arts, literary arts, or visual arts. At times, there were only one or two teachers available, and so students were grouped based on teacher availability. At the midpoint of this instructional period, there was a "snack" break for about 15 minutes, during which time students would come together in the primary classroom to eat and socialize with their peers. After break, students were directed by their teachers to attend a specific class, and would each disperse into one of three classrooms. Different activities took place during this class time,

which included read-aloud in literary arts, creating comic strips using iPads™ in media arts, and making animals out of paper maché in visual arts. Students were given varying levels of support based on teacher-determined need during these activities. Grouping students who struggled with an activity with students who demonstrated competence in the same activity was one strategy used by teachers; seemingly to help support students in non-intrusive ways. Additionally, there were often volunteers and educational assistants present during class time who assisted students with their activities. After these classes concluded at lunch time (12:00 p.m.), no other observations took place, but teachers reported that in the afternoon sessions, students would regularly dance, sing, or do drama.

Communication

This section describes the patterns of communication that were evident before the AAC devices were introduced to the students. Data presented here are based on the perspective of the SLP found in the interview data, the teachers' perspectives from interview and journal data, and the researcher's perspective from observation field notes. Based on consistency across participant data and frequency reported, perspectives have been grouped into three main categories: methods of communication, prior knowledge of students to facilitate communication, and students as passive communicators.

Methods of communication. The two student participants in the study primarily used "total communication," described by one of the teachers as "a little bit of signing, a little bit of verbal, and just guessing sometimes" [C I]. The SLP noticed that the students "certainly used their available methods of communication, or, certainly some words, some word approximations, gestures, body language; sometimes answering 'yes/no;' and so those things at least [gave] those students some ways of interacting" [S I]. The researcher observed this

type of communication in both students during the first two observations. For example, she wrote in her field notes: "Mary [was] introduced to the SLP, and her first word is 'mama,' pointing upwards. This [was] interpreted by one of the teachers who said that Mary is telling the SLP that her mother is in heaven. Mary confirmed this with a nod." [ICOB A, p. 1] Regarding Tom, the researcher observed that "when reading, he [made] sounds as if to mimic the teacher who [was] reading out loud. [He pointed] at words; sign[ed] (ASL) 'baby.' The book [was] about baby sharks. [He said] 'ooohh' excitedly" [ICOB 1, p.7]. Data suggested that the researcher, teachers, and the SLP have a common knowledge of how students communicated before the AAC device was implemented, i.e., that the two focal students used a combination of some words, sounds, word approximations, American Sign Language, and gestures to communicate.

Prior knowledge. Another way that teachers described communication between themselves and the students was through interpreting student methods of communication previously described in this chapter based on prior knowledge; asking the student a question; and waiting for the student, for example, to confirm. Teachers reported that it was easier to communicate with students the longer they were acquainted because they used their background knowledge of the students to guide conversation, concurring that without this contextual knowledge, communication was challenging.

> The more that I got to know them, the easier it became…this morning, I was coming in with Tom into the school, and I wanted to ask him, I did ask him, "What did you do?" because he went to respite last night for the first time. I wanted to find out how it was. What did he eat? What did they do? What kind of activities did they do? And, because I don't have anything to go on, I can't. I don't know anything about his

> respite. I can't say "Did you do this?" "Did you watch TV?" He will often say "yeah" to everything, so it's very difficult without the background knowledge to be able to have meaningful communication. [J I]

Another teacher made a related comment during her interview: "I sort of know some of the things that he's trying to tell me, or I know the questions to ask" [C I]. The idea that background knowledge plays an important role in facilitating discussion with the student participants is a common theme in each of the interviews, including the one with the SLP. She said:

> …it leaves the person that has the communication impairment always in the role of um, the, the passive recipient, and kind of at the mercy of, sort of, as luck will have it, does the next person kind of guess what I want? And then, does she hit upon the right thing? And does she ask me the right questions? [S I]

This raises another concept related to the importance of having background knowledge when communicating with the students, which was discussed during interviews as well as recorded during observations, i.e., that students were in a passive role when communicating.

Students were passive communicators. In the context of this study, passive communicators are those who rarely initiate or who rely on their communication partner to guide the conversation or interaction. Both participating students were described as passive communicators by two of the teachers and the SLP during interviews, as well as by the researcher in her field notes. "Most of the time, initiation came from the teacher," said the SLP. When asked what she remembered about communicating with the students before the AAC device was implemented, one teacher said: "I had to essentially go to one of the senior staff; get a lot of background information on [the students], and then go with 'yes' or 'no'

questions [to] be able to elicit something from them" [J I]. The researcher also noticed that the two focal students were somewhat passive in their role as communicators, but only to the extent that they were forced to rely on others to converse. In the second observation, the researcher recorded eight different instances when Tom either reached out his hand to receive a high-five or said the first sound in a teacher's or peer's name while looking at that person. Only three of these attempts by Tom to interact were reciprocated. One of the teachers, who did not refer to the students as demonstrating passive communication, also noticed that students attempted to communicate with others. During her interview, one of the teachers said that "he absolutely initiated it [conversation], he [would] seek me out and tell me something" [C I]. Data from these observations show that one of the two students in particular often attempted to initiate communication with others, but whether or not there was an interaction depended on the other person noticing and responding.

Summary

Communication patterns that were described in this section were based on teacher interviews and journals, the SLP interview, and the researcher's field notes. Before the AAC device was implemented, students communicated using total communication. Communication between teachers and students relied heavily on familiarity and prior knowledge about the students. Three participants (including the researcher) thought that students were passive communicators, demonstrating a reliance on others to communicate and a lack of initiation; while two non-student participants who described student dependence on others, also described students' efforts to initiate communication. Patterns of communication that existed before the AAC device was implemented are important to describe in this study because they provide a basis for comparison in the study.

Implementing the AAC Device

In this section of Chapter Four, the implementation process, which includes using the device in class without any training, as well as teacher training and on-site training, will be described chronologically. Training sessions for teachers that took place outside of the classroom, as well as in-class training sessions are detailed and are described here sequentially; rather than categorically. The researchers' field notes from direct observations, Susan's interview, and the teachers' interviews are used to construct a detailed description of the implementation process. Data are presented sequentially that provide answers to two of the guiding questions of this study: 1) What were the steps in the implementation process; and 2) Who and what supported and impeded the implementation process?

Step One: Introducing and Exploring the AAC Device

Before teachers and students underwent any professional training from the SLP, Susan, students were given a pre-programmed AAC device to explore in class. Students experimented with the device by pressing icons randomly and impulsively, using the device often, and began adopting it as a method of communication. Teachers supported student use by asking questions for which answers were on the AAC device; but this was limiting because students remained in a passive role during interactions. The researcher's intent of observing student exploration of the device was so that the differences between implementation with and without professional instruction could be recorded. Seeking to explain these differences was not a primary focus of this research, but observations took place so that the researcher could provide a full and comprehensive description of the process. AAC devices were available to both students in class for one week prior to formal training. Students were given their own device and teachers guided them in using it as best as they

could. One teacher, Jana, programmed the devices and appeared familiar with their applications. She was able to direct students to find certain phrases, such as "I feel," and then they selected the corresponding picture for a feeling (sad, happy, angry, etc…). Field notes used were from observations E and F, which took place on January 31 and February 5, respectively. These took place while only Jana was present which did not give the researcher a full illustration of this step because only one teacher out of three was observed.

During classroom activities, Tom was observed using the AAC device regularly with a high level of support from the teacher. The class during which this was observed was media arts, a time when all of the students in class had access to an iPad™. The teacher gave instructions on and demonstrated how to create a photo slideshow. Students were seated at the tables in the principal classroom, and the teacher stood mostly at the front of the room beside the SmartBoard™, which projected what she was doing on an iPad™. When Tom first arrived in class, the teacher brought him his AAC device and set it in front of him on the table. She asked a direct question: "How do you feel today?" [OB E, p.1]. With help from the teacher, which was "getting the iPad™ (AAC device) to the relevant page and pointing to the icons and saying out loud what each icon means," [ICOB E, p.1] Tom pressed the icon for "I feel." The teacher then asked "how?" and Tom pressed the "happy" icon—a picture of a smiley face. The teacher then moved on to check on other students, and Tom looked around the room and appeared to be watching other students. Tom continued to experiment with the AAC device by pressing various icons. Although these selections appeared to begin with random selection, it seemed evident that he understood what he had pressed because he was able to engage in conversation once he heard what each icon 'said.' This is illustrated in the researcher's field notes:

Tom presses “I feel.”

E.A. says “How do you feel Tom? Tell me on your iPad™.”

Tom says “Yeah! (excitedly), and then presses “I want to go.”

Teacher asks “Where?”

Tom presses “Home.”

Teacher asks “do you want to go home?”

Tom shakes his head “No.”

Teacher asks “Do you want to be here?”

Tom says “Yeah.”

Teacher says “then press ‘classroom,’” and points to the appropriate icon [on the AAC device].

Tom watches which button is pointed to, and then presses “classroom;” says “yeah!” [ICOB E, p.2]

This type of communication, during which Tom pressed an icon but did not seem to be sure of its meaning at first, but then gained familiarity with support from staff, took place during four more observation periods. Tom was also observed pressing icons completely randomly and rapidly, to the extent that the teacher asked him to put the device away because it was too distracting [ICOB E, p. 2]. While Tom was pressing icons at random, he appeared to be exploring the device and may have comprehended some, if not most, of their meanings. He used gestures and ASL to confirm what he was communicating via his AAC device. For example, the researcher noted: “he continues to press random buttons, and every four or five buttons, he responds “yeah” or by shaking his head yes or no…” [ICOB E, p. 3]. The

researcher inferred that he was searching for an icon, and then signaled when he found one or was frustrated that he did not find one.

At one point during this class, another student in the class was observed coaching Tom on the device.

> [Tom's] partner tries to engage him [in photo slideshow activity] by saying "we're going to do this one now" and then shows a picture online. She finds the icons on Tom's iPad™ that say "I like that" and "I don't like that." She points to each one explaining what they mean, and then asks him: "do you like this one [picture]?" Tom presses: "I don't like that." Partner: "what about this one" and shows another picture. Tom: "I like that." [ICOB E, p.2, 3]

Later on that day, the researcher observed Jana while instructing the focal students on how to use the AAC device to communicate for about 30 minutes. Mary and Tom were removed from regular classroom activities, and taken into the unoccupied art room. The researcher, the teacher, and the two students sat together at one table. Jana began by what appeared to be an assessment of what the students did and did not know about the icons on their device. She gave directions that Tom was able to follow a number of times. For example, she asked him to "go back" and Tom found the "back" icon and pressed it while the teacher watched. Additionally, Jana asked him to "show: I want to go to the bathroom" [ICOB F, p. 1] and he did. She then asked him to go to the section that lists the feelings, but he was not able to do this without her pointing to that icon. After explicit prompting, he pressed the appropriate icon and was able to follow directions to press individual emotion icons that were depicted by corresponding faces (e.g., ☺ was the symbol for "happy"). This type of interaction took place for about ten minutes, and then Jana used an AAC device to have a discussion with Tom.

Using iPad™s, Tom and Jana have a conversation…

J(Jana): “Hi”

T(Tom): “Hi”

J: “How are you?”

T: “Hi, Hi” (presses) other buttons randomly

Jana attempts this (conversation) a second time…

J: “Hi”

T: “Hi”

J: “How are you?”

T: “Not so good”

J: “Why?” and then points to “I feel” on Tom’s computer

T: “I feel sick” and then claps excitedly, smiling

[ICOB E, p.1, 2]

A similar level of comprehension was also observed in the other student’s actions. Mary was able to press the icons that were asked of her. With visual prompting (pointing) from the teacher, she was able to follow directions such as “show me ‘I want to go to the bathroom;’ ‘I want to go home;’ and ‘I want to go somewhere different’” successfully [ICOB F, p. 1]. What differed between Tom and Mary at this stage was that Mary appeared to be disinterested in using the device, as she only used it when asked to do so directly. She was not observed using it during class time, even though she almost always had it with her or on the table in front of her [ICOB E & F].

Overall, during this step in the implementation process, it appeared that students were given the opportunity to demonstrate to Jana what they were capable of doing on the AAC

device. On a single occasion, for fewer than 20 minutes, Jana took the two students aside and asked them to press specific icons; and through her pointing at certain items, students were able to follow her directions successfully. In contrast, while teaching the class as a whole, Jana was not able provide consistent support to the two students using the device, and was observed to ask few questions that the students were able to answer using their AAC device. The questions that were posed required "yes" or "no" responses, and did not invite conversation. This section of this chapter provided an overview of the patterns of communication and how students used their AAC devices with one teacher when they were first given them, and before teachers were trained.

Step Two: Out of Context Teacher-Only Training

Setting. The second step in implementing the AAC device was to train teachers on how to program and use the device themselves, outside of class. This was a lecture-style out-of-context training session. Teachers and the SLP later described this session as overwhelming due to the large volume of information shared, and said that it would have been helpful if it were more "hands-on" and focused on instructional design. This training took place on February 7, 2013 at INARTS from 1:00 p.m. to 3:30 p.m., with two breaks lasting under 15 minutes in total. The training was during regular instructional time; thus, the students were also at the school, but in the Studio dancing under the direction of a dance instructor. The training took place in the principal classroom, where there are tables that form a U-shape around the outside of the room. The projector was connected to Susan's iPad™ and projected onto the SmartBoard™. Susan, along with her assistant, Natalie, trained all three of the teachers using a combination of lecture-style and hands-on instruction. The three teachers and one educational assistant shared two tablets that were available for training.

Introducing the AAC device to the teachers. Susan began the training by introducing herself and her assistant to the teachers as formal introductions had not been made with Christine and Diana up to this point despite both Susan and Natalie being in classes observing students. Susan first introduced the device by saying that learning how to implement it is a "complicated, overwhelming process, and there is a lot to learn" [TTOB 1]. Natalie conducted the first part of the training by using a Power Point™ presentation to guide instruction while the teachers practiced what was being taught on their shared devices. Natalie explained that her goal for the training was to help teachers learn how to set up and use the AAC device, so that they would be able to support their students' introduction to the technology. She introduced many different functions of the AAC device and told teachers how to switch utilities on the device by describing images of each function and displaying the visual representation on the PowerPoint™ slides. Functions included settings for zoom, text size, color, voice output, folders for different subjects, and layout of icons on the device. She asked teachers to complete specific tasks after they were described, for example: "create a new user…add different types of vocabulary" [TTOB 1] and the teachers did as they were asked. Susan worked directly with the teachers and helped them complete these tasks when they were unable to figure it out on their own. At about one hour into the training session, teachers were given an opportunity to ask questions. For example Christine asked "a question about what scrolling [was]…and if you [could] just have one folder and scroll through the whole thing" [TTOB 1] which lead to a discussion about "advantages and disadvantages of doing this: if there [were] only a few icons, it wouldn't be overwhelming to have just one file; but if you had lots [of icons] it might be hard to find one thing" [TTOB 1]. Natalie continued to work with the teachers until about 2:30 p.m., when everyone took a short break. After the

break, more questions were addressed, such as how to facilitate communication when the tablets were not on hand, for example, during art class. Natalie suggested the idea of printing out the same images that are used to identify words or phrases on the AAC device, so that if the piece of paper becomes ruined, it is not a big concern. This was of clear interest to Christine, who exclaimed "I love it!" with a laugh [TTOB 1]. Just after 3:00 p.m., when Natalie had been instructing the teachers for two hours, Susan took over.

While Natalie had focused primarily on functions of the AAC device, Susan focused on how to incorporate the device into the classroom and how to support students in using the device to express themselves. She highlighted key critical strategies for teachers to support students' effective use of the device such as the importance of vocabulary selection and voice selection, and reminded teachers that when programming the device, thought must be given to what the student might want to say, not what the teachers might say if using the device. Remembering this training, Susan shared her perspective during her interview:

> I think it was a challenging situation that afternoon. There was a lot of background noise. I found it distracting and, you know, these were teachers that have been working all day. I think they were tired. I think there they were overloaded with information, and…this goes back to [my response to the question], "what would I do differently?" I think I would have split [the initial training workshop] up in[to] maybe two shorter sessions and made sure that the, ah, information was kind of chunked a little bit more. I think it was a little bit tedious for them. I certainly think they learned the…basics of how to program though. [S I, p.2]

Susan's assessment of the training was shared not only by the researcher based on her observations, but was similar to that of the teachers as described during interviews.

How teachers responded. During the training, teachers were observed to be interested in learning about the device and its applications in class, but also overwhelmed [TTOB 1]. Teachers asked questions, appeared to follow instructions, and made eye contact with Susan and Natalie throughout. The researcher thought that the teachers might have been overwhelmed when one teacher remarked during the training "it's a lot of information, but we are learning something." These interpretations were close to what teachers disclosed about the training during their interviews. Each of the teachers reported that she found the training helpful for developing her own abilities to support students. Christine said that "it helped me orientate myself on the iPad™ a little bit better," while Diana reported that "the suggestions for some of the layout and how to position stuff was good and helpful too [be]cause then I [knew] where to look for things." Jana said that "it was good to know, you know, how to organize it, how to colour code things" [J I]. Each of the teachers also described being somewhat overwhelmed with structural and programming information, and would have appreciated more "hands-on" and practical information that related to their classroom experience [C I, J I & S I]. The "first session was not enough about best practices and too much about the technical side" [J I], said Jana. Christine commented that:

> …talking about the history and all of that…was a little irrelevant for me. I would have rather [had] practical [hands-on] experience because…we have so little time I think the more I can learn about how to use it directly in the classroom, more practical uses, that's really important for me. [C I]

This quote raises two more ideas that were shared during interviews: first, that the practical knowledge was valuable to teachers; and second, that teachers have limited time to spend on professional development. One teacher shared that more hands-on practice would

have been helpful, and suggested that "pulling in a student to work with…so I [could] really see how…to do it with a student would [have been]…more helpful to me, [i.e.,] to have a speech pathologist show me how she works with somebody…"[C I]. This teacher also discussed the fact that she, or the other teachers, did not have a lot of time to spend in training, and that if given more time, she might have learned more practical strategies for integrating the device into the classroom.

Step Three: In-Situation Student Training

The next step in the implementation process of the AAC device was in-class training. This training took place between February 12, 2013 and March 4, 2013. A second teacher training session that took place on February 28, 2014 separated this stage into two parts, and so the final component of the in-class training will be described as it existed, sequentially, after the second teacher training is discussed. This section describes how the AAC device was used in-class while Susan was on-site providing training to the students. This training involved a combination of modeling (when Susan demonstrated how to use the AAC device to the student); coaching (when Susan guided the student in using the device), and direct instruction with the student. Students appeared to learn how to use the device to communicate with the support of the teachers, and they were eventually able to initiate conversation, but often remained in a passive role. Data from researcher observations (G, H, I & J), teacher and SLP interviews, and teacher journals were used in this section in order to provide multiple perspectives.

Day one: modeling and guiding student use of the device. On the first day of in-class training, Susan and Natalie arrived at 9:30 a.m. to work with the two student participants and their teachers. They booked two hours to be at the school, and were not sure

how to organize their time between students. After asking me how to divide their time, they followed my suggestion to work with each student for one hour, and then switch students, so that I could observe only Susan for consistency. Before working directly with the students, Susan and Natalie discussed the settings that were on the AAC device with Jana, which had not changed since before the staff training. At this point in the implementation process, Susan believed that she would be able to work with teachers and students simultaneously, but she quickly learned that this was not logistically possible. When asked during her interview what she would have done differently, she said:

> I would explain from the outset to the team that the on-the-job coaching is a necessary thing…[and] you've got to somehow make it happen so that the teacher is able to observe what I'm doing. So whether that involves having another staff member teach a class, or change things around so that you have a larger group with one teacher and a smaller group with another so that you can provide that sort of level of actual coaching. I realize after the fact that I should have made that more explicit to the whole team.
>
> [S I, p. 7 & 8]

During the in-class training, the teachers were pre-occupied with the entire class and were teaching a lesson, and so despite intentions to have real-time training provided to both teachers and students, it was provided only to students. During her interview, Jana reported that she would have created "a schedule so that each [teacher] could have shadowed [Susan and Natalie] at some point" [JI p.9] if she were to go through the implementation again.

Tom. Susan began the in-class training with Tom, who was sitting at the table in the main classroom while Current Events were being discussed. He was looking around the room

and out the window, and did not appear to be engaged in the class discussion. At one point, Tom had a turn reading the article, which meant that he made noise that was not audible to the educational assistant who was reading. Susan sat next to him, and held the AAC device in front of him on the table and, when he finished reading, she asked him if he wanted to tell everyone whether or not he liked it. He first replied "yeah" out loud, and then Susan navigated the device so that she could point at "I like that," which she did, and then Tom pressed it, saying "yeah" out loud and excitedly immediately afterward [ICOB G, p. 2]. The class resumed discussion and Tom resumed looking around the room. When students were working, Susan asked Tom "how are you?" and then pointed to the icon for "I'm fine," which he pressed. He continued to look at the AAC device. Susan asked questions that could be answered using the device, for example, to identify the feeling that he thought another student was feeling [ICOB G, p. 4]. In this example, he pressed two different, opposite feelings and neither of them were accurate. Susan eventually pressed the most appropriate emotion on Tom's device, and he did the same immediately after [ICOB G, p.4]. After Current Events finished, another activity began in which students were asked to describe feelings in a song. During this activity, Susan continued coaching Tom, as described in the researcher's field notes:

> Tom is not working on this activity, and so he and SLP have a conversation.
>
> SLP shows Tom "how are you," and she presses it.
>
> Tom signs "fine."
>
> SLP says: "show me" while pointing to "fine."
>
> Tom then presses "fine."[ICOB G, p. 5]

This type of coaching continued throughout the entire class, and Tom continued to follow Susan's directions to communicate with the ACC. He also chose to speak using his voice and by using some ASL. Diana remembered this stage in the implementation process during her interview:

> Susan helped him navigate a little bit, but we were at the beginning…so I think we were all at that learning curve. Susan was showing Tom how to use [the device]; where to find certain activities, [for example] when we were doing painting as opposed to reading or doing the play [she navigated him to the appropriate folders]. From that day to now he's able to navigate it himself. [CI p. 9]

Diana does not say whether or not she attributes Tom's learning to the in-class training, although this might be implied in her description above.

During the break at 10:30 a.m., Susan and Natalie worked together to add new icons to both AAC devices. They created a folder called "Current Events," which included "good news," "bad news," "it's about" and a choice between "community events," "sports," and "music" [ICOB G, p. 6]. Susan also mentioned to Natalie that students would benefit from having cases with straps for the AAC device so that they could keep their devices with them at all times.

Mary. This observation took place in the Studio during visual arts, during which Diana read students a book while students sat around a small table and listened. After listening, students were asked to draw a timeline of events. Mary and Susan sat beside one another at the table, with the AAC device on the table in between them. While Diana read the book to the class, Mary appeared to be listening and following along because she watched Diana and made sounds after each word that Diana spoke as if reading along (even though

she was not in a position to view the words) [ICOB G, p. 6]. Mary used her voice, as opposed to the AAC device to communicate and the teacher appeared to understand her. For example: "Mary ask[ed] 'wa ah mmm?' which seem[ed] to be interpreted by the teacher as 'what's that noise' because the teacher answer[d] 'it's the heating.' There [was] a humming sound coming from the heater" [ICOB G, p. 6]. During this class, Susan worked on the AAC device programming it so that language from the book is also on the device. She added descriptive words with pictures, such as "big; cold; old; small; fast; slow; hard; soft; funny," [ICOB G, p.7] which she showed me after the class was over. There was little interaction between Susan and Mary.

At the end of this training period, Susan and Natalie told each other which icons they added to the AAC devices. They then programmed the devices so that they had the same setup. After two hours of in-class training and an informal follow-up discussion, Susan and Natalie left for the day.

Day two: engaging in sustained conversation in a passive role. The second day of in-class training took place between 9:00 a.m. and 11:00 a.m. during Current Events, followed by break, and ending with visual arts class. Just before class began at 9:05 a.m., Natalie met with the educational assistant (EA) who was going to facilitate the lesson and suggested to her that she "ask [students] direct questions that have a positive or negative answer" [ICOB H, p.1]. Susan then found out what vocabulary words would be used during the Current Events lesson, and added them to the AAC devices.

Mary. On this day, Mary only entered the class briefly before leaving again to have a discussion with Christine in the teachers' office. She returned after about five minutes and participated in class discussion. The EA summarized what Mary had missed, and then asked

her if the story was "good news" or "bad news," to which Mary replied "bad" verbally. Natalie then pointed to the "bad news" icon on Mary's AAC device, and Mary pressed it [ICOB H, p. 1]. Mary continued to participate for about 15 minutes, answering questions in a similar manner; first verbally and then using the AAC device after guidance from Natalie. Midway through the class, one of the teachers told Mary that she had to go home and that someone was there to take her. During her interview, Jana said that "…Mary ha[d] some challenges around…how to find buttons; how to get to the stuff that she might want to say…Mary opt[ed] not to use it when she [was] upset or angry…[but] those are the times we would like her to use it" [JI p. 15]. I learned later that there had been a behaviour issue at the beginning of the day before class began. "Mary kicked someone in the morning when she was upset" said a teacher. "This behaviour is not acceptable," but the teacher did not know at that time why Mary was upset. Jana later reported in her journal that Mary used her AAC device after this incident to communicate that she had been upset with her mother for passing away [JJ Feb 15]. During the brief discussion with teachers about why Mary was upset, Christine and Natalie discussed what could be added to her AAC device to help her communicate when she was upset to prevent another outburst. Christine suggested adding descriptions, such as "I miss my mom" and Natalie recommended adding requests such as "I need to leave" and "I want to talk to someone" because such phrases would empower Mary [ICOB H, p.3]. These recommendations were acted upon. This conversation ended and I returned to the classroom to observe Tom.

Tom. The class was discussing what they had done on the weekend, and to encourage Tom to share, Natalie pointed to different options on his AAC device. For example, she asked him who he was with on the weekend, and then pointed to a number of different icons

(brother, mom, dad, etc…), and Tom said "no" until the correct response was found, and then he pressed the correct one. This continued, and Tom was able to use the AAC device spontaneously when "the [educational assistant]…ask[ed] a more specific question: "was it good?" Tom [said] "yeah!" out loud, and then press[ed] "great" on the [AAC device] without guidance [ICOB H, p. 3]. Another time that Tom used the device to communicate and also used a different method to communicate the same thing was when he pressed "I need space" and then signed "stop" immediately afterward [ICOB H, p. 3]. Later that morning, during art class, Tom used the device to request a smock:

> Christine ask[ed] Tom what he needs. Natalie help[ed] him navigate by pointing to visual arts section, and he immediately presse[d] "I need a smock." He [said] "yeah" loudly and with enthusiasm, [stood] up and [ran] out of the room toward to hallway where the smocks are stored, while repeating "yeah." [ICOB H, p. 5]

Tom eventually got a smock and participated in class by drawing a shark on a piece of paper. While he was working on his drawing, the class ended. After this second day of in-class training, Jana noticed that "Tom and Mary [were] able to navigate [the AAC device] with much more success. They still require[d] a great deal of prompting and guidance, but we [were] finding some meaningful conversation [was] happening that might not have before" [JJ Feb 15]. Diana noted that Tom was interested in exploring the device, and that he was spending most afternoons browsing the AAC device, but not necessarily using it meaningfully [DJ Feb 15].

Day three: Selecting responses accurately and practicing conversing. On the third day of in-class training, Mary was not at school, and so only Tom, his teachers, and Susan were observed. This session took place from 9:30 a.m. to 10:30 a.m., and began during

Current Events, which was in the Studio, and then moved into the principal classroom for a special presentation. On this day, Current Events was slightly different because students were watching short videos about special Olympians instead of reading a newspaper article. The special presentation was made by two of Tom's peers who were enrolled in a community integration program at the University. They introduced their professor and described one of their assignments to the rest of the class, a presentation that lasted until break. Tom did not appear to be consistently engaged in either the videos or the special presentation, but he did occasionally join into the conversations using his AAC device as well as speech.

During Current Events, Tom sat on a bench in the second row beside Susan, facing the screen onto which the videos were projected. Susan held the device in front of her but leaned in toward Tom. He navigated the device, without prompting, to a folder that had his classmates' names and photos in it and then pressed his classmate's name, pointed at him, and then said his name out loud. When a video about a basketball player was on, Susan asked Tom if she should add "basketball" to his device, to which he answered "yeah" eagerly [ICOB I, p.1]. She added it, and then asked him what the people on the video were doing. He answered by pressing "basketball" which may have been an indication that he understood the question and was able to understand the meaning of that icon before actually hearing it [ICOB I, p.1]. Shortly after this, we moved to the principal classroom to listen to the presentation by Tom's two classmates. While the class was settling down and before the presentation began, Tom and Susan sat close to the professor and had a short conversation that the researcher observed:

> [Susan] prompt[ed Tom] to press "hi how are you?" [by pointing to the icon]. [Tom pressed it and] the professor [replied] "I'm fine, how are you?" Tom use[d] iPad™ to

say “I’m fine.” Note: before using IPad™ Tom says “Uh” and signs “Fine.” [ICOB I, p. 1]

Once the presentation began, the student presenters discussed a play that INARTS would be performing. Other students shared with the professor what their role would be in the play, and once this discussion began, Susan added related phrases to Tom’s AAC device. For example, Tom was the shark in the play, and she added “shark” and “puppet” to the device [ICOB I, p. 2]. Tom pressed these icons when it was his turn to share. This example demonstrated the level of attention that is needed in programming the device so that Tom and Mary could be included in class discussion. The programming did not take long, so teachers could pre-program their devices before each class, but that would still not have allowed for involvement in spontaneous discussion. At about 10:15 a.m., Tom began pressing the icon for “it’s time for break,” and continued this intermittently until 10:30 a.m. when it was time for the scheduled break. Susan got up to leave “and prompt[ed] Tom to say ‘bye’ using the iPad™. He wav[ed] and [gave] her a high five” [ICOB I, p. 3].

Step Four: Teacher Training B

After the first teacher training, informal requests were made by the teachers to the SLP to have another training that focused entirely on instructional strategies, as opposed to programming the device. As a result of these requests, a second training was held on February 28, 2014 at INARTS, in the teachers’ shared office. Teachers asked Susan questions and discussed specific teaching strategies that could be used to support students. Susan, Jana, and Diana attended the entire hour-long session, while Christine participated in parts of it because she was pre-occupied with students. This training took place during class time, and students could be heard from outside the office. There were two AAC devices that the

teachers could access during this training, and since it was a small group of people, they all sat closely around a small table. Compared to the first training session, this one was relatively casual in that it appeared that there was little advanced planning or resource preparation by Susan.

The training. This training session was primarily a discussion among the teachers and the SLP about instructional strategies for incorporating the AAC device, and supporting the students who use it, into regular classroom activities and lessons. Susan began by prompting teachers to discuss how the device was being used up to that point. She asked the teachers "how they [thought] AAC usage [was] going so far…prompts [by asking if there were] 'any problems, comments, or questions'"[TTOB 2, p. 1]. She also asked teachers their opinions about how their role in supporting students to navigate the device and whether they were comfortable prompting them. Teachers responded by saying that the answers to both questions were essentially circumstantial. For example, Diana said that she thought it was easier to support students on Mondays because there was a smaller group of students present on that day of each week allowing her more time to give direct support to each [TTOB 2, p.1].

Susan also asked teachers if they would brainstorm how to use Universal Design for Learning in their classes. Universal Design for Learning takes place when instructional "materials and activities [are] designed to include alternatives for students with diversity in abilities and backgrounds" (Hutchinson, 2010, p. 384). This allows students to access the curriculum or course content in ways that meet their individual needs. Susan suggested that by using more visuals in class, all students would benefit. She said that all students "need props and visuals," and suggested recruiting volunteers to make props for use during reading

activities. She also recommended slowing down activities and instruction, and asked teachers to think about the goals for each lesson. For example, Susan told teachers to "always think about what the purpose of reading is: for some students, it might be a high level, but for others, it might be about word recognition" [TTOB 2, p. 3] and suggested that they plan their instruction to meet the needs of all.

The questions that teachers asked were mostly related to instructional strategies. Christine raised an issue that she was facing, which was that students could not bring their devices into her art class because they would likely get ruined by paint, glue, or other messy art supplies. Susan recommended printing out images that were the same ones used as icons on the AAC devices and laminating them for the students to use during this class. Christine said that she liked this idea, and followed through with it using this strategy in art class [TTOB 2, p. 3]. Another concern that was raised was whether the teachers' time would be wasted if they added vocabulary to the devices at the beginning of each class so that the students could be involved, and then never use that vocabulary again. Susan suggested making a folder entitled "my words," so that specialized words that may not be used all the time could be placed [TTOB 2, p.6]. Other than these questions and suggestions, little else was discussed during this training session. When there were no more questions from the teachers, the session ended about one hour after it began.

How teachers responded. There were mixed responses from teachers when asked about their assessments of the second training. Jana agreed that some valuable information was shared, but stated that the delivery style was not her preferred mode. When asked her opinion, she responded by saying:

> …the second session…was more of a discussion than a training session. And while that was good in terms of hammering home a couple of points, [such as the importance of adding] buttons that are thematically appropriate to whatever you're teaching…[and] try[ing] to use it with the whole class so that [you] can incorporate the students. I think those pieces were good, but there was not enough structure for me to get enough out of it. [JI, pp. 9–10]

Diana and Christine described the session as having a positive influence on their classroom experience with students using the device. Diana reported: "I became a little bit more confident with using it with the students and trying out different things" [DI, p.7] after the second training session. When asked what she remembered about all of the training sessions, Christine said: "I remember a little bit more about Susan's [second training] about just being thoughtful about how words fit together; how phrases can fit together; how you put [icons] in different categories…those things were helpful for me" [CI, p.8]. Overall, it seems that while there were mixed thoughts about the way this training was delivered, teachers were appreciative of the content that was discussed during this training, and acknowledged that some instructional strategies were applied or remembered in lesson planning.

Step Five: In-Class Training B

Day four: encouraging students to make requests. This section describes the in-class training that took place on March 2, 2013; after the second teacher training session. On the fourth day of in-class training, Mary, Diana, and Susan were observed during Art Class in the Studio, from 11:00 a.m. to 12:00 p.m. Tom was not present on that day. Similar to the art class described in day two, the teacher read the same book to the class out loud, and then students drew a picture of the scene that was described. Seven students, Diana, Susan, and I

sat together around one large table during this class. Susan told me that she chose to provide in-class training during this class because Diana had told her that it would be similar to the last session. She also told me informally that she chose this class because she could support Mary in using the device that had been programmed with specific, content related vocabulary the week before.

At the beginning of the class, before the teacher began reading, Susan navigated to the folder she created with content specific vocabulary and pointed at and pressed different icons, for example, the names of characters in the book [ICOB J, p.1]. Diana began reading, and Mary appeared to be listening. She reacted verbally to exciting events in the text, saying "oh no," "boom" and "yew haw;" interrupting Diana briefly [ICOB J, p.2]. Susan did not engage with Mary during the reading, though Susan was engaged in writing something down on paper. Once a discussion began about the book, Susan quickly added new icons, for example "fireworks" because that was the main focus of the chapter that was read [ICOB J, p.4]. Susan showed Mary the new icons and Mary pressed "fireworks" and "fight" while other students were drawing a picture. Mary then asked a peer to pass her the markers verbally, and did not get a response. Susan reminded her that she can use the AAC device to ask for supplies. Mary then pressed "paintbrush," and then "markers" when Susan asked her to clarify whether she wanted markers or a paintbrush [ICOB J, p.5]. At one point during this class, another teacher entered the room, and Mary asked her "how are you?" using the AAC device. A spontaneous and brief conversation then took place with Mary using the device and the teacher speaking out loud [OB J, p. 5]. At the end of class, everyone put away the supplies and left to eat lunch, concluding this in-class training session.

Step Six: Follow-up Session

As a result of informal discussions arising from teacher and SLP interviews, a follow-up training session was held on May 8, 2013 from 9:00 to 10:30 a.m. Tom was late for class, arriving at 9:40 a.m., and Mary did not come at all. Each of the participants who was interviewed said that the training would have been better for them if there were more instructional strategies and modeling presented. After all interviews were completed, Susan offered to do a follow-up session with the teachers at INARTS; which they accepted. After a request that Jana and the researcher made for more funding from the Queen's Community Outreach Centre was approved, the follow-up session was scheduled. Both Natalie and Susan facilitated this session, which was an in-class demonstration of their recommendations to integrate the AAC device into a typical class lesson. The class during which they chose to conduct this demonstration was the Current Events class that was scheduled each morning in the principal classroom. Natalie and Susan facilitated the lesson with all of the 16 students that were at INARTS that day. During this demonstration lesson, two of the teachers were present. One of them sat at the table with the students and observed Natalie, while the other teacher entered and left the room throughout. The third teacher was unexpectedly not working that day. This section will provide details of the follow-up session based entirely on the perspective of the researcher because it took place after the study had been completed and it was not a topic included in the earlier interviews with the SLP and teachers.

Demonstration of AAC device integration into instruction. As students arrived in class just before 9:00 a.m., Natalie asked one of them to select a newspaper article from an online, local newspaper, to be used as the point of discussion for the lesson. Once the article was found, Natalie began setting up for the lesson. This took about 20 minutes. Students

waited and appeared relaxed; talking casually with one another and eventually playing a group game led by one of the teachers. The researcher assumed that the reason Natalie chose to set up at the beginning of class when students were arriving, rather than before class, was for consistency with typical routines because the topic for discussion typically was chosen by a student. Setting up for the lesson not only included preparing her tablet computer, but also involved adding relevant words and icons to the student participants' AAC devices. A tablet computer was used to facilitate this lesson, and the screen was projected at the front of the classroom. While setting up, Natalie was observed filling in blank spaces, with content relevant to the chosen newspaper article, on games that appeared to have been created prior to this class. In the short time between article selection and instruction, she added logos taken from the internet of corporations that were the focus of the chosen article. At 9:17 a.m., Susan and Natalie gained the attention of the class and introduced themselves to all of the students. They explained that they were teaching the lesson because the want "to practice using the SmartBoard™ because they had just learned how [BT OB, p.1]." Natalie began the lesson, which is described in the researcher's field notes below:

> [Natalie] says that a student has picked an article, and this student volunteers to read the article first. While the student is reading out loud to the class off the SmartBoard™, [Natalie] highlights each word as it is being read. She helps to read as needed.
>
> A second student volunteers to read, and this time [Natalie] gives her the option of highlighting at the same time, which the student chooses to do. At the end of the paragraph, [Natalie] goes over the difficult words and asks the whole class to explain them. Once the meaning is identified, [Natalie] circles the word and writes the

> meaning in simpler terms beside it in red. When trying to discover the meaning of the words, [Natalie] gives hints. When the word is defined, students cheer for one another out loud. [BT OB, p.1]

After this, Natalie asked students direct questions, such as "who is mentioned in this story?" and "who are the owners of [the business]?" and students were given the option to answer the questions in writing it on the board, by circling an image or word on the board, by signing if possible, or by speaking [BT OB, p. 2]. This question and answer activity continued until 9:35 a.m., during which time students appeared engaged because they were looking at the front of the room, smiling, and reacting to the questions and comments.

At 9:40 a.m., Tom arrived and Natalie asked him to sit at the front of the room beside a teacher so that she could work with him. She "asks Tom if the story is good news, or bad news" [BT OB, p. 2]? Having just arrived in class, Tom does not have a way of knowing, and so the majority of the class answers for him verbally that it is a good news story. "Tom [then] presses "it's bad news," and then laughs. The researcher makes an assumption that he is joking [TB OB, p. 1]," to explain why he pressed the incorrect answer with intent. Between class discussions, the teacher who was sitting next to Tom said that she forgot where everything is on the AAC device. The researcher assumed that this could have been an indication that either the device was not in use all the time, or, that the teacher no longer worked directly with Tom while he used the device. Tom, on the other hand, appeared to remember how to use the AAC device because he was able to answer who, what, and where questions [BT OB, p. 3]. When Christine entered the room after having stepped out for a short time, Tom pressed her name two times, interrupting discussion.

The next activity that Natalie facilitated with the class was a matching game in which students drew a line between pictures and the written word on the board. Tom then took a turn:

> [Natalie] ask[ed] Tom to show her which [image] he wants…He presse[d] one of them on his [AAC device], and then [went] up [to the board] to draw a line between the correct word and the picture. He chose correctly on the first try. There were four options. [BT OB p. 2]

Tom continued to demonstrate an awareness of what he was communicating using the AAC device throughout this class. His responses were observed to take longer than the rest of the class, for example: "[Natalie] aske[d] the entire class a question, and most of the students shout[ed] out the answer. Tom [found] and press[ed] the response about 30 seconds later than the rest of the class" [BT OB, p. 2].

Another observation that was made was that Tom used his AAC device to initiate conversation. At one point, he pressed "I want to use the SmartBoard™" and this request was acknowledged by Natalie [BT OB, p. 3]. When other students in the room began writing "who, what, and where" on a piece of paper, Tom requested a pencil using the device. Finally, at 10:30 a.m., when it was time for break, Tom first uses ASL to tell Natalie that it is time for break, and then presses "it's time for break" on his AAC device two times without prompting [BT OB, p. 4].

The follow-up training session gave an opportunity for the researcher to observe and record Tom's use of the AAC device in-class two months after the implementation process was completed. It appeared that Tom was able to use the device to communicate when asked direct questions, and he made self-initiated requests using the device. He appeared to be

engaged in the classroom activity because he chose to participate in games and to answer and ask questions.

Because this session was facilitated by Natalie and Susan, teachers were not observed in their natural role at the school on this day. It is not possible to draw any conclusions about the teachers' level of support during instructional times because they acted as observers for the majority of this session.

This section of the chapter described the follow-up session that took place after the implementation process had been complete for about two months. This was the final time that the researcher made an observation, and no interview or journal data were included because those had been also completed over one month earlier. The researcher's field notes were used to describe the follow-up session, making this section based solely on her perspective. The field notes included examples and quotes, as well as specific examples from the training in an effort to present the data accurately and rigorously.

Summary

In this section, the implementation of the AAC device during training was described chronologically. Two out-of-class and one in-class, teacher-focused training sessions, and all in-class student-focused training sessions were detailed. Data from the researcher's observation field notes, the SLP and teacher interviews, and teacher journals were included in this section. Teacher perspectives were shared, and there was a general consensus that the training by the SLP, especially the in-class training, was an important part of the implementation of the AAC device.

Post-Implementation of the AAC Device

This section describes how the AAC device was used in the classroom after the formal implementation process was complete. Once a week, for two weeks after the speech and language professionals had finished the final stage in the planned implementation plan, students and teachers were observed during regular class time. The researcher was looking for ways in which students and teachers communicated and engaged in classroom discussion and activities. Data from the researcher's field notes are used along with data from the teacher interviews in this section. Additionally, the teachers' and the SLP's perspectives on student changes to engagement in classroom activities and interpersonal communication in response to AAC device implementation and training are described.

In this post-implementation stage, students used their AAC devices to communicate during class, and teachers encouraged them to do so if and when the AAC devices were obviously accessible. For example, if the student was holding her device, the teacher would ask her a question to which a response was available on the device. Students used their device to initiate some conversation, engage in more active communication, while at other times, students used their device to answer simple questions in more passive ways [OB K]. Teachers were not observed to pre-program the device before or during classes, and continued to have limited time to focus on personalized tasks for their students.

Post-Intervention AAC Device Usage

This section describes how students used the AAC device in class one and two weeks after to the formal training had been completed. First, researcher observations and perceptions will be used to describe the classroom experiences sequentially. Secondly, teacher and SLP

interview data will be used to describe changes in student communication that were noticed post-implementation.

Classroom observations. On March 4, 2013, Mary's and Tom's method of communication and engagement patterns were observed in class. Mary used a mixture of speaking, ASL, and her AAC device to respond to questions during Current Events. At the beginning of the observation, Mary had her AAC device, and Tom did not [OB K, p. 1]. Interestingly, Mary appeared eager to use her AAC device at this time, while she was with Tom. When Students from a local community college began a placement on the same day, and everyone in the room introduced themselves to each other (INARTS students, staff, and placement students). Without prompting, Mary attempted to use her AAC device to introduce herself. She appeared to be searching for something on her device, but did not find it or press it, and after about two minutes, she used ASL to say "my name is Mary" [OB K, p. 1]. Tom did not yet have his device with him and also used ASL to introduce himself. After his turn, the teacher reminded him to go and get his AAC device and he did. Much of this class was spent doing introductions, and few interactions took place that included either Mary or Tom. The researcher observed Mary using her device in a passive manner during the discussion about the newspaper article being discussed that day for Current Events. The teacher asked her "what sport did they [the people in the article] play?" [OB K, p. 2] and then listed a number of different sports. Mary spoke "no" to each of them, until the teacher came to the correct answer, to which Mary responded by pressing "hockey" (the correct answer) on her AAC device [OB K, p.2]. This depicts how the device was used by both Mary and Tom at this time; with a mixture of ASL, speaking out loud, and AAC device.

The second post-implementation observation took place on March 11, 2013 during Current Events. At the beginning of the observation, which began at 9:30 a.m., neither student had their AAC device with them. There were two teachers in the room when the researcher first arrived in the class, and one of them immediately went and got Mary's AAC device [OB L, p. 1]. During this observation, Tom did not have his AAC device and it was unknown why he did not have it or where it was. Tom used spoken language and ASL to communicate, and made some requests and some passive responses. Mary had her device and used it intermittently, again, with a combination speaking and ASL. At first, she seemed resistant to using her device:

> The teacher ask[ed] Mary if she want[ed] to introduce herself [to new placement student]. [Mary replied] "yeah," [The teacher] then ask[ed] if she want[ed] to used her iPad™ to introduce herself. [Mary replied] "No." [The teacher] push[ed] it, saying "it might be cool." [Mary replied] "no" out loud, and then sign[ed] "My name is Mary." The teacher interpret[ed] the sign language and repeat[ed] what Mary sign[ed] out loud so everyone could understand. [OB L, p. 2]

When Tom arrived to class, Mary began using the device, even though Tom did not have his. She also began responding to questions asked by the teacher shortly after Tom's arrival. For example, she communicated that the story was a "good news" story using her device. She also requested supplies when it was time to draw, such as "pencil" and "paper" [OB L, p. 7]. Tom communicated using ASL and some spoken language, and requested items and responded to questions using single words. For example, when Mary requested a pencil using her device, Tom made the sign for "pencil." The teacher noticed him requesting a pencil, and asked him to use his AAC device to ask instead, but he did not have it. Later on during class,

Tom made what appeared to be a request for his AAC device. He got the teacher's attention, pointed to Mary's device, and then at himself, and repeated these actions again. The teacher acknowledged that he wanted his device, but said that he could not have it because they had just begun doing visual arts and she did not want it to get dirty [OB L, p. 8].

Overall, during post-implementation observations, students used a combination of different methods of communication that were available to them. Mary used ASL, spoken language, and her AAC device, and Tom used ASL and spoken language. Tom did not have access to his AAC device, and it was not known whether he or his teachers knew where it was. Mary had access to her device, and used it intermittently and noticeably more when Tom was also present. These data were recorded on two separate occasions after the implementation process was finished, and because teachers were present every day, all day, they were interviewed so that more detailed descriptions and different perspectives on student communication and engagement could be shared.

Teacher perspectives. Interviews were conducted with teachers on March 15, 2013, which was 2 weeks after the implementation process concluded. Teachers were asked to describe student communication and engagement in response to AAC device implementation. Tom and Mary will be discussed separately because teachers discussed the two students separately when they responded to questions. Teachers found that Tom and Mary responded differently to the AAC device. "I truly believe that with Tom I've really seen a change; with Mary I'm not so sure yet" [C I, p. 10] captures the general response of the teachers. Teachers were also asked to reflect on their own experience as teachers throughout and after the implementation process, and to share recommendations for future AAC device

implementation in a class for students with ID. This section presents data from interviews in which this information is shared.

How Tom communicated post-implementation. The teachers had similar accounts of how Tom communicated in class after the implementation process was complete: he appeared to enjoy using his AAC device; he was able to navigate his AAC device quite easily and deliberately; and he made requests and answered questions using total communication, which included using the AAC device [C I, pp. 9–13; D I, p. 10; J I, pp. 13–14]. One teacher said that she felt "really excited about the fact that [she thought] there [were] a lot of possibilities because of the fact that he's so engaged with [the AAC device]" [J I, p. 14]. Another teacher reported that Tom used the device to engage not only in class, but with other students:

> …it create[d] a little point of interest for the students to come and…interact with [Tom]…with the [AAC device], they'll try to get him to say "hi" or they'll…[try] to train him. Which is kind of nice because he's getting that little bit more attention than he may have before. [D I, p. 10]

Teachers reported that Tom appeared to use the device deliberately. "He kn[ew] exactly where to go…he's actually scanning and looking for the things that he wants to express; so that's a real shift" [C I, pp. 9–10]," said Christine. All three teachers noticed that Tom used the AAC device to communicate, but that he also continued to use ASL and spoken language. One teacher observed that he used less ASL than he did before the device was implemented because he used his AAC device instead, but she hoped that eventually he would use more total communication [C I, p. 10]. Overall, there seemed to be a consensus among teachers that Tom used the AAC device to communicate and engage in classroom activities and lessons.

How Mary communicated post-implementation. Teachers reported that Mary used the AAC device to communicate after it was implemented, but that she often chose not to use it and to use spoken language instead. Teachers also noticed that Mary used the AAC device more when Tom was present. They were uncertain about the extent to which Mary understood how to use the AAC device as a means of communication, and thought that she might have pressed random icons at times. Diana thought that Mary was capable of expressing herself verbally, and did so instead of using the AAC device because it was quicker : "She'll sign, or say the words she knows and kind of mime out whatever she's trying to get across" [D I, p. 11], she said. Christine noted that Mary continued to struggle with orienting the device after the implementation process was over:

> With Mary I think she's still just randomly searching…I don't see…that she she's made the correlation between where to find things, how to express [what she's trying to say], what department to look for it in. She's just randomly looking, but hopefully that will shift; and I think it can." [C I, p. 10]

Jana and Diana also believed that Mary might not have used the device as an effective communication tool because she still did not know how to navigate it accurately [J I, p. 14; D I, p. 11]. When asked if there was a noticeable difference between before and after the device was implemented, Diana said: "with Mary I don't think there's a whole lot of difference [and] that it hasn't really increased her involvement…with Mary I don't think there's been a lot of change" [D I, p. 12]. Although teachers reported that Mary faced challenges in using the AAC device to communicate, fortunately she was still able to use her verbal skills to engage in classroom activities.

How teachers reacted to student use of AAC devices. Overall, teachers reported that they found the AAC devices useful for both Tom and Mary, and that when the devices worked and were used as intended, they were good communication tools. They noticed that even with implementation that included professional training, students' abilities remained limited. Finally, teachers described ethical concerns with this particular implementation.

Both Christine and Diana reported that the AAC device was sometimes distracting to them while teaching. Both students sometimes pressed buttons randomly during a lesson, as if they were searching for something, but regardless, teachers found that it interrupted their teaching [C I, p. 11]. "It [was] great when working…and a bit frustrating [when it didn't]," said Christine, "you have to stop everything to try to make the [AAC device] work" [C I, p. 10]. She continued to describe the challenges of facilitating an entire class with a number of other students who also require attention while trying to fix the device. Often times, she and the student simply set the device aside and did not use it until later [C I, p. 10].

One teacher, Diana, reported that during some classes, the teachers forgot to get the AAC devices for the students. The devices were stored in the principal classroom, and students could access them if they wanted to or remembered to. She said that on some days, the devices were not used until after lunch, but that this was improving and the devices were becoming part of their routine [D I, p. 9].

Another teacher discussed her ethical concerns with implementing the device in the classroom because students were not given the device to use all of the time. She had concerns about "giv[ing] them this amazing tool and encourage[ing] them to use it…[J I, p. 14]"and then not using it all of the time, for example, during art class and in the community. She believed this to be an ethical issue because "they've sort of had a taste of what it's like to be

able to communicate more efficiently, effectively, and meaningfully, and then they don't have that ability when they go home or they go out in the community" [J I, p. 15]. Another concern of hers was money, because the school "[could not] afford the kind of cases that we required in order to keep the iPads safe…whenever there's food or water, drink or paints, or…when they're performing the play, when they're practicing the play because they're not portable as they stand" [J I, p. 14]. These ethical concerns were not reported by all teachers, but are important to note nonetheless.

Finally, teachers reported that the AAC devices aided the students in communication. Jana shared that "it's hard to isolate what the variables were but, regardless, I think the truth of the matter is that they're, [the students are] much better at communicating now, and that they can communicate much more than they used to" [J I, p. 12].

Recommendations for Future Implementation

During interviews, teachers were asked to reflect upon their experiences as educators and as learners throughout the implementation process of the AAC devices in their classrooms. They shared that the process was challenging at times; professional training by the SLP was helpful; and access to AAC devices for certain students in particular situations is recommended. This section describes the teachers' feedback.

The AAC device implementation process was challenging for some of the teachers because they found it to be somewhat disruptive during lessons [C I, p. 10; J I, pp. 9, 17]. Jana recommended being patient because it took time for the students to learn how to use the AAC device, and while they were learning, they sometimes experimented with the device in the middle of class [J I, p.18]. She added:

> There are a lot of barriers [in implementing the AAC device], absolutely, it's not a magic pill.…knowing that learning happens incrementally [is important], and just like teaching somebody to read, it's not always that you're going to be at the phonetic stage where you have to sound everything out. It's going to get easier for them and [for] you. [J I, p. 18]

Teachers shared the view that AAC device implementation was difficult for them, but that it became easier over time and after both teacher and student training.

Teachers were unable to say whether the skills that were developed by the students were a direct result of professional training, but did share that all of the training contributed to the students' perceived "success" [C I; D I, p.10; J I, p. 18]. In addition to reporting that the device seemed to help students communicate in some ways, teachers discussed what they learned as a result of the professional training. Christine and Diana both shared that they were more thoughtful about the questions they asked the students and the structure of lessons after they participated in the teacher-only training [C I; D I]. Jana said that she benefitted most from the in-class training: "I think more than anything having the on-the-job training was probably the biggest piece" [J I, p. 9]. She also reported that the instructional strategies that were discussed during the second teacher-only training, specifically Universal Design for Learning, were beneficial to her role as a teacher [J I, p. 18]. Overall, teachers reported that both in-class and out-of-class professional training by the SLP was helpful, and they added some suggestions for future AAC device implementation.

With few exceptions, teachers recommended the use of AAC devices in class for people with ID. "I would say…first; definitely use it…if you have the ability to take the time to do the training; that's required. I think [the device] needs to be used consistently to be fair

to the students and to be worth the trouble of learning it and teaching it and incorporating it into the classroom" [J I, p. 18] said Jana. She later added that she "would recommend it for teachers who feel comfortable with the technology or feel comfortable learning the technology" [J I, p. 18], but not necessarily for those who are not willing to learn.

Another recommendation that both Diana and Jana shared was that a system be developed to help teachers remember to encourage the use of the AAC device on a regular basis. Both teachers noticed that at times, the device was forgotten and never used; making it more challenging for the students to learn [D I, p.13; J I, p. 17]. Additionally, one teacher said it was important to "…keep [the device] in mind when…planning lessons…[and add] some things ahead of time [D I, p. 13]" to make sure the student has opportunities to use the device in class.

Summary

This section described how the students communicated after the AAC implementation process was complete. It also described teacher perceptions of the implementation process and their recommendations for future use. The teachers and the researcher found that both students used total communication after the implementation process was complete, which included the use of their AAC devices. Teachers shared that the AAC device was a useful communication tool for the students, and that professional training by the SLP was an important part of the implementation process. They also described their experiences during the implementation process as challenging, yet worthwhile.

Key Findings

In this chapter, data that answered research questions was presented in chronological order. Codes and patterns emerged from the data, and from these, themes were derived. These

key findings are described in this section. First, the data suggested that both teachers and students were interested and engaged in learning how to use and implement the AAC device. Secondly, teachers faced practical and logistical challenges during the implementation process which limited their ability to change their teaching to include participation by students who used AAC devices. Thirdly, students faced practical challenges which limited, but did not completely thwart, their ability to use the device as a communication tool. Fourth, the AAC device itself was restrictive. Fifth, students used a combination of ASL, vocalization, and body language to communicate throughout the study, and in addition to these methods, used the AAC device to communicate after implementation. Finally, student engagement changed with the use of the AAC device.

Teacher and Student Engagement in Learning

For the duration of the study, both teachers and students appeared to be interested and engaged in learning how to use and implement the AAC device in the classroom. The teachers reported that they were excited to support their students in acquiring the skills needed to use the device as a communication tool, and were observed to be engaged and interested in the professional training that took place. Both students appeared to be engaged in learning how to use the AAC device before and during professional training by the SLP, and one student appeared to be more engaged than the other after the device was implemented and there was less much support. One student continued to use the AAC device regularly when given the opportunity after it was implemented.

Practical Challenges Faced by Teachers

During the implementation of the AAC device, teachers faced many challenges which limited their ability to integrate the devices into their classroom. Teachers did not have

enough time or the opportunity to participate in ongoing professional development because they could not fund extra staff to supervise their instructional time. Additionally, it was difficult for all teachers to schedule training times with the SLP. Some did not observe the in-class training, as was originally intended, because they were occupied teaching the entire class. The SLP did not realize that teachers would be instructing at the same time that the in-class training took place. Finally, teachers had limited planning time which made it challenging to re-structure and organize lessons to include new strategies learned during training.

Practical Challenges Faced by Students

Students faced practical challenges in using the AAC device. Firstly, students were not deemed capable of programming the device prior to or during its use, and had to rely on pre-selected vocabulary to communicate. This meant that they did not necessarily have the opportunity to express their own emotions, reactions or requests. Most significantly, the AAC device was slower than speaking, and students either used their voices (despite their difficulties articulating words), ASL or experienced a delayed response to questions. The device was also complex, and students appeared to get confused with the numerous folders and icons on the device; likely as a result of their ID. Finally, students were not able to use the AAC device outside of school or during all class times, which meant that they could not rely on or commit fully to use the device as a support to communication.

AAC Device Restrictions

The AAC device itself was somewhat limiting. It is an expensive, high-tech piece of equipment, and because of safety concerns, students were restricted in its use. For example, the device was not allowed to leave the school, be used in the presence of food or drink, or

taken to art, music, and dance classes. The device was slower than speech because it was complicated and time was required to navigate from the home page to a specific desired response.

Students Used a Combination of Different Strategies to Communicate

Students were observed using a number of different methods to communicate throughout the study. These were ASL, speaking, body language, and the AAC device. Before the AAC device was implemented, students were in a passive communication mode and the majority of their interactions were responses to others' comments or questions. During and after the implementation of the AAC device, students used the AAC device to ask questions and make requests, affording them more opportunities for active communication. One student, Tom, used the AAC device more consistently than the other, Mary. Mary's use of the device was concomitant with Tom's presence and purposeful employment of the AAC. Students continued to use the same methods of communication that they used before the device was implemented, but added the AAC device to their menu of communication choices throughout the study.

Student Engagement Changed Throughout the Study

Student engagement in classroom activities differed between the two student participants. Mary was intermittently engaged in classroom activities before, during, and after implementation. At the beginning of the process, she appeared to be engaged in using the device, but lost interest as time passed, likely because she was somewhat capable of communicating without it. Tom appeared less engaged in classroom activities before the AAC device was implemented. During implementation, Tom was engaged in learning how to use the AAC device, and later on, became more engaged in the class. After implementation,

Tom used the AAC device to interact with other students and teachers socially during class. Overall, Mary's engagement changed during the implementation process and she appeared interested in the device during in-class training, but this was not sustained. Tom changed from being moderately engaged in classroom activities, to being engaged during in-class training, to full engagement with others in the classroom using the AAC device as a communication tool.

Summary

In this section, the key findings were presented based on the data that were detailed throughout this chapter. Teachers and students were engaged in learning how to implement the AAC device, yet they all faced practical challenges during this process. The AAC device was limiting to the focal students as a communication tool in this environment. Students continued to use a combination of different methods to communicate throughout the study. Finally, student engagement appeared to change in response to the implementation process for the AAC device, but this change was not the same for the two students. These key findings answer the research questions that guide this study, as they describe student and teacher responses to the implementation process of an AAC device as a communication tool for two individuals with IDs.

CHAPTER 5: DISCUSSION

Introduction

In this chapter, the key findings of this study and their relation to the literature, as well as the researcher's reflections on and challenges while conducting this study are discussed. The purpose of this study was to describe the experiences of students with IDs and their teachers throughout the implementation process of an AAC device. This study was guided by the following four questions.

1. What patterns of communication were evident in the classroom prior to the implementation of the AAC device?
2. What were the steps in the implementation process?
3. Who and what supported and impeded the implementation of the AAC device?
4. How did teachers describe changes to engagement in classroom activities and interpersonal communication in response to AAC device implementation and training?

In this chapter, both the research questions and the sequence of the AAC implementation process are used to facilitate discussion. First, student communication and engagement is discussed with self-determination theory as a guide. Second, the challenges that teachers and students faced during the implementation process are discussed and explained using Guskey's model of teacher change and self-determination theory (SDT). Third, the researcher reflects upon the findings of this study and shares the challenges she faced when attempting to report the perspectives of individuals with ID. Finally, the overall AAC implementation process is discussed and improvement-oriented recommendations are made.

Self-determination and the Student Participants

One framework that guided this study—self-determination theory—is applied to the participating students, and is used in this section to discuss their responses to training about and access to a tool believed to have the potential to enhance their ability to communicate and engage in classroom activities and discussions. Components of the implementation process that may have affected the students' internalization of extrinsic motivation are discussed. Their experiences of autonomy, competence, and relatedness are described; followed by a discussion of the relationship between self-determination and engagement in the context of this study.

Internalization Opportunities

Internalization is the process by which external sources of motivation become internal motivators. These can range from controlled sources, such as marks in school, to integrated sources, such as learning to use a device because it may facilitate one's inherent desire to communicate (Deci & Ryan, 1991; Neimiec & Deci, 2009). Internalization is driven by an individual's self-perception of autonomy, competence, and relatedness, and can be supported by teachers. In this study, there were both barriers to and enablers of internalization and, by extension, self-determination (Neimiec & Deci, 2009). These positive and negative influences are discussed in sequence: first, aspects that were reported to be autonomy-supportive are discussed, followed by a discussion of those factors that were less so, neutral or deleterious. Competence- and relatedness- supportive factors are then discussed.

To have a sense of autonomy, students must feel that they are in control of some of their own behaviours. Teachers can facilitate students' sense of autonomy in the classroom by minimizing traditional evaluation procedures, providing choice to students, and designing

opportunities to learn that lead to the production of student work that has positive outcomes (Neimiec & Deci, 2009). All of these teaching strategies were observed in the study before, during, and after the implementation of the AAC device. At no time during the study were students required to complete formal evaluations based on their classroom activities. They were given the opportunity to engage in performance assessments, displaying their artwork or performing in productions open to the public. Informal evaluations took place in the form of applause from their peers and praise from their teachers for work completed. Teachers gave students options for what to do in class and how to accomplish tasks. For example, students could opt to read aloud or not, to draw or write during Current Events, and to act, sing, dance, video-record or produce backdrops for the musical that was in production.

For the implementation of the AAC device, specifically, students were evaluated informally when, for example, teachers would ask students to locate and press a particular icon. Less directly, students would be given the opportunity to answer questions which demonstrated what they knew about the device and the class discussion. At times during the in-class training, students were given choice by the SLP as to what images to associate with certain icons on the AAC device, for example, which photo to correlate with a sport. Additionally, when students had access to their AAC device, it was not imposed upon them; rather, it was usually placed in front of them and they used it as desired. An important autonomy-supportive action that was taken during the implementation of the AAC device was the way in which the device was first introduced. Students were given the device without formal instruction prior to the in-class training by the SLP, and were given time and opportunity to explore the device. Allowing students to explore the AAC device for days prior to formal training inadvertently provided students with choice. Students chose to use the

AAC device, and used it at their discretion. Feedback was given informally from other students and from teachers who reacted to the students when they used the AAC device.

Promoting autonomy was not a stated goal by either the teachers or the SLP, but it was a bi-product of this stage in the AAC device implementation. Teachers were able to "…identify, vitalize, and develop their students' inner motivational resources during instruction (Reeve, 2012, p. 167)," which is what the literature recommends for supporting student autonomy. Whether intentional or not, teachers demonstrated this process when, for example, Mary's and Tom's personal interests were added to each of their AAC devices and teachers asked questions about these interests and gave students the opportunity to answer using their device. Reeve (2012) also promotes engaging students' in problem-solving discussions, which was exemplified when teachers asked students to identify stories as "good news" or "bad news." Opportunities which supported autonomy in regular class activities that were appropriate for each student's cognitive and social abilities were observed during the implementation process.

Although autonomy was supported in many ways during this study, autonomy was also threatened because of a lack of choice during certain activities or for some aspects of the implementation process of the AAC device. Primarily, students were given few opportunities to program the device which they used to communicate. During in-class training, during one occasion, the SLP was observed showing Tom what was being added to his device and giving him choice in image selection. Otherwise, students were not part of the programming of the device. They could have selected a 'voice' and a talking-speed on their device that they felt represented their own, but the teachers chose these options for them. Also, students did not assist in selecting icons and words that were programmed onto the device. In addition to

selecting icons, they would have benefitted from having input into the organization of the icons on the device (Allen, 2005; Bausch & Ault, 2008). Not only would this have increased their autonomy, but it may have made it easier for the students to navigate the devices because the devices would have been organized based on their students' own thought processes. The teacher and the SLP who programmed the AAC device considered what they believed the student would want on their device based on prior knowledge and experience working with each student. This does not support autonomy because the students may not have known the extent to which their interests were considered and they certainly did not have control of what was programmed onto the device. The importance of providing choice is summarized nicely in an article by Bowman and Plourde (2012) which discusses andragogy for people with ID.

> The goal of adults with ID is the same as it is with any adult—to lead as independent and productive a life as possible. This is accomplished through choices and decisions while interacting on a daily basis with a community. If those choices and decisions are more restricted or delayed for adults with ID, then the choice and decisions leading to adult independence are also going to be restricted or delayed. (Bowman & Plourde, 2012, p. 791–792)

When people have the sense that they can face and overcome challenges, and that their goals are attainable (Deci & Ryan, 1991; Neimiec & Deci, 2009), they are said to exhibit perceived competence. Teachers can support competence by assigning tasks to students that are stimulating enough to be challenging, but not so challenging that they are not attainable (Reeve, 2012). Additionally, competence can be supported by giving students specific, constructive feedback. In general, the environment at INARTS was supportive of

competence-development because students were usually provided with the tools and supports they require to participate in class activities and tasks were flexible. Again, using the example of the musical, students chose a role that suited their abilities and teachers, educational assistants, and volunteers helped to facilitate student success. With the AAC device, specifically, competence was both supported and thwarted. It was supported when students were given multiple opportunities and the required time to locate and press a specific icon on their device. Students were likely familiar with the meaning of many of these icons, and they did not have to think about the answer to a question itself so much as they had to think about how and where to locate the icon on their tablet computer. For example, prior to using the AAC device, Tom was observed making the ASL sign for "break" at 10:30 a.m. (which was break-time) on multiple occasions, and when he eventually received his AAC device "it's time for break" was pre-programmed onto it.

A challenge that students faced in developing their competence was the complexity of the AAC device itself. Students sometimes struggled to locate icons on their devices because of the numerous folders and icons on each device: an effort that seemed to complicate the task unnecessarily. Mary might have used the device less and less because over time she realized that she was equally or more competent in communicating by voice, rather than by using the device. In contrast, Tom appeared to be aware of his slightly increased competence in communicating with the AAC, and so continued to use it when he was given the opportunity. Since SDT is inherently about motivation, and competence is a factor within the theory, it is clear that both students' competence was likely a factor in using their AAC device and demonstrating self-determination.

Additionally, students used their AAC device for a limited period of time only. They used their devices during select classes, when they themselves or their teachers remembered to get it. Students would have had more opportunity to become competent in using their device had they used it consistently in all classes as well as outside of school. They likely had a greater need to communicate with the public, for instance, at the grocery store, than with people at INARTS who were familiar with them. Assuming that more practice would impact competence; students could have had significantly more time using their device had they been able to take their device outside of the school.

Relatedness-supportive teachers demonstrate that they care about each student and are understanding of their needs and goals (Neimiec & Deci, 2009). Teachers demonstrated these qualities from the beginning to the end of the study in their daily actions. Teachers asked students questions about themselves and were aware of their interests (such as Tom's interest in sharks and Mary's interest in cats), and utilized these in their facilitation of learning. For example, much of the classroom activities centered on the upcoming musical and students created masks, puppets, and images about their character. Tom played the role of the shark, while Mary played the role of the cat. Additionally, teachers promoted conversation that included Mary and Tom by asking the entire class whether a Current Events story was "good news" or "bad news," knowing that this was a response that could be communicated through the AAC device. The one-on-one attention that students were given during the in-class implementation would likely be perceived as supporting the students' need to receive individualized instruction on the device. When this support ceased, Mary began to lose interest in the AAC device, and this decline continued until the end of the study. Tom may have continued using the device because using it made his communication more audible,

which helped other people (such as his classmates) to understand him and to communicate with him; and as a result he likely felt more related.

Another factor that may have placed a role in Mary's motivation was the social aspect of using the device in Tom's company. It appears that Tom's modelling and behaviours motivated Mary to use her AAC device. One reason could be that she used it because he was the only other person at the school using the same device, and when he was part of the environment, she felt more supported or included.

This section outlined the role of autonomy, competence, and relatedness in the implementation process of the AAC device. These three factors appeared to influence the students' ability to internalize the importance of adopting the AAC device as a communication enhancing mechanism, and likely had an impact on their development of self-determination.

Teacher Change in Practice

Guskey's (1989) model of teacher change posits that teachers adopt a change to practice when they are able to observe changes in their students' achievements and believe that this is a direct result of their instructional changes. Professional development must be ongoing and provide teachers with constructive feedback; and the most influential type of feedback is student success. Guskey's model can be used to explain why the teachers in this case study did not change their practice as much as one might have expected. First, teachers might not have had sufficient training because they did not demonstrate in class that they had been taught how to program the AAC device, and they did not adapt their lessons to include Universal Design for Learning as suggested by the SLP. Secondly, teachers might have mistaken *different* communication (i.e., using the device rather than sign language) for

enhanced communication (i.e., using the device to make requests and ask questions that could not be asked without it); and believed that their instruction sufficiently supported students' successful use of the device meaning that they did not need to teach differently. It is possible that teachers might not have noticed change in their students' communication and engagement because they were occupied with all the students in the class, and so continued to instruct as they did at the beginning of the study. Teachers were eager to implement the AAC device, but may not have realized the time and effort it would take to integrate it into their classroom; moreover, the benefits to their students did not appear to outweigh the effort required to change instructional design.

Teacher training was limited in this study. Teachers were not given leave of their regular teaching duties during the in-class training, and therefore were able only to participate fully in the two out-of-class training sessions and the follow-up session. As reported during formal interviews, these training sessions were beneficial to the teachers in that they learned how to program the AAC device and had discussions about how to integrate it into their instruction during training. Similar to Guskey's (2002) findings, Bradshaw (2002) found that professional development is an essential part of technology implementation, but that there are many variables that impact the success of implementation. Critical aspects of teacher training are that teachers collaborate among themselves, that both teachers and trained professionals set goals and design specific training sessions geared to obtain these goals, and that ongoing support takes place on-site after the conclusion of the initial training sessions (Bausch et al., 2008; Bradshaw, 2002; Calculator, 2009; Guskey, 2002). As the literature suggests, the teachers in this study needed ongoing training with specific constructive feedback throughout the implementation process (Bradshaw, 2002; O'Keefe et al., 2007; Torrison et al., 2007).

Teachers reported notable change in Tom's ability to communicate using the AAC device, and reported little to no change in Mary's communication and engagement. It is possible that these are two reasons why instruction did not change. First, the observed increase in communication through the device for Tom might have made teachers believe that they did not have to change their teaching because he was already successful. Second, Mary's continued verbal communication would not have allowed teachers to see a change, and as a result they would not be motivated to make the extra effort required.

In summary, the findings of this study that relate to teacher practice appear to be consistent with Guskey's (1989, 2002) model of teacher change and with reports of other AAC implementation projects (Bradshaw, 2002; Calculator, 2009; O'Keefe et al., 2007; Torrison et al., 2007). Teachers did not report much significant change in student communication, and, they did not demonstrate a change in their teaching practice. Students did not consistently exhibit substantial change and enhancement in their ability to communicate using the AAC device as a result of logistical and practical challenges, including the device and training itself, and therefore teachers were not motivated to modify their instruction further to include the AAC device.

Including Student Participant Perspectives

In this study, the researcher faced significant challenges in including the students' perspectives about the AAC implementation process and about their experiences throughout. The researcher designed the study to include student perspectives by reviewing the literature about how to conduct interviews on people with ID; but some unexpected challenges arose. The data from student interviews were not reported in the findings of this study because very little was communicated about the topic, and the research questions were not answered by the

students. Similar to the findings of other studies (Cameron & Murphy, 2007; Dalton & McVilly, 2004; Iacono, 2006; Mactavish et al., 2000), the participant responses were not reliable because the students demonstrated characteristics frequently seen in people with ID, which make it difficult to communicate. The primary concern was that students answered "yeah" to questions in spite of the fact that such responses contradicted their experiences as observed by the researcher and their contradicted responses to other questions. Additionally, students did not appear to remember their past experiences with the device. This was a mistake made by the researcher in that student interviews were conducted only at the end of the implementation process. Finally, the questions that students were asked during interviews were initially as open-ended as possible, but in order to secure responses it was necessary to change them to questions with one-word answers. Overall, these data were not trustworthy, and student perspectives were not self-reported in the findings of this study. Instead, indirect data about the students' engagement and communication were obtained through the teachers and the SLP interviews, teachers' journals and observations by the researcher.

AAC Implementation

The literature about AAC implementation has shown that integrating such technologies into the classroom is challenging because it requires ongoing training and support of both students and teachers, as well an observable enhancement in communication abilities (O'Keefe et al., 2007; Torrison et al., 2007). In order for these things to happen, resources, such as time, classroom support, and appropriate technology must be available (Chmillar & Cheung, 2007). The findings of this study were similar to those in previous studies of technology implementation in general, as well as the few studies that preceded this one about AAC implementation (Cheslock et al., 2008; O'Keefe et al., 2007; Snell et al.,

2006; Torrison et al., 2007). The AAC device was used as an additional method of communicating, rather than a communication-enhancing tool. The in-class training was insufficient due to a lack of financial resources, which meant that a supply teacher was not brought in to support teachers, and that students were not able to keep their devices with them for fear of damage or loss, which translated to time and money. Despite student and teacher interest in the device, they faced many challenges during the implementation process that affected the integration of the device into classroom routines and, ultimately, affected student communication.

The teacher training did not fulfill the recommendations of past studies (Bradshaw, 2002; Cheslock et al., 2008; Chmiliar & Cheung, 2007; O'Keefe et al., 2007; Torrison et al., 2007) that suggested future training be intensive, ongoing, and in situ. The intended implementation process, which included these recommendations, was affected by a lack of resources. The intensity of the training was diminished because the SLP was not available to provide daily training due to her full-time job outside of this study. For the same reason, training lasted weeks instead of months or even years. Although the in-class training made up the majority of the instruction on using the AAC device, the teachers were not included. Recommendations from the literature are to place in-situation training as a high priority, since it has been shown to be more effective than that conducted out-of-context (Torrison et al., 2007). There was a misunderstanding during the planning stage in that the SLP assumed that the teachers would be free from their regular duties in order to observe and participate in the in-class training with the student. Instead, the teachers facilitated the class while the SLP worked with the student only. Teachers were familiar with the device, but did not demonstrate that they were able integrate it into instruction so that it would enhance student

communication and participation. This may have been because they did not have the additional time it took to prepare for such lessons, or they might not have known how because they did not observe the in-class training sessions provided by the SLP. Another possible explanation is that regardless of the SLP's knowledge, experience, and facilitation skills, she was not an educator. The use of experienced teachers as facilitators of training has been shown to contribute to successful implementation and teacher development (Bausch & Ault, 2008; Bradshaw, 2002; Guskey, 2013). Other trained educators could have shared their experiences and instructional strategies with the teachers participating in training, and this collaboration (vs. training) might have increased accountability. Specific goals related to integration of the technology could have been discussed in terms of instructional design, rather than communication-enhancing strategies (Bradshaw, 2002). This is not to say that the training by the SLP was not valuable, but that including professionals who were teachers might have had a greater impact on the success of the implementation process.

Student use of the AAC device looked different for each student. By the end of the study, Mary appeared to return to her original method of communicating, which was primarily verbal, because it was faster, easier, and equally effective. She did not need the device because the people around her were able to infer meaning based on her words or word approximations. Tom, on the other hand, likely had a greater need for the device because his language was more impaired, and appeared to benefit more from using the AAC device to communicate. With in-class training, he was able to understand how to use the device to respond to questions and to initiate some conversations. Unfortunately for Tom, the device was not always available, which in turn limited his potential to fully utilize it. With consistent use, gains in communicative abilities might have been more noticeable.

Summary

This section discussed the findings of the study and situated them within the published literature about the guiding theoretical and conceptual framework of this study, as well as about conducting research on people with ID and about AAC implementation. The AAC device likely contributed to the student participants' self-perception of autonomy, competence, and relatedness as they exhibited some behaviour in class that demonstrated engagement. Teachers did not adopt new instructional strategies probably due to insufficient training resulting from a lack of resources, and may not have seen a need to change. Obtaining student perspectives was a challenge faced by the researcher, and she was not able to include their data in the study. Finally, the implementation process shared similar characteristics to past studies, and underscored the recommendations of previous studies for ongoing, in-class training.

Recommendations

Based on the findings of this study, a number of recommendations are made for both educators and researchers. For educators, recommendations on supporting student self-determination during AAC device implementation are made first. Suggestions for future professional development, as well as those for AAC device implementation processes follow. Finally, recommendations are made for researchers who wish to include participants with ID, and, who study AAC devices in the classroom. General recommendations are outlined below:

1. Encourage students to provide input and feedback in the planning and implementation process.
2. Give students opportunities to make choices and initiate conversation on their AAC device.

3. Ensure that the implementation process is well-planned and that each session is both purposeful and practical.
4. Include educators with knowledge of AAC device implementation in the entire process.
5. Develop teacher knowledge of past studies and other programs in which AAC devices were used prior to implementation.
6. Conduct brief interviews with participants who have ID at regular intervals throughout study to increase inclusion.

Recommendations for Practice

The findings of this study hold useful information for teachers who may wish to implement AAC device in their classrooms in the future. Firstly, students need to be given choice, opportunities to demonstrate competence, and consistent opportunities to use the device to enhance communication in order to develop competence, confidence, fluency and automaticity in AAC utilization, and, to support self-determination. Secondly, AAC implementation requires and should always include thoughtful planning and purposeful training, in-class modeling and coaching, student involvement in the planning process, and resources (time, financial support for products, and experienced professionals) must be available. Thirdly, teachers would benefit from developing their own knowledge of AAC device usage through observations and research prior to implementation, so that they can set goals and be aware of the degree to which they likely need to change their practice.

Encourage students to provide feedback and make choices. To provide opportunities for students to increase their motivation toward learning how to use an AAC device, it is recommended that students be given choices and tasks that are challenging yet

attainable, that they set goals and have support in reaching them, and have positive relations with their teachers and peers.

As discussed earlier, it is important that students are given choice in programming their AAC device; but they should also be given choice in setting-goals, selecting activities in class, deciding whether or not to participate in discussions, and in how they want to communicate (with or without the device). Having choices and making decisions about their learning would likely positively influence their sense of autonomy. Competence can be affected by overcoming challenges. In this case, teachers may not have to plan for challenges because learning how to use the AAC device is sufficient; instead, helping students overcome challenges and breaking down barriers would be useful. This can be done by providing personal support, slowly increasing the complexity of their device (by adding more icons), slowly reducing modeling during training sessions, gradually phasing out the SLP, and providing opportunities to show what they know. A student's sense of relatedness can be encouraged by providing students with feedback so that they recognize that the teacher wants to help them. Additionally, simply engaging in conversation with students and focusing on their interests would be beneficial. Engaging in practices that promote self-determination is recommended for teachers in any classroom, as well as including those in which an AAC device is being integrated (Bradshaw, 2002; Guskey, 2002; Guskey, 2014).

Engage in targeted planning and implementation. When introducing an AAC device into the classroom, a holistic planning process that considers all different contexts in which a student has communication opportunities, the available resources, and goal-setting exercises for teachers, students and professionals (such as an SLP or occupational therapist) is recommended. A holistic planning process would include the perspectives of all parties

directly involved in the study, take into account students' and teachers' needs in a variety of routine scenarios reflective of a "typical day," and culminate in a specific plan for strategies and resources to support implementation.

Thoughtful planning begins with helping teachers understand the possibilities available for students with the assistance of AAC devices, as well as helping teachers to envision how to educate these students. Observing a program in which a student who uses an AAC device has been successfully integrated into the learning environment would provide a real-life example of the ultimate goal of implementation. This would help teachers decide whether or not they wish to invest in professional development aimed at (likely) changing their practice. Additionally, it would give them an idea of the potential that the AAC device holds for assisting their students in communication.

The next step in thoughtful planning is selecting and programming the device. Selecting a cheaper AAC device would provide students with more opportunities. It would be more likely that students could take their device home with them, allowing for more practice communicating with people who might not understand nonverbal or sign language. Selecting a more basic setup for students with severe ID would also be beneficial in that navigation would be less complicated. Honouring the students' perspectives would be particularly important in this stage of planning. Depending upon their cognitive and physical abilities, students could be included in this process by learning how to program the device themselves (and doing so); being asked questions about what they wanted on the device and these preferences being taken into account; being given options of devices and icons from which to choose and autonomy to select those that are installed; or simply affording the opportunity for the student to approve the ways in which the device was pre-programmed. Teacher

perspectives are valuable in that they provide unique perspectives about the ways in which the student routinely communicated, about the content of the course, and, about the method of instruction. Teachers can determine the content on the device so that students' are able to participate in discussions and activities in class. Additionally, teachers could share their prior knowledge of student interests and have this incorporated into the device's content. The SLP can contribute to the planning process by providing her specialized knowledge of language development and communication methods. She could help formulate sentences on the device that empower and enhance the students' communication based on her expertise. With the collaboration of an inter-professional team and family members—the AAC device can be programmed so that the student has opportunities for enhanced communication; but these same people should also help to make the device functional.

Thoughtful planning includes planning for practicality. Student needs, the context, and the environment must be considered. Supporting student needs includes supporting individual physical and cognitive abilities. An example of this type of support could be choosing a large display screen to support motor-control challenges and visual impairments, or minimizing the complexity of the icons on a device's screen. It also means scheduling training sessions that support student abilities, which would affect the length of sessions, the instructional method or modeling foci provided in each session, and the goals of each session; as well as the overall outcome of implementation. It is recommended that the level of support required is determined during the planning process, and resources (such as one-on-one support from an educational assistant) are ensured to be available during the implementation plan. The environment in which the device will be used is also critical to consider. Classes or schools that require the student to be mobile (e.g., dance) or work with messy substances

(e.g., paint) might purchase a waterproof case with a neck strap. This way the device can be protected and yet constantly be with the student, which would allow the student continual access and more opportunities to use the device. Regardless of the specific situation, what is important is that the plan must be thoughtful, individualized, and contextualized.

During thoughtful planning, teacher availability to participate in training sessions should be considered, and these sessions must have purpose that is applicable to their individual practice. In-class training of teachers is essential for successful implementation of AAC devices (Cheslock, et al., 2008; Torrison et al., 2007) and must be prioritized during the planning stages. To prepare for in-class training, which includes modeling and coaching, teachers need to be released from their daily responsibilities. Another instructor should be brought into the class to support the students while the teacher focuses on her own professional development. As suggested in other studies, this in-class training should be provided on multiple occasions over time (Cheslock, et al., 2008; Torrison et al., 2007).

Time and money, however, are not always available in today's economic context. Fortunately, without these scarce commodities, successful implementation is still possible. Through strategic professional development that includes targeted training, in-class coaching, and peer support for both teachers and students, AAC devices could be fully integrated into the classroom. With little time and money, it is especially important to plan training that is goal-oriented, and that teachers have a clear vision of successful implementation. Teacher training could be conducted in the classroom and include a demonstration by the SLP of how to support the AAC device user. When planned effectively, teachers could work together and support each other's learning while the one of them participates in training and the other teaches. Students would also benefit from working with their peers, as demonstrated in this

study by Mary, who was more inclined to use her device in the presence of Tom. An environment in which teachers and students support one another by allowing each other opportunities to learn can be both inexpensive and efficient.

Develop teacher knowledge prior to implementation. Educating teachers on past AAC device implementation experiences and on how AAC devices are used successfully in the classroom is recommended. Having an awareness of the experiences of teachers who implemented AAC devices in their classrooms would help them learn how challenging it is to integrate an AAC device into the classroom, and the level of teacher-support and teacher-change that is required. Learning how AAC devices are used successfully in the classroom would provide the teachers with exemplary practices which they could strive to adopt. Additionally, teachers would be able to select facilitators of training who could support them in setting and obtaining their goals, and, who could provide strategies that could be used to support individual students who use AAC devices while instructing the entire classes. .

Past studies have found that teachers were not initially aware of the extent to which their teaching practice might have to change in order to accommodate students who use AAC devices (Cheslock, et al., 2008; O'Keefe et al., 2007; Torrison et al., 2007). By knowing what significant challenges other teachers have faced in supporting implementation of AAC devices in the past and considering what they have recommended, teachers could determine whether or not they have the time, resources, and desire to commit to such an endeavour. Teachers who realize the efforts required on their part would be able to make modifications to their instruction and take the time that is needed for their own professional development and planning. Designating time to set goals for personal professional development, engage in training sessions, and plan for classes is recommended. Additionally, it would be helpful for

teachers to take this time not only during the implementation process, but on an ongoing basis. Supporting students does not end when the training period is complete, and it is critical that teachers are willing to continue to provide support to their students through professional development and planning (Bradshaw, 2002).

If teachers are able to access schools in which AAC devices are used regularly in classrooms, such as a classroom or school for people with ID, it is recommended that they observe how other teachers integrate students who use a device into their instruction and activities. Not only would this help teachers develop an awareness of the level of commitment required, it might help them set attainable goals to work toward during the implementation process in their own schools.

Recommendations for Research

Based on the findings of this study, a number of recommendations arose. These include suggestions for educators about how they can support students during this implementation process, as well as how they can optimize their personal development as teachers. Other recommendations are directed at researchers who study AAC devices in classrooms, and, who study exceptional learners and seek to include the perspectives of people with ID.

This study has implications for future research which seeks to develop an understanding of the experiences of teachers and students with ID during the implementation process of an AAC device in the classroom. These findings can be extended to research on AAC implementation in general, the development of self-determination through AAC devices, as well as research which seeks the perspectives of people with ID.

Since studies about AAC implementation for people with ID are limited, this study contributed to existing studies by helping make the published findings and recommendations of other studies more transferable. Past studies, as well as the present study found that AAC devices can be used as effective communication tools when students and teachers are given individualized and ongoing support from a language specialist; but that this does not typically happen within the classroom environment due to limited resources and time (Cheslock et al., 2008; O'Keefe et al., 2008; Maor et al., 2011; Millar et al., 2006; Snell et al., 2006; Torrison et al., 2007). These studies also recommended that teachers specifically receive in-class training; and they suggested that increased teacher motivation improves the integration of students who use AAC devices into classroom activities. Although this information has been described previously, the present study verifies and supports suggested strategies for future AAC implementation.

Include participants with ID through thoughtful data collection methods. Few studies have been conducted which apply aspects of self-determination theory to individuals with ID. SDT is often used to describe student motivation and learning, and papers discussed in this thesis are samples of many (Deci et al., 1991; Deci & Ryan 2002; Neimiec & Ryan, 2009; Reeve, 2012; Vansteenkiste et al., 2006). One study sought to share the perspectives of two people with ID about their own self-determination, and the participants in this study functioned at a high level and were able to communicate effectively (Ward & Meyer, 1999). The present study is unique in that it suggests that self-determination can be increased by enhanced communication by people with ID, and it opens up a dialogue for exploring the relationship between SDT, communication, and ID further.

Conducting research about people with ID is not unique to this study, but there is little literature that helps qualitative researchers when working with people with severe ID and the findings of this study may be useful. This study recommends that researchers maintain detailed observation notes and use video-recording during all data collection periods to obtain accurate and trustworthy data. It is important that the researcher who seeks the participants' perspectives conduct numerous interviews over time, immediately after an event has taken place, in order to collect trustworthy data. Asking open-ended questions is challenging, and so perhaps asking closed questions but providing multiple choices of answers would be helpful. It is also recommended that the researcher seek the perspectives of additional sources to corroborate the data obtained directly from participants with severe ID to increase reliability.

Summary of Recommendations

This section provided recommendations based on the findings for this study for teaching practitioners and researchers. For teachers, it suggested that they engage in purposeful, goal-driven planning; that they build their knowledge about other AAC implementation processes and use it to make informed decisions about the level of support they can provide and what it might look like; and that they strive to use the implementation process to support students' self-perception of autonomy, competence, and relatedness. Recommendations for researchers included strategies for future research on AAC device implementation and on self-determination in education, as well as suggestions for including people with ID in research.

Limitations

The trustworthiness of the data, the lack of a baseline, and limited resources were limitations of this study. The description of student experiences relied entirely on the perspectives of the researcher, the teachers, and the SLP. Despite efforts to include their perspectives in a first-hand way, the researcher did not obtain meaningful data from students, which can be attributed to the research design in which interviews took place once, at the end of the process, rather than at intervals throughout. Additionally, there was no way of knowing what implementation would have looked like without professional training by the SLP, and many findings were attributed to the professional development which might have occurred organically (without training). The research was also limited by a flaw in design, which was that the researcher and the SLP believed that teachers would be available to participate in in-class training, when in fact they were not. The school was not equipped with the resources needed to support teachers in the classroom so that they were able to focus on the training instead of providing instruction to the entire class.

Concluding Thoughts

This study sought to describe the experiences of students with ID and their teachers during the implementation process of an AAC device in the classroom. It was guided by the following research questions:

1. What patterns of communication were evident in the classroom prior to the implementation of the AAC device?
2. What were the steps in the implementation process?
3. Who and what supported and impeded the implementation of the AAC device?

4. How did teachers describe changes to engagement in classroom activities and interpersonal communication in response to AAC device implementation and training

Responses to these questions were sought through direct observations, interviews, and teacher journals. Prior to implementation, the researcher found that students communicated using mixed methods, such as sign language, word approximations, short sentences, and gestures. The steps in the implementation process began with in-class observations, followed by student experimentation with the AAC device, teacher out-of-context training session, student in-class training, one additional teacher out-of-context training session, more student in-class training, and release of SLP support. A single follow-up session took place after the process concluded.

This study found that both teachers and students were interested in implementing AAC devices into their classroom, but that they faced challenges in doing so. Teachers struggled to find the time to engage in training and planning, and were not able to participate in the in-class training because of a lack of resources. Students had difficulty integrating the device into constant use because it was complex and it could not be used during many daily classes or outside of school. Students did not have the opportunity to use it to enhance their communication, rather, they used it as an additional method of communicating in the same way they had before the device was used. Gains in communication were made by one student and not the other, and the researcher believed that students could have made improvements in their communication given more opportunities to use the AAC device with peers and intensive training, and teacher professional development that involved informed goal-setting, ongoing in-class development, and practice using new instructional strategies. While being supported in class, both students used the AAC device to communicate effectively, although

still with limitations. During the follow-up training session, instruction that followed Universal Design for Learning strategies, gave all students, including those using an AAC device, opportunities to participate. These glimpses into the possibilities of AAC device implementation gave hope to the researcher that successful implementation is attainable and realistic.

Personal Reflections

I believe that teachers have a responsibility to help their students become autonomous, self-directed learners by providing them with the tools and strategies they need to reduce barriers to learning. AAC devices have the potential to engage learners who face communication challenges both inside and outside of the classroom, and, they can help support student self-determination. Further research in the area of AAC implementation for people with disabilities might assist in the development of strategies for successful implementation in the future, and it is my hope that this study will be a building-block in this process and in supporting learning for people of all abilities.

As an educator, this study has helped me to reflect on my own experiences working with people with ID. It has heightened my awareness of the complexities of implementing an AAC device into a classroom, and emphasized the importance of purposeful professional development. The need to set goals that are specific, relevant and attainable for general professional development as well as for individual aspects of training (such as a single session) will remain a priority in my own career. Having a clear understanding of what is possible, as well as what I wish to attain by participating in professional development, is a critical step in my own professional and personal development. I have further developed my appreciation for those who are able to integrate assistive technology into the classroom

successfully, and, who provide the necessary supports for people with ID to be engaged and included while facilitating learning for the entire class. Overall, this study has made me a more thoughtful, goal-oriented learner who values researchers, educators, and other professionals who work to improve the quality of life for people with all levels of ability.

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APPENDIX A: CORE CERTIFICATE

PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Leslie Paterson

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: 31 August, 2012

APPENDIX B: GREB APPROVAL NOTICES

November 08, 2012

Dr. Nancy Dalgarno, Research Associate
Faculty of Education, Duncan McArthur Hall
Queen's University
511 Union Street
Kingston, ON K7M 5R7

GREB Ref #: GEDUC-649-12; Romeo # 6007498
Title: "GEDUC-649-12 How teachers and students with intellectual disabilities, who are trained in using an Augmentative and Alternative Communication (AAC) device, communicate in the classroom"

Dear Dr. Dalgarno:

The General Research Ethics Board (GREB), by means of a delegated board review, has cleared your proposal entitled **"GEDUC-649-12 How teachers and students with intellectual disabilities, who are trained in using an Augmentative and Alternative Communication (AAC) device, communicate in the classroom"** for ethical compliance with the Tri-Council Guidelines (TCPS) and Queen's ethics policies. In accordance with the Tri-Council Guidelines (article D.1.6) and Senate Terms of Reference (article G), your project has been cleared for one year. At the end of each year, the GREB will ask if your project has been completed and if not, what changes have occurred or will occur in the next year.

You are reminded of your obligation to advise the GREB, with a copy to your unit REB, of any adverse event(s) that occur during this one year period (access this form at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Adverse Event Report). An adverse event includes, but is not limited to, a complaint, a change or unexpected event that alters the level of risk for the researcher or participants or situation that requires a substantial change in approach to a participant(s). You are also advised that all adverse events must be reported to the GREB within 48 hours.

You are also reminded that all changes that might affect human participants must be cleared by the GREB. For example you must report changes to the level of risk, applicant characteristics, and implementation of new procedures. To make an amendment, access the application at https://eservices.queensu.ca/romeo_researcher/ and click Events - GREB Amendment to Approved Study Form. These changes will automatically be sent to the Ethics Coordinator, Gail Irving, at the Office of Research Services or irvingg@queensu.ca for further review and clearance by the GREB or GREB Chair.

On behalf of the General Research Ethics Board, I wish you continued success in your research.

Yours sincerely,

Joan Stevenson, Ph.D.
Professor and Chair
General Research Ethics Board

cc: Dr. Lynda Colgan and Ms. Leslie Paterson, Co-Investigators
Dr. Don Klinger, Chair, Unit REB
Erin Wicklam, c/o Graduate Studies and Bureau of Research

February 11, 2013

Dr. Nancy Dalgarno
Research Associate
Community Outreach Centre
Faculty of Education
Duncan McArthur Hall
Queen's University
511 Union Street
Kingston, ON K7M 5R7

Dear Ms. Paterson

RE: Amendment for your study entitled**: GEDUC-648-12 How teachers and students with intellectual disabilities, who are trained in using an Augmentative and Alternative Communication (AAC) device, communicate in the classroom;** ROMEO# **6007498**

Thank you for submitting your amendment requesting the following changes:

1) To change the Principal Investigator (PI) status from Nancy Dalgarno to Leslie Paterson;

2) To change the status of Nancy Dalgarno from PI to co-investigator;

3) To change the status of Lynda Colgan from co-investigator to supervisor/co-investigator.

By this letter you have ethics clearance for these changes. The Romeo file has been updated accordingly.

Good luck with your research.

John D. Freeman

John Freeman
Acting Chair, GREB

c. Dr. Lynda Colgan and Ms. Leslie Paterson, co-investigators.

February 19, 2013

Ms. Leslie Paterson
Master's Student
Community Outreach Centre
Faculty of Education
Duncan McArthur Hall
Queen's University
511 Union Street
Kingston, ON K7M 5R7

Dear Ms. Paterson

RE: Amendment for your study entitled**: GEDUC-648-12 How teachers and students with intellectual disabilities, who are trained in using an Augmentative and Alternative Communication (AAC) device, communicate in the classroom;** ROMEO# **6007498**

Thank you for submitting your amendment requesting the following changes:

1) To change the number of participants from five to seven, to include the speech and language pathologist (SLP) and the speech and language assistant (SLA) in the observations;

2) To video-record the two student participant interviews using: a) an introductory letter to participants and their parents/guardians that outlines the reason for requesting the change in method; b) a revised Letter of Information; and c) a video consent form.

By this letter you have ethics clearance for these changes.

Good luck with your research.

John D. Freeman

John Freeman
Acting Chair, GREB

c. Dr. Lynda Colgan, Supervisor
Dr. Nancy Dalgarno, Co-investigator

APPENDIX C: LETTER OF INFORMATION (STAFF)

"How teachers and students with intellectual disabilities, who are trained in an augmentative and alternative (AAC) device, communicate in the classroom"

Dear Potential Participant,

This research is being conducted by Dr. Nancy Dalgarno, Lynda Colgan, and Leslie Paterson in the Faculty of Education at Queen's University in collaboration with the director at INARTS. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines and Queen's Policies.

What is this study about? The purpose of this research is to explore the effectiveness of student and teacher training on an Augmentative and Alternative Communication (AAC) device and its use in the classroom. We hope to learn how training on AAC devices affects teaching and learning for adults with an intellectual disability who specifically struggle with oral communication.

What does this study involve? This study will involve three, two-hour observations, and one 60 minute audio-recorded interview, which will take place at the end of March and be facilitated by the RA, Leslie Paterson.

I understand the observations and interviews will take place at INARTS. I understand the RA will take field notes during the observations and the interviews will be audio-recorded. I also understand that the weekly activity logs will be scanned and the originals then returned to me. There are no known physical, psychological, economic, or social risks associated with this study.

Is my participation voluntary? Your participation is entirely voluntary. You may withdraw from the study at any time for any reason, without pressure or consequence of any kind, and you may request the removal of all or part of your data from the research. You should not feel obliged to answer and questions that you find objectionable or that make you feel uncomfortable. To withdraw from the research please contact the researcher Nancy Dalgarno (**nancy.dalgarno@queensu.ca**; 613-533-6000 ext. 79324).

What will happen to my responses? We will keep the data collected from observations, interviews, and activity logs confidential to the extent possible. Only the researchers will have access to this information. The data may be published in professional journals or presented at scientific conferences, but any such presentations will be of general findings and will maintain individual confidentiality to the extent possible. A pseudonym will replace your name on all data that you provide to protect your identity. The members of our research team will have access to the data after the pseudonyms have been inserted by the researcher who collected the data. If the data is made available to other faculty and researchers for secondary analysis it will contain no identifying information. In accordance with Queen's Faculty of

Education policy, data will be retained for five years after which time it will be destroyed. Should you be interested, you are entitled to a copy of the findings.

Will I be compensated for my participation? You will not receive any monetary compensation for your time. Participants will be trained by a Speech and Language Pathologist on how to use the AAC software effectively in the classroom. If you choose to discontinue your participation in the study, you will continue to have access to the AAC program installed on INARTS iPads.

What if there are concerns? Any questions about study participation may be directed to the Educational Researcher, Dr. Nancy Dalgarno at **nancy.dalgarno@queensu.ca** or 613-533-6000 ext. 79324. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at **chair.GREB@queensu.ca** or 613-533-6081.

What do I do if I am interested in participating in this study? If you are interested in participating in this study please contact Leslie Paterson, the Research Assistant, at 01lap11@queensu.ca. If you agree to participate, please sign the accompanying consent form and return it to Leslie Paterson Please retain a second copy for your records.

Sincerely,

Leslie Paterson
Research Assistant, Community Outreach Centre
Faculty of Education, Queen's University
Queen's University, ON, CA, K7L 3N6

Dr. Lynda Colgan
Coordinator, Community Outreach Centre
Faculty of Education, Queen's University
Queen's University, ON, CA, K7L 3N6
Tel: 613-533-6000 ext. 75553

Dr. Nancy Dalgarno
Educational Researcher, Community Outreach Centre
Faculty of Education, Queen's University
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Tel: 613-533-6000 ext. 79324
nancy.dalgarno@queensu.ca

APPENDIX D: LETTER OF INFORMATION (STUDENT)

Letter of Information for INARTS Students and Parents/Guardians
"How teachers and students with intellectual disabilities, who are trained in an augmentative and alternative (AAC) device, communicate in the classroom"

Dear Possible Participant and Parents/Guardians,

This research is being conducted by Dr. Nancy Dalgarno, Dr. Lynda Colgan, and Leslie Paterson in the Faculty of Education at Queen's University in collaboration with the director of INARTS. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines and Queen's Policies.

What is this study about? The purpose of this research is to explore the effectiveness of student and teacher training on an Augmentative and Alternative Communication (AAC) device and its use in the classroom. We hope to learn how training on AAC devices affects teaching and learning for adults with an intellectual disability who specifically struggle with oral communication.

What does this study involve?
This study will involve the following:

- A maximum of 10, one hour classroom observations during regular class sessions by the Research Assistant (RA), Leslie Paterson, over a 15 week period of time.
- A 60 minute, **video-recorded** interview at the end of March, facilitated by the RA

During observations the researcher will be looking for student engagement and whether or not this changes after the AAC device has been implemented in the classroom, as well as after training on the AAC device by SLP. The researcher will specifically observe communication patterns, such as: student participation in class discussions and activities; how the device is being used in class (both by the teacher and the student); the students' ability to ask and answer questions; and the type of communication between teachers and students. Observations will be recorded in a word processor and typed by the researcher, Leslie Paterson.

The interview will consist of a maximum of 12 questions regarding your use and training of the AAC device in class, and will be **video-recorded**. Parents/guardians are invited to accompany their child to the interview. Should a participant show any indication of distress, the interviewer will stop the interview and restart once the participant has settled.

As a part of this study, teachers will also be observed and interviewed. It is possible that during the teacher interviews, the teacher will mention specific students. The researcher will inform the students and their parents/guardians that if the teacher mentions specific students during their interviews, only information relevant to the study will be discussed, and it will remain confidential.
I understand the observations and interviews will take place at INARTS. I understand the RA will take field notes during the observations and the interviews will be audio-recorded. There are no known physical, psychological, economic, or social risks associated with this study.

Is my participation voluntary? Your participation is entirely voluntary. You may withdraw from the study at any time for any reason, without pressure or consequence of any kind, and with no effect on your standing in school. You may request the removal of all or part of your data from the research. You should not feel obliged to answer any questions that you find objectionable or that make you feel

uncomfortable. To withdraw from the research please contact the researcher Nancy Dalgarno (**nancy.dalgarno@queensu.ca**; 613-533-6000 ext. 79324).

What will happen to my responses? We will keep the data collected from observations and the interview confidential to the extent possible. Only the researchers will have access to this information. **Video-recordings of interviews will be digital, and stored on a password-locked computer that is stored in a locked office. Video increases the confidentiality risk to participants, as it will contain identifying features. Only the researchers directly involved in the study will have access to videos.** The data may be published in professional journals or presented at scientific conferences, but any such presentations will be of general findings and will maintain individual confidentiality to the extent possible. A pseudonym will replace your name on all data that you provide to protect your identity. The members of our research team will have access to the data after the pseudonyms have been inserted by the researcher who collected the data. If the data is made available to other faculty, researchers or graduate students for secondary analysis it will contain no identifying information. In accordance with Queen's Faculty of Education policy, data will be retained for five years after which time it will be destroyed. Should you be interested, you are entitled to a copy of the findings.

Will I be compensated for my participation? You will not receive any monetary compensation for your time. Participants will be trained and provided with the AAC software to use until the end of the semester. If you choose to discontinue your participation in the study, you will continue to have access to the AAC program installed on INARTS iPads.

What if there are concerns? Any questions about study participation may be directed to the Educational Researcher, Dr. Nancy Dalgarno at **nancy.dalgarno@queensu.ca** or 613-533-6000 ext. 79324. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at **chair.GREB@queensu.ca** or 613-533-6081.

What do I do if I am interested in participating in this study? If you are interested in participating in this study please contact Leslie Paterson, the Research Assistant, at **01lap11@queensu.ca**. If you agree to participate, please sign the accompanying consent form and return it to Leslie Paterson. Please retain a second copy for your records.

Sincerely,

Leslie Paterson

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APPENDIX E: STAFF CONSENT FORM

"How teachers and students with intellectual disabilities, who are trained in using an Augmentative and Alternative Communication (AAC) device, communicate in the classroom"

Name (please print clearly): _____

1. I have read and retained the *Letter of Information* and *Consent Form*, and have had any questions answered to my satisfaction.

2. I understand that I will be participating in the study called "How teachers and students with intellectual disabilities, who are trained in using an Augmentative and Alternative Communication (AAC) device, communicate in the classroom." I understand that I will:
   - be observed for approximately 10 hours over 15 weeks during regular classes at INARTS by the Research Assistant, Leslie Paterson
   - participate in a 60 minute post-study interview conducted by the Research Assistant
   - maintain a weekly activity log

   I understand that the interview will be audio-recorded, transcribed verbatim and conducted at INARTS. I understand that the activity log will be scanned by the Research Assistant and the original copy returned to me.

3. As my participation is voluntary, I understand that I am free to withdraw with no effect on my standing in school as a INARTS employee. If I do withdraw, I understand that I may request removal of all or part of my data from the study and I will continue to have access to and use of the AAC software on INARTS iPads.

4. I understand that the researchers will maintain confidentiality to the extent possible. Only the researchers in the study will have access to this data. I understand the the Research Assistant, Leslie Paterson will use the data from this study for her Master's thesis and maintain confidentiality to the extent possible. The data may also be published in professional journals or presented at scientific conferences, but any such presentations will be of general findings and will maintain individual confidentiality to the extent possible. Given the small number of participants in this study, direct quotes used in publications may inadvertently identify a participant, but every effort will be made to avoid this situation. Should I be interested, I am entitled to a copy of the findings.

5. Any questions about participation may be directed to the Research Assistant Leslie Paterson at **01lapp11@queensu.ca** or the Educational Researcher Dr. Nancy Dalgarno at **nancy.dalgarno@queensu.ca**; 613-533-6000 ext. 79324. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613-533-6081 or **chair.GREB@queensu.ca**.

I have read the above statements and freely consent to participate in this research.

Signature: _____ Date: _____

I would like to request a copy of the results of this study sent to the following email or postal address below:
Please sign one copy of this Consent Form and return it to Leslie Paterson. Retain a second copy for your records.

APPENDIX F: STUDENT CONSENT FORM

"How teachers and students with intellectual disabilities, who are trained in using an Augmentative and Alternative Communication (AAC) device, communicate in the classroom"

Name (please print clearly): _____

1. I have read and retained the *Letter of Information* and *Consent Form*, and have had any questions answered to my satisfaction.

2. I understand that I will be participating in the study called "How teachers and students with intellectual disabilities, who are trained in using an Augmentative and Alternative Communication (AAC) device, communicate in the classroom." I understand that this means I agree to participate in a maximum of 10 classroom observations and one 60 minute interview. I understand that I will be observed for approximately 10 hours over 15 weeks during regular classes at INARTS by the Research Assistant, Leslie Paterson. I understand that the interview will be audio-recorded, transcribed verbatim and conducted at INARTS. Should I show any indication of distress during the interview; the interviewer will stop the interview and restart once I am ready.

3. I understand that my participation is voluntary and I may withdraw at any time. As my participation is voluntary, I am free to withdraw with no effect on my standing in school as a INARTS student. If I do withdraw, I understand that I may request removal of all or part of my data from the study. I also understand that if I do withdraw from the study, I will continue to have access to and use of the AAC software on my iPad.

4. I understand that the researchers will maintain confidentiality to the extent possible. Only the researchers in the study will have access to this data. I understand the the Research Assistant, Leslie Paterson will use the data from this study for her Master's thesis and maintain confidentiality to the extent possible. The data may also be published in professional journals or presented at scientific conferences, but any such presentations will be of general findings and will maintain individual confidentiality to the extent possible. Given the small number of participants in this study, direct quotes used in publications may inadvertently identify a participant, but every effort will be made to avoid this situation. Should I be interested, I am entitled to a copy of the findings.

5. Any questions about participation may be directed to the Research Assistant Leslie Paterson at **01lapp11@queensu.ca** or the Educational Researcher Dr. Nancy Dalgarno at **nancy.dalgarno@queensu.ca**; 613-533-6000 ext. 79324. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at 613-533-6081 or **chair.GREB@queensu.ca**.

I have read the above statements and freely consent to participate in this research.

Student Signature: _____ Date: _____

Parent/Guardian Signature: _____ Date: _____

I would like to request a copy of the results of this study sent to the following email or postal address below:

Please sign one copy of this Consent Form and return it to Leslie Paterson. Retain a second copy for your records.

APPENDIX G: VIDEO CONSENT FORM

For The Use Of Videotape Of The Session

Please fill out either Section A or Section B

Section A

I agree to allow **Leslie Paterson** to use the videotape of our session for one or more of the following purposes:

1) Publication in a Journal *Signature:* _____

2) Demonstration to Students *Signature:* _____

3) Demonstration at a Conference *Signature:* _____

Date: _____

I understand that neither my name nor my child's name will be associated with the work.

Section B

I prefer not to have the videotape of my child shown in classes or at conferences or reproduced in any form.

Signature: _____

Date: _____

Section C

Would you be willing to participate in future studies? Yes ☐ No ☐

APPENDIX H: ACITIVITY LOG TEMPLATE

Date: Name:

Using the template below, please describe a situation that you witnessed in the past week that relates to **engagement, interaction and/or communication** and involves at least one of the participants involved in the study.

Communication between peers and teachers	Involvement in class discussion
Asking questions	Other

APPENDIX I: INTERVIEW QUESTIONS

Sample staff questions:

1. How did you communicate with students in class before the ipads were implemented?
    a. How much do you think the students understood what you were attempting to communicate?
    b. How much do you think you understood of what the students were trying to communicate?
2. What did you notice about student engagement before the ipads were implemented?
    a. How did students participate in class activities?
3. What did you learn in your the AAC device training sessions that helped you the most? Why?
    a. What about the instruction helped you learn?
4. What did you learn in your the AAC device training sessions that didn't help you at all? Why?
    a. What about the instruction made it challenging to learn?
    b. Is there anything you would have liked to learn, but didn't?
5. What changes in student communication (if any) did you notice after the in-class coaching?
6. What changes in student engagement (if any) did you notice after the in-class coaching?
7. What would you recommend for other teachers who work with students who use an AAC device to communicate?

Sample student questions:

1. Do you like using your ipad?
    a. Is it hard?
    b. Is it easy?
2. When do you use your ipad?
    a. Do you use it in music; art; current events; dance; drama
3. Who helped you learn how to use your ipad?
4. Do you want to keep using your ipad in class?

APPENDIX J: OBSERVATION SCHEDULE

Stage of implementation	**Focus of observation**	**Participants present**	**Dates observations took place**	**Duration**
Pre-implementation of AAC device	To observe and record student and teacher communication during class time	Teachers and students	January 15, 2013 January 17, 2013	2 hours 3 hours
Segregated teacher training on AAC device	To observe and record details of teacher training by SLP	Teachers, students, SLP (plus her assistant)	February 7, 2013 February 17, 2013	3 hours 1 hour
In-class implementation of AAC device	To observe and record c) student and teacher communication during class time d) details of implementation process	Teachers, students, and SLP	January 18, 2013 January 22, 2013 January 31, 2013 February 2, 2013 February 5, 2013 February 12, 2013 February 20, 2013 February 21, 2013	1 hour 1 hour 1 hour 1 hour 2 hours 2 hours 2 hours 1 hour
Post-implementation of AAC device	To observe and record student and teacher communication during class time	Teachers and students	March 4, 2013 March 11, 2013	1 hour 2 hours
Follow-up in-class training demonstration	To observe and record c) student and teacher communication during class time d) details of implementation process	Teachers, students and SLP (plus her assistant)	May 8, 2013	1.5 hours