ACCEPTANCE AND USE OF ASSISTIVE TECHNOLOGY: PERSPECTIVES OF HIGH SCHOOL AND COLLEGE STUDENTS WITH HIGH-INCIDENCE DISABILITIES

by

Bishwa Bandhu Poudel

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Education

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by

Bishwa Bandhu Poudel

Approved: _____
Ralph P. Ferretti, Ph.D.
Director of the School of Education

Approved: _____
Lynn Okagaki, Ph.D.
Dean of the College of Education and Human Development

Approved: _____
James G. Richards, Ph.D.
Vice Provost for Graduate and Professional Education

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Signed: _____

Laura T. Eisenman, Ph.D.
Professor in charge of dissertation

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Signed: _____

Albert R. Cavalier, Ph.D.
Member of Dissertation Committee

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Signed: _____

Ralph P. Ferretti, Ph.D.
Member of Dissertation Committee

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: _____

Beth A. Mineo, Ph.D.
Member of Dissertation Committee

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Signed: _____

Kristen D. Ritchey, Ph.D.
Member of Dissertation Committee

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DEDICATION

This manuscript is dedicated to my parents Ram Chandra and Geeta, my brother Narayan, and my wife Geetu. My parents, despite being illiterate themselves, made their children's schooling a top priority, and that includes me. I can imagine that their happiness and accomplishment are much greater than mine.

Now I understand why my brother Narayan carried me to school every day starting I was just four years old. I can never forget how he put my education first although he had other priorities. He spent his whole salary to pay for my school and worked extra jobs to support me in each step when our parents were busy toiling to make ends meet. So, here is this present to make you feel proud.

I cannot think of words to express the unending love, care, and support I received from Geetu. Your care and attention to the details of all of my tasks often confused me as to whether it was you who was attending the graduate school. Now, it is your turn to get a doctorate. Geetu, days are more cherishable being with you.

Again, I would not be here without the support from each one of you. So, mom and dad, brother, and Geetu, this is our degree!

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LIST OF ACRONYMS

ABI	Acquired Brain Injury
ADD	Attention Deficit Disorder
ADHD	Attention Deficit Hyperactivity Disorder
AIM	Accessible Instructional Materials
AT	Assistive Technology
BDD	Body Dysmorphic Disorder
CAST	Center for Applied Special Technology
CD	Compact Disc
DSS	Disability Support Services
EBD	Emotional Behavior Disorder
ED	Educational Diagnostician
GAD	General Anxiety Disorder
GSR	Galvanic Skin Response
HAAT	Human Activity Assistive Technology
HTML	Hypertext Markup Language
IBM	International Business Machine
IEP	Individualized Education Program
IDEA	Individuals with Disabilities Education Act

IRB	Institutional Review Board
NCLB	No Child Left Behind
IT	Information Technology
LD	Learning Disability
LRE	Least Restrictive Environment
M/MID	Mild/Moderate Intellectual Disability
MPT	Matching Person and Technology
MS	Microsoft
OCPD	Obsessive Compulsive Personality Disorder
OHI	Other Health Impairment
OSERS	Office of Special Education and Rehabilitative Services
PL	Public Law
QIAT	Quality Indicators of Assistive Technology
SDT	Self-Determination Theory
SETT	Students, Environment, Task, Tools
SLD	Specific Learning Disability
SLI	Specific Language Impairment
TAPE	Transportable, Available, Practical, Engaging
UDL	Universal Design for Leaning
US	United States
UTAUT	Unified Theory of Acceptance and Use of Technology

ABSTRACT

Assistive technology (AT) is linked with better academic progress and improved post-school outcomes for students with disabilities. Despite the emphasis on the use of AT evidenced by AT effectiveness literature, requirements by Individuals with Disabilities Education Act (IDEA) and Section 504 of the Rehabilitation Act to consider AT, and the proliferation of technological products, studies have indicated concerns about students' AT use. High school and college students with high-incidence disabilities are less likely to accept and use AT or they often abandon it after using it. There could be several factors that influence their decisions about accepting and using or abandoning AT. This study attempted to explore those factors from students' perspectives through qualitative analyses of semi-structured in-depth interviews with 17 high school and college students with high-incidence disabilities. Guided by concepts derived from the Unified Theory of Acceptance and Use of Technology (UTAUT) and Self-Determination theories (SDT), constant-comparative methods were used to explore and describe the factors that students perceived as influencing their AT decision-making, their perceptions of AT decision-making processes, and their beliefs about AT in relation to their success. Findings showed that students who accepted and used AT reported having a well-rounded support system. Other factors included their prior skills, experience with AT and preference for mainstream devices, and timing to introduce AT. Students did not perceive

the existence of established assessment and evaluation guidelines while procuring AT and felt little involved in schools' AT decision-making processes, which also influenced their acceptance and use or rejection and abandonment of AT. Students perceived academic improvements due to AT use and their AT proficiency also seemed to boost their overall sense of competence. Implications of the study include considerations for research and practice in creating supportive environments for AT acceptance and use, implementing AT assessment and evaluations, and involving students in the AT decision-making process. Findings also may help educators to design and implement AT-supportive transition programs for continued use of AT in high school and post-school environments.

Chapter 1

INTRODUCTION

1.1 Background

As in many other fields, technology has revolutionized education. Along with the rapid growth and use of educational technology, substantial progress has been made in the development of assistive technology devices and services to support the needs of students with disabilities. However, research on acceptance and use of AT indicates mixed findings. Despite the empirical evidence linking AT to students' positive academic and post-school outcomes, literature has indicated that students with high-incidence disabilities (such as learning disabilities) and mild health impairments tend to have low rates of AT acceptance and use (Woodward & Reith, 1997). While technology that is systematically identified and implemented can be an academically motivating factor for students with disabilities (Bender, 2001), students with high-incidence disabilities continue to show low rates of AT acceptance and use, which may be due to various psychosocial, environmental, disability, and device related issues.

Students play a crucial role in decisions about accepting or rejecting and using or abandoning AT. This issue is especially important when it comes to transitioning students from high school to college and post-school lives. The provisions of IDEA that make schools responsible for ensuring access to needed technology no longer apply once

students complete high school. Students with disabilities who continue into postsecondary education assume responsibility for deciding when and how to access assistive technology. Therefore, it is important to explore those factors that high school and college students perceive are important in accepting and using AT. The understanding of those factors can help schools and colleges to intervene by implementing AT guidelines and providing a favorable environment that encourages higher rates of AT acceptance and its continued use.

1.1.1 AT Benefits Students with High-Incidence Disabilities

Appropriate use of AT has various benefits for students with learning disabilities (Anderson-Inman, Knox-Quinn, & Szymanski, 1999; Day & Edwards, 1996), emotional disturbance (Mitchem, Kight, Fitzgerald, Koury, & Boonseng, 2007), intellectual disability (Wehmeyer, 1998), and speech and language impairments (Hasselbring & Glaser, 2000). AT promotes greater independence, self-confidence, productivity, and overall quality of life to students with disabilities by enabling them to learn and perform tasks that otherwise would have been difficult or, at times, impossible to accomplish (Craddock, 2006; Englert, Manalo, & Zhao, 2004; Fichten, Asuncion, Barile, Fossey, & Robillard, 2001; Higgins & Raskind, 2004; Jutai, Rigby, Ryan, & Stickel, 2000; Macarthur, 1999; Mazzotti, Test, Wood, & Richter, 2010; Mechling, 2007; Riffel et al., 2005; Wehmeyer et al., 2006). Use of AT might not be as essential in enabling students with high-incidence disabilities to perform certain tasks as it is for many students with low-incidence disabilities, for example, to support their daily living. However, with the use of AT, students with high-incidence disabilities may perform tasks with improved

quality and comprehend instructions and group discussions better, similar to their peers without disabilities.

Learning issues related to students with high-incidence disabilities may include a combination of problems in the areas of reading, writing, listening, math, organization, attention, and memory. AT improves students' academic learning and performance (Brackenreed, 2008; Geary, 2004; Hasselbring & Glaser, 2000; Hetzroni & Shrieber, 2004; MacArthur & Cavalier, 2004; MacArthur, 2009; Mazzotti et al., 2010; Raskind & Higgins, 1998; 1999), and facilitates successful transition to college (Anderson-Inman et al., 1999; Mitchem et al., 2007; Stodden , Conway, & Chang, 2003), employment (Gamble, Dowler, & Orslene, 2006; Luecking & Certo, 2003; Wehmeyer et al., 2006), and independent living (Riffel et al., 2005). Continued use of AT is also likely to empower students for better transition and post-school outcomes (Anderson-Inman et al., 1999; Mazzotti et al., 2010; Mull & Sitlington, 2003; Riffel et al., 2005; Sharpe, Johnson, Izzo, & Murray, 2005), and students are more likely to be proficient in using AT in college (Parker & Banerjee, 2007; Raskind & Higgins, 1998).

1.1.2 Laws Mandate AT Consideration

Students who receive special education services or who have a Section 504 plan are entitled to the consideration of AT. The Assistive Technology Act of 2004 states that the use of AT devices is intended to –

> …increase involvement in, and reduce expenditures associated with, programs and activities that facilitate communication, ensure independent functioning, enable early childhood development, support educational achievement, provide

and enhance employment options, and enable full participation in community living for individuals with disabilities. (P.L. 108–364, 29 U.S.C. § 3002)

Similarly, IDEA mandates that every student with a disability who is eligible for special education has a legal right to technology to assist them with learning. Individualized education program (IEP) teams, therefore, must consider incorporating AT into the student's education program (20 U.S.C. 1414(d)(3)(B)(v)). In addition, the standards-based education reform of the Elementary and Secondary Education Improvement Act, popularly known as No Child Left Behind Act (NCLB), requires all schools and districts receiving Title I funds to meet the state curriculum standards, and align tests to state academic standards (NCLB, 2001, 20 U.S.C. § 6316 [2011]). To help meet these standards, the US Department of Education has embraced educational, assistive, and media technology research in order to improve the academic achievement for all students (U.S. Department of Education, 2010).

1.1.3 Transition to Postsecondary Education and the Changes in Legal Protection

Upon their transition from high school to post-school environments, or when the students are above 21 years old, the legal protections for the provision of services under IDEA are no longer binding. However, the Americans with Disabilities Act (2008) and Section 504 of the Rehabilitation Act (1973) continue to protect them by prohibiting disability-based discrimination and requiring provision of reasonable accommodations, although neither guarantees delivery of special services to students.

In light of the Rehabilitation Act of 1973, institutions in higher education receiving federal funds are expected to accommodate the needs of students with

disabilities. Sections 504 and 508 of the Rehabilitation Act (1973) address AT and other accommodations support for individuals with disabilities. Section 504 requires entities to provide appropriate AT for people with disabilities (P.L. 93 – 112, 29 U.S.C. § 794, 41 CFR Part 60-741). Section 508 requires electronic and information technology to be developed and maintained so as to be accessible to people with disabilities (P.L. 93 – 112, 29 U.S.C. § 794d, 34 CFR Part 104). However, it becomes the student's responsibility to ask for available accommodations or accessibility resources by self-disclosing a documented disability to the designated disability support office in college settings.

Because students in postsecondary education settings become the primary decision-makers about disclosing disability and requesting accommodations, it is important for them to learn how to effectively use and advocate for the AT they need to support their learning before leaving high school (Alper & Raharinirina, 2006). Despite the research-base on the effectiveness of AT use in postsecondary settings (Goodman, Tiene, & Luft, 200; Fichten et al., 2001; Fichten, Barile, & Asuncion, 2003; Holmes & Silvestri, 2009; 2012; Raskind & Higgins, 1998; Higgins & Raskind, 1995; 2005), students will be less likely to benefit from AT if they are unaware of those tools and lack the required skills to use those tools. Along with knowing what AT supports their learning and acquiring necessary skills to use it, transitioning students need to prepare to self-disclose their disability and become their own self-advocates in requesting and acquiring the needed AT tools and services in postsecondary settings (Alper & Raharinirina, 2006).

1.2 Statement of the Problem

Despite the availability and advancement of AT tools and legal requirements that make AT consideration part of educational program planning, students with high-incidence disabilities, who represent about 70% of all students' with disabilities (Aud et al., 2011), have low rates of AT use (Kaye, Yeager, & Reed, 2008; Woodward & Reith, 1997). Research supports that AT helps to improve academic learning (Blankenship, Ayres, & Langone, 2005; Bryant & Bryant, 1998; Hetzroni & Shrieber, 2004; Higgins & Raskind, 2004; Higgins & Raskind, 2005). However, low rates of AT use and abandonment are persistent issues (Kaye et al., 2008; LaPlante, Hendershot, & Moss, 1992; Ofiesh, Rice, Long, Merchant, & Gajar, 2002; Phillips & Zhao, 1993; Woodward & Reith, 1997).

Existing research on AT abandonment has focused heavily on individuals with low-incidence disabilities. The limited research that is available related to factors associated with AT acceptance and use by young adults with high-incidence disabilities in high school and college attests to the need for more research in the area (Lahm & Sizemore, 2002; Riemer-Reiss & Wacker, 1999). Further, research on transitioning students' with high-incidence disabilities perspectives of the factors that influence their AT decision-making is lacking (Urdang, 2011). This study seeks to bridge the gap in the knowledge base in understanding the possible factors influencing low rate of AT use and high rate of rejection and abandonment.

1.3 Research Questions

This study explores answers to the following questions:

1. What are high school and college students' perceptions of factors that influence their AT decision-making?
2. How do the students describe their decision-making processes about the use of AT in high school and college?
3. How do the students perceive AT in relation to their success in high school and college?

1.4 Organization of the Dissertation

This dissertation is organized into five chapters. Chapter 1 provides a background and introduces the study. The chapter also provides a statement of the problem and the research questions.

Chapter 2 contains three parts. First, the chapter presents a literature review showing how the study relates to previous research and scholarly thought. It summarizes the previous research and lists the multiple factors that have been identified as possible influences on AT rejection and abandonment. Second, the chapter reviews relevant AT evaluation and assessment guidelines that are intended for practitioners to use in the AT decision-making process. These tools are reviewed to identify student or user involvement in AT assessment and evaluation processes. And third, the chapter introduces constructs derived from two theories– Unified Theory of Acceptance and Use of Technology (UTAUT) and Self-Determination Theory (SDT) – that served as conceptual frames for data coding and analysis. The UTAUT theory was selected to

explore the associated factors from the consumer's perspective of the technology (e.g., performance, design, and training). The basic concept underlying the UTAUT model is that "individuals will form various beliefs and attitudes regarding the technology; these will, in turn, have an impact on their intentions to use the technology and, therefore, affect their actual use of the technology" (Garfield, 2005, p. 25). SDT, the other theory that guided this study, was chosen to explore student agency and development in relation to AT acceptance and use. Research supports that higher levels of student self-determination are related to better post-school outcomes (Sarver, 2000; Wehmeyer & Schwartz, 1997; Wehmeyer & Palmer, 2003). Constructs of SDT such as autonomy, relatedness, and motivation may help to frame how students' perceptions are affected when they do or do not feel that they are causal agents in their own lives, feel competent and can relate themselves to others, and feel rewarded for the actions they take and the decisions they make. This may be informative in explaining how students felt about their roles during AT decision-making and how that affects their AT acceptance and use. Detailed descriptions of the constructs of these theories are discussed in Chapter 2, and their application in the study will be discussed in Chapter 3.

Chapter 3 presents the methodology of the study. This study employs a grounded theory approach (Charmaz, 2006; Glaser & Strauss, 1967; Strauss & Corbin, 1990). Developed by Glaser and Strauss (1967), grounded theory is a research methodology in which theory is discovered inductively from data that is systematically obtained and analyzed. Its emphasis is to give voice to the participants who have experience with the phenomenon and to build a theory about a particular phenomenon (Charmaz, 2006;

Glaser & Strauss, 1967). A qualitative grounded theory approach was selected given this study's purpose to understand the perceptions of students with high-incidence disabilities who are in high school or have transitioned to postsecondary education.

Chapter 3 also addresses participant recruitment, demographics, interview protocols, analytic methods, and issues of research quality. Conducting qualitative research requires adhering to multiple standards of quality, variously known as validity, rigor, or trustworthiness (Morrow, 2005). To give researchers and the consumers of research confidence in its findings, the research must be conducted in a trustworthy and credible manner (Merriam, 2001; Patton, 2002). Lincoln and Guba (1985) consider trustworthiness as the degree to which the researcher is able to present a balanced and fair account of the multiple perspectives of the participants. The trustworthiness of this study was ensured through being consistent in the requirements of what Lincoln and Guba called the four criteria of trustworthiness – credibility, transferability, dependability, and confirmability (1985).

Researcher assumptions are also presented as part of Chapter 3. While it is not possible to be completely bias-free, it is important to maintain researcher neutrality and transparency throughout the study (Merriam, 2001; Patton, 2002) as a way to enhance the credibility and dependability of the research. This is accomplished in part by discussing the researcher's assumptions. Researchers have their *a priori* knowledge and assumptions about the world, the topic they study, and how they understand phenomena. Explicit incorporation of researchers' assumptions or the "bias" from their background, identity, and experience makes the researchers and the readers aware of possible confounding

factors, but also it provides researchers with a major source of insights and hypotheses to the study (Berg & Smith, 1988).

Chapter 4 presents the results of the study. Findings are organized by the three research questions regarding students' perceptions about the factors influencing their AT decision-making, their AT decision-making processes, and their attributions of success related to AT. Then, a grounded theory of students' AT acceptance and use that ties these elements together is offered.

Chapter 5 provides a discussion of findings and potential significance of the study for research and practice. The proposed study has implications at the theoretical and functional level for understanding and incorporating user perspectives in decision-making; provisioning of AT devices, training, and resources; and creating AT supportive environments to encourage AT acceptance and use.

The use of grounded theory approach helps to develop a deeper understanding of a phenomenon that has not been well studied. By understanding students' perceptions of factors that influence their decision-making, the study may inform AT assessment and intervention models (Johnston & Evans, 2005). It may help educators to develop guidelines and strategies designed to increase AT use by transitioning students with high-incidence disabilities (Lauer, Rust, & Smith, 2006; Parette & Scherer, 2004; Riemer-Reiss & Wacker, 1999; Sze, 2008). The study also may inform technology developers about the technology preferences that students with high-incidence disabilities are more likely to choose (Parette & Scherer, 2004).

1.5 Definitions of Key Terms

High-incidence Disabilities

High-incidence disabilities include the legally defined mild or moderate intellectual disability (M/MID), specific learning disabilities (SLD), speech or language impairments (SLI), or emotional/behavior disability (EBD) (Office of Special Education and Rehabilitative Services [OSERS], 2010). For the purpose of this study, high-incidence disabilities also includes attention deficit hyperactivity disorder or other health impairments (ADHD or OHI); other disabilities that might not be easily visible to others. Students with multiple, severe disabilities or sensory impairments are not included under high-incidence disabilities.

Assistive Technology

Definitions of AT by the Assistive Technology Act of 2004, also known as the Tech Act, and the 2004 amendment of the Individuals with Disabilities Education Improvement Act (IDEA) are widely used in special education literature. The Assistive Technology Act of 2004 defines AT as "…technology designed to be utilized in an assistive technology device or assistive technology service," and an AT device is "…any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (P.L. 108 – 364, 29 U.S.C. 3002). IDEA 2004 defines AT as "…any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability. The term does not include a medical

device that is surgically implanted, or the replacement of such device" (P.L. 108 – 446, 20 U.S.C. § 1401). AT devices can be categorized as low tech (e.g., less sophisticated devices such as walking cane, Velcro fasteners), medium tech (e.g., relatively complicated mechanical devices such as wheelchairs), or high tech (e.g., electronic dictionaries, computer hardware and software, laptops and tablets, smart pens, smart phones, or other electronic devices) (Kaye, Yeager, & Reed, 2008).

For the purpose of this study, terms such as AT, technology, device, tool, and application are used interchangeably to appropriately refer to the AT depending on specific cases. For example, the term "device" will be used for a laptop (and its physical properties) but "application" will be used while referring to the applications in a laptop, such as Kurzweil 3000.

Accommodation

An accommodation is any type of adaptation to a task, tool, or environment that removes barriers and facilitates access so that a student who has a disability has equal opportunity to learn and perform. Accommodations, unlike modifications, do not change the essential purpose or nature of a learning activity.

1.6 Summary

The purpose of this chapter was to introduce the topic of the research study, which is to explore students' with high-incidence disabilities perceptions of factors that influence their decision-making on AT acceptance and use or rejection, and abandonment. Despite the evidence on the effectiveness of AT and the legal mandates supporting its use in high school and postsecondary education, students with high-

incidence disabilities are found to use AT at a lower rate than other groups (e.g., low-incidence disabilities). It is important for schools to understand the students' perceptions of factors that influence their AT decision-making in order to develop guidelines and strategies that promote AT use by transitioning students with high-incidence disabilities. The next chapter of the study reviews empirical literature on AT acceptance and use, examines AT evaluation and assessment guidelines, and introduces constructs from two theories used to explore students' perceptions of factors and decision-making processes.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

This chapter opens with a review of literature that explored various factors influencing AT abandonment and low rate of AT use. The summary of literature maintains that the AT decision-making by transitioning students with high-incidence disabilities is an understudied phenomenon. This review of literature is followed by a review of practical AT assessment and evaluation models. These models are intended for the practitioners to use during the AT assessment and evaluation process. They provide additional insight into the factors that need to be taken into consideration in the AT decision-making process. In this review they are scrutinized for users' consideration of student involvement and decision-making components. Third, a discussion of theoretical frameworks is presented. The constructs from the Unified Theory of Acceptance and Use of Technology (UTAUT) and Self-Determination Theory (SDT) are introduced as conceptual and analytic tools for understanding students' AT decision-making processes.

2.2 AT Abandonment and Low Rate of AT Use

Abandonment, rejection, and low rate of AT use is gaining increasing attention in the AT outcomes literature. Studies seem to indicate that individuals with high-incidence disabilities use AT at a lower rate than individuals with low-incidence disabilities (Kaye

et al., 2008). Individuals with more severe types of disabilities who use AT to perform daily basic functions are more likely to use AT than young adults with high-incidence disabilities (Quinn et al., 2009). In terms of age and disability type, young adults (LaPlante et al., 1992) and those who have high-incidence disabilities (Kaye et al., 2008; Ofiesh et al., 2002) tend to use AT at a much lower rate than older adults and those with low-incidence disabilities. Analysis of the National Longitudinal Transition Study-2 (NLTS2) data from early to mid-2000s showed only 7.8% high school students with high-incidence disabilities receiving AT in high school, which dropped to 1.1% after high school (Bouck, Maeda, & Flanagan, 2011). Despite the evidence that AT helps to improve the academic success for students with high-incidence disabilities (Blankenship et al., 2005; Bryant & Bryant, 1998; Hetzroni & Shrieber, 2004; Higgins & Raskind, 2004; 2005), these young adults are less likely to use AT to support their academic learning (Quinn et al., 2009).

2.2.1 Literature Search

A literature search using ERIC EBSCOHOST, ERIC ProQuest, and PsycINFO databases with varying combinations of keywords, such as, "assistive technology, technology, acceptance, use, abandonment, rejection, discontinuance, high-incidence disabilit*, learning disabilit*, transition, high-school, college, special education" were used to locate studies of AT abandonment or use in the literature. Citation index searches using Web of Science, ancestry searches from relevant articles, descendant searches using the SAGE online catalogue, and online journal searches using *Journal of Special Education Technology*, *Assistive Technology*, and *Disability & Rehabilitation: Assistive*

Technology were conducted. Studies that were published in peer reviewed journals since 1990, the year that AT and transition services were incorporated into IDEA, were included in the review. Studies that did not include the intended population of this study such as those only on low-incidence disabilities or only for geriatric population were excluded.

Various possible reasons for the rejection and abandonment of AT by all students with disabilities were identified in the literature and were broadly categorized as user factors, device factors, and school/environment factors.

2.2.2 User Factors

Studies have highlighted the importance of several user factors related to AT use by students with various disabilities. The user involvement, awareness, beliefs, and perceptions seem to play a major role influencing AT use.

User involvement. Although user involvement in AT assessment is not a new concept (Phillips & Zhao, 1993), stakeholders such as students, parents, and teachers should be encouraged to take user perspectives in full consideration for increased rate of AT use (Alper & Raharinirina, 2006). Oftentimes, the students are not considered as important members in the decision-making process by AT teams (Gamble, Dowler, & Orslene, 2006; Lahm & Sizemore, 2002). Studies have pointed out that users who believe that they are involved in the AT selection process are less likely to discontinue use than users who do not feel involved (Phillips & Zhao, 1993; Wessels, Dijcks, Soede, Gelderblom, & De Witte, 2003). A review of AT outcomes studies published between

1988 and 2003 showed that only 12% of the studies reported family involvement (Alper & Raharinirina, 2006).

Stakeholders often bring divergent perspectives in deciding what is best for the student. Some parents feel their children will not be able to develop important skills if they rely on such devices (Parette & Scherer, 2004). These divergent perspectives are likely to create complicated and emotionally-charged patterns of interaction with the student and the technology, making it difficult to sort out what is best (Todis, 1996). Lack of consideration of user opinion and their involvement in AT decisions may discourage AT use gradually leading to abandonment (Alper & Raharinirina, 2006; Bailey, Parette, Stoner, Angell, & Carroll, 2006; Beigel, 2000; Parette & Peterson-Karlan, 2007; Parette, 1999; Riemer-Reiss & Wacker, 2000; Scherer & Cushman, 1997; Phillips & Zhao, 1993).

User self-advocacy. Higher levels of self-advocacy (Craddock, 2006), self-confidence and motivation (Burton, Nieuwenhuijsen, & Epstein, 2008) seem to be associated with long-term AT use. Using findings from a survey of college service coordinators from 79 colleges and universities, Janiga and Costenbader (2002) speculated that students who are their own self-advocate are more likely to ask for AT. Students who are their own self-advocate usually have high levels of self-realization – a major construct of self-determination (Deci & Ryan, 2000). Students who have higher levels of self-determination are more likely to have positive postsecondary outcomes (Eisenman, 2007; McDonnall & Crudden, 2009; Wehmeyer & Schwartz, 1997; Wehmeyer & Palmer, 2003). Similarly, the use of AT seems to increase student self-advocacy (Brackenreed, 2008). In a review of literature on the needs of students with disabilities who chose to

pursue postsecondary education, Webb and colleagues (Webb, Patterson, Syverud, & Seabrooks-Blackmore, 2008) found that self-determination and AT were two of the five major factors to support better transition. Assuming a relationship between technology use and self-determination, Skouge and colleagues (Skouge, Kelly, Roberts, Leake, & Stodden, 2007) describe a self-determined learning model employing technology that may benefit students with developmental disabilities.

Awareness, training, and skills. Awareness, training and skills required to use the device are found to be associated with long-term AT use (Burton et al., 2008; Hemmingsson, Lidström, & Nygaard, 2009). Inadequate and ineffective training, on the other hand, seem to influence AT non-use (Bailey et al., 2006). Students with high-incidence disabilities often lack the required skills and trainings to use AT appropriate for their academic learning (Mull & Sitlington, 2003). These young adults and their families often are unaware of the technologies that are available or the potential benefits of using them (Beyerbach, Walsh, & Vannatta, 2001; Parette, 1999). Studies often cite lack of skills and awareness as a likely cause to result in the inappropriate selection of AT tools (Benitez, Morningstar, & Frey, 2009; Gamble et al., 2006; Parette, VanBiervliet, & Hourcade, 2000) that would likely lead the student to abandon those tools.

Stigma attached to disability. Studies have speculated that stigma is a major factor associated with lower rate of AT use by individuals with disabilities (Mullins & Preyde, 2013 ; Parette, 1999; Parette & Scherer, 2004; Vanderheiden, 1998). Parette and Scherer (2004) elaborate on the possible issues related to stigma and its effect on AT decision-making for individuals with developmental disabilities. By summarizing the

issues often confronted by AT decision-making teams, such as peer "fit in" issues and visibility of disability due to AT use (Craddock, 2006; Johnson, Inglebret, Jones, & Ray, 2006; Parette & Scherer, 2004), the authors recommend addressing the factors, including device aesthetics, universal design, gender and age appropriateness, and social acceptability, which may help reduce or overcome stigma. Students with high-incidence disabilities where the disability is invisible tend to have more control over stigma, and thus, may be more likely to avoid using AT that makes their disability more visible.

Self-perceptions. User's self- perceptions tend to influence how they assess the benefits of AT and making AT decisions (Blackhurst, Lahm, Harrison, & Chandler, 1999; Hocking, 1999; Jutai et al., 2000). Self-perceptions of feeling informed and being involved in the decision-making process (Martin, Martin, Stumbo, & Morrill, 2011), self-perceptions about how others are seeing their disability (Hocking, 1999), and getting undesired attention (Todis, 1996) may influence AT use. Another related factor affecting students' perceptions may be the conceptual understanding of AT and the meaning it carries to the individual user. Be it the exact same technology, calling it instructional or educational technology may suggest adding to student ability to perform even better; whereas, when calling it AT, may suggest coping with or minimizing certain problems that a student might have. Young adults with disabilities tend to be more aware of the image they want to convey based on their perceptions of who they are as a person, and thus, are likely to avoid any link that will define them in other ways; or they might not perceive that a need exists or that they have a problem (Blackhurst et al., 1999). For students with high-incidence disabilities, due to the hidden nature of their disability, they

tend to have more control over how they want others to perceive them (Mullins & Preyde, 2013), and they might not want an AT which may disclose their disability. Furthermore, while selecting an AT device, their self-perceptions about AT use may include psychological, physical, and monetary costs of different alternatives and their consequences (Blackhurst et al., 1999).

Age and gender. AT abandonment rate may vary by age and gender (Wessels, et al., 2003). Analyses of NLTS2 data show a low rate of AT use by high school and college students with high-incidence disabilities (Bouck et al., 2011). Studies have speculated that low rates of AT use among this age group is possibly due to their identity development, their preference to hide their disability, and desire to fit-in among peers (Mullins & Preyde, 2013; Parette, Wojcik, Peterson-Karlan, & Hourcade, 2005; Parette, 1999). Gender and age appropriate AT devices, including device performance expectations, aesthetics, and universal applicability of the device, thus, are likely to increase AT acceptance and use for these young adults (King, 1999; Martin & McCormack, 1999; Parette & Scherer, 2004; Vanderheiden, 1998).

Experience with AT. New users of AT tend to perceive psychosocial factors to be more powerful than the functional and academic benefits (Hemmingsson et al., 2009; Louise-Bender, Kim, & Weiner, 2002), whereas users who use AT for a longer period of time are more likely to continue using it and are less affected by such psychosocial factors (Craddock, 2006). Long-term users' experiences with the devices are associated with higher self-confidence and motivation, whereas novice users tend to feel a lack of confidence and are not motivated to use the device (Burton et al., 2008). Novice users, on

the other hand, felt a lack of confidence and were not motivated to use the device; and they tried to reject or avoid using AT whenever possible to fit in with their peers (Craddock, 2006; Hemmingsson et al., 2009).

2.2.3 Device Factors

Studies have reported various device characteristics that are important to long-term AT use (Johnson et al., 2006; Hemmingsson et al., 2009; Phillips & Zhao, 1993; Wessels et al., 2003). These studies focused primarily on low-end AT devices or AT devices that are needed to support daily living skills. These studies included factors such as universal applicability, acceptability, reliability, durability, portability, aesthetics, and general reputation of the producing company in terms of construction and performance of device etc. Studies that included some of these factors and other device factors in relation to AT use are discussed in the following sections.

Design and layout. Design and layout of a device seem to influence AT acceptance and use (Wessels et al., 2003). They seem to be important factors in the mainstream technology research. Sutherland (2012), in his biography of Steve Jobs, former chief executive officer of Apple Inc., describes how Jobs' emphasis on the design and layout of the Apple products led the company to its height. The author states that although the products were innovative, Jobs realized they were badly designed. He took the opportunity to design products that would appeal to the eye. In addition to performance, the huge success of Apple products such as iPod, iPad, iPhone, and MacBook can be largely attributed to their design and layout. For students with high-incidence disabilities, the use of AT may be the only factor that discloses their disability.

Therefore, they may not want to use AT if they think that the device's design and layout is made to meet their unique needs because it distinguishes them from their nondisabled peers (Parette & Scherer, 2004; Vanderheiden, 1998).

Innovation and Performance. Innovation and performance of a device are found to influence students' acceptance and use of it. "Power users," who mostly used high-end technological devices such as voice recognition and screen readers for a longer period of time, are more likely to use AT (Craddock, 2006). Although students who were novice users did not like using AT, they supported using high-end technology (Craddock, 2006). Innovative technology that can execute a given task as expected might positively influence students towards its acceptance and use (Phillips & Zhao, 1993; Riemer-Reiss & Wacker, 1999; Vanderheiden, 1998). Summarizing the participants' views in a 2006 workshop on "Technology for Improving Cognitive Function," Bodine and Scherer (2006) summarized that technological efficiency and choices in devices might also increase the AT acceptance and use for individuals with cognitive disabilities. Another study of 115 individuals with various disabilities, who were provided with funding for 136 AT devices, found that technologies that had less relative advantage (effectiveness, reliability, ease of use, comfort, and enhancement of user's performance) were linked to AT discontinuance (Riemer-Reiss & Wacker, 2000).

Universal design. Students with high-incidence disabilities may be less likely to use an AT tool if it serves only the unique purpose related to their needs (Hemmingsson et al., 2009). AT tools that are developed with a universal design approach can serve a wider range of users and the need for additional devices might be reduced (Dolan, Hall,

Banerjee, Chun, & Strangman, 2005; King, 1999; Messinger-Willman & Marino, 2010). Such tools not only can accommodate various needs of students with disabilities, but also can perform a multitude of tasks so that everyone, regardless of having a disability, is likely to use them (Messinger-Willman & Marino, 2010; Story, 1998; Vanderheiden, 1998). The flexibility and adaptability of notebooks and tablets, for instance, can execute various functions and thus are widely popular in education as the same technology can be used for various learning purposes. Technology developers and service providers can work collaboratively to recommend products with a universal design in their learning approach (Heemskerk, Volman, ten Dam, & Admiraal, 2011), which would also result in easier availability, lower cost, better reliability, greater utility, greater compatibility, that is universally acceptable and less stigmatizing (Story, 1998).

Price value. User's perception of the price value of an AT product versus its relevant benefits is likely to impact its use (Anderson-Inman et al., 1999; Parette & Peterson-Karlan, 2007; Sze, 2008). Similarly, depending on its usefulness to support student performance for a period of time, some devices can become obsolete (Sze, 2008), which might negatively influence the acquisition of such devices. Thus, users often weigh out psychological, physical, and monetary costs of different alternatives and their consequences (Blackhurst et al., 1999).

2.2.4 School Environment Factors

The third and the last major category of factors is related to school or classroom environments. These include support from school teachers, AT specialists, and other school personnel; AT assessment and evaluation; and availability of AT devices and

resources. Also, teacher and classroom support of AT seem to be positively associated with teachers' AT skills. Teachers who were proficient with AT seemed to incorporate AT in their instruction and support students' use of it, whereas teachers who lacked AT skills did not. School environment factors identified in the literature are presented in the following paragraphs.

Teacher and classroom support. Teacher support and motivation is likely to encourage students' AT use (Anderson-Inman et al., 1999; Blackhurst et al., 1999; Woodward & Rieth, 1997). Instructional environments where technology is effectively used by teachers have positive influences on students to use technology in the classroom (Hemmingsson et al, 2009; Izzo, Yurick, & McArrell, 2009; Kim-Rupnow & Burgstahler, 2004; Woodward & Rieth, 1997). Examples of teacher and classroom support include teachers' receptiveness to having learners with AT in their classes, integration of devices into daily educational practice where students experience immediate benefits, encouraging the use of AT, and positive social health of the classroom (Woodward & Rieth, 1997). However, teachers often lack the necessary skills to teach AT skills to their students or use it effectively in their teaching. Teachers tend to have low comfort level (Sze, 2008) and lack of technology training (Beyerbach et al., 2001) to use AT in classroom. Middle and high school teachers often feel unprepared to conduct AT assessments (Benitez et al., 2009). Lack of trained personnel in facilitating student use of AT devices and services (Kochhar-Bryant, 2003; Bausch & Hasselbring, 2004) seems to be a major determinant behind students' low AT acceptance and use. Studies suggest teacher trainings that include the use and integration of AT in classrooms

are likely to enhance teacher's comfort level and knowledge to teach and use technology (Bausch & Hasselbring, 2004; Bryant & Bryant, 1998; Parette, Perterson-Karlan, Smith, Gray, & Silver, 2006; Sze, 2008), which will have positive impacts on AT use in classroom (Morrison & Jeffs, 2005).

Assessment and evaluation. Comprehensive AT assessment (Hemmingsson et al., 2009), the acquisition process (Burton et al., 2008), and ongoing support (Craddock, 2006) are likely to influence long-term AT use. Similarly, lack of individual assessment of AT device and ongoing support (Alper & Raharinirina, 2006; Todis, 1996) and mismatch between the device and the user's desires and/or needs (Beigel, 2000) might result in AT abandonment. For a successful AT assessment it is important for all the stakeholders to collaborate (Lahm & Sizemore, 2002) and discuss how willing the students are to consider AT, what they desire from the use of AT, and the supports and level of training they need (Beigel, 2000; Todis, 1996).

School vs. college: Differences in legal system and learning environments. Students' use of AT may be influenced by the differences in school and college instructional environments that are related to legally-mandated shifts of certain responsibilities from schools to students (Stodden et al., 2003). Students with disabilities, who are in K-12 school, and until they are 21-years-old, are protected by the IDEA, which requires schools to identify students with disabilities and provide required services and accommodations, which might include AT devices and services. However, when these students go on to college, the legal protections for the provision of services under IDEA are no longer binding. NLTS2 data from early to mid-2000s attests to the fact that

only 7.8% high school students with high-incidence disabilities received AT in high school, which dropped to 1.1% after high school (Bouck et al., 2011). This reluctance towards AT use might increase when they go on to college, particularly because students do not have to disclose their disability, and students may prefer to keep their disability status invisible although that may affect their academic performance (Hemmingsson et al., 2009).

Since school and colleges are two different environments for students with disabilities, it is critical for high school personnel to consider effective assessments and relevant interventions to ensure students' proficiency in using the appropriate AT tools (Parker & Banerjee, 2007; Sze, 2008). A review of research by Mull and Sitlington (2003) on the role of technology during high school and college recommended transition practices that include finding funding sources and acquiring AT to use in postsecondary education, careful AT selection process centered on an individual's future needs, and providing the required training to decrease the high level of AT discontinuance. Technology experts who were surveyed about their recommendations on ways to increase AT use in high school and postsecondary education suggested providing AT instruction, teaching self-determination, using best transition practices, and establishing AT infrastructure (Houchins, 2001).

2.2.5 Summary

A variety of factors discussed above have been posited as influencing AT use by students with disabilities. The perspectives of these students as they become primary decision-makers about AT use have not been directly studied (Urdang, 2011). Limited

evidence regarding students' perceptions of the factors associated with AT acceptance and use suggests the need for more research (Hocking, 1999; Lahm & Sizemore, 2002; Parette & Scherer, 2004; Riemer-Reiss & Wacker, 1999; Scherer, Sax, Vanbiervliet, Cushman, & Scherer, 2005). Moreover, the literature often focuses broadly on students of various disabilities and ages with relatively few considering the intended population of the current study – transitioning students with high-incidence disabilities. Thus, there seems to be a gap in the literature in studying the factors that influence AT acceptance and use for this population. To further determine the need for research in this area, AT assessment and evaluation tools that are intended as guidelines to help educators and stakeholders to facilitate an effective and continued AT use were examined. The following section reviews AT models that were either described in peer reviewed journals or found to be popularly mentioned in the practitioner-oriented journals.

2.3 AT Assessment and Evaluation Models

2.3.1 Why mention AT Models?

Systematic assessment and evaluation processes (Hemmingsson et al., 2009), acquisition processes (Burton et al., 2008), and ongoing support (Craddock, 2006) seem important for AT teams to identify appropriate AT tools and provide timely feedback that encourages students' AT acceptance and continued use. AT assessment and evaluation models are intended to facilitate the AT decision-making process by identifying the need and providing appropriate AT devices and options. AT assessment and evaluation models may be used to promote concerted group action. Several AT models or guidelines are available in the literature that are intended to guide the assessment and evaluation of AT

for users with disabilities (Morrill, 2011; Riemer-Reiss & Wacker, 1999). Additionally, the Quality Indicators on Assistive Technology (QIAT) consortium has established quality indicators to provide general guidelines for evaluating the quality of AT services (Zabala et al., 2000). AT models can help schools to create a structure for helping students make effective decisions. In schools, educators might support students' decision-making by first understanding how students think and intervening at appropriate times to help them or by providing the kinds of information and support they want. Since one of the goals of this study was to explore students' AT decision-making process, it was important to revisit the existing models and explore whether and how the models facilitate the user's involvement and decision-making during assessment and evaluation processes.

2.3.2 Search and Selection of Models

A literature search using ERIC EBSCOHOST, ERIC ProQuest, and PsycINFO databases with varying combinations of keywords, such as, "assistive technolog*" + "guideline," "framework," "model," "assessment," "evaluation," "taxonom*," were used to locate the models in the literature. Citation index searches using Web of Science, ancestry searches from relevant articles, and descendant searches using the SAGE online catalogue were conducted. The models that were published in peer reviewed journals in the past 24 years (i.e., 1990 or later), and those that seemed to be popularly mentioned in the practitioner literature but were not published in peer reviewed journals, were reviewed. The decision to begin with 1990 was made in consideration of the 1990 amendment of IDEA, which required schools to consider the need for AT device and

services as part of a child's special education, related services, and supplementary aids and services during IEP meetings. The amended law seemed to emphasize a focus on developing AT guidelines that schools could use to provide appropriate AT tools and services to benefit a child. Also with this amendment, transition planning and services were mandated.

During the winnowing process of the literature search, AT models or guidelines that explicitly mentioned the *exclusion* of high-incidence disabilities or the transition-age group were not included. For example, frameworks specifically for individuals with physical disabilities or older adults were not included. Fifteen models were included in the final review.

2.3.3 Review of Existing Models

Table 2.1 includes a list of existing AT models reviewed. My review is based on the articles about a particular model or the manual itself or a combination of both, which are included in Table 2.1. All of the models were all inclusive in terms of the age group they intended to serve.

For the purpose of this study, the models are differentiated by whether a model described how a user would be involved in the decision-making process or not. The QIAT guidelines also suggest active involvement of the student and family or caregiver in the AT planning process to the extent possible (Zabala et al., 2000). In this review, seven models described the user's role to some extent in the AT process. The others did not seem to describe how a user would be involved in the process. Although some of the models had user factors in the decision-making process, it was presented as a factor that

decision-making teams needed to consider, which was obvious since the AT had to be intended for a user. Those models did not outline or describe incorporating user perspectives or involvement in the decision-making process.

Table 2.1 List of AT models included

Authors	Name of AT Model	Describes User Involvement (Yes/No)	Disability Type Focus
Blackhurst, Lahm, Harrison, & Chandler, 1999	Unifying Functional Model	Yes	General
Bouck et al., 2012	TAPE Framework	No	High-incidence
Bowser & Reed, 1995	Education Tech Points	No	General
Chambers, 1997	Consideration Model	No	General
Cook and Hussay, 2002	The Human Activity Assistive Technology (HAAT) Model	Yes	Low-incidence
De Couvreur & Goossens, 2011	Design for (Every)One	Yes	General
Edyburn, 1998	Edyburn's Model of the Technology Integration Process	No	General
Haines and Sanche, 2000	The AT CoPlanner Model	No	General
King, 1999	King's Adaptation of Baker's Basic Ergonomic Equation	No	Low-incidence
Kintsch and DePaula, 2002	No name [A Framework]	Yes	General
Lenker and Paquet, 2003, 2004	No name [A user-centered conceptual model]	Yes	General
Reed, 2009	Assessing Students' Needs for Assistive Technology (ASNAT)	Yes	General
Scherer, & Cushman, 1997; Scherer & McKee, 1992; & Scherer et al., 2007	Matching Person and Technology (MPT)	Yes	General
Wile, 1996	Wile's Model of Human Performance Technology	No	Low-incidence
Zabala,1995	SETT framework	Yes	General

Although many of the models included user factors such as the individual's functional ability, problems, alternatives, environment, or need for AT, the consideration of most of these factors (e.g., deciding on the user's functional ability, environment) are primarily based on the judgment of the stakeholders other than the user. Thus, some of the "user-centered" models that included user factors considered them from the AT decision-making teams' perspective. The importance of user perspectives and their perceptions of the factors that influenced their decision-making seemed to be inadequately addressed by these models.

Synopses of the models reviewed above are presented in the following paragraphs under the two categories: those that described direct user-involvement in the process and those that lack or do not clearly describe user involvement.

Models describing user-involvement. The "Matching Person and Technology" (MPT) model (Scherer & Cushman, 1997; Scherer & McKee, 1992; & Scherer et al., 2005) was a user-centered model that emphasized user satisfaction and subjective well-being. In this model, the interaction of milieu, person, and technology were associated with long term use or abandonment of AT. Here, the milieu or the contextual factors included device training, environmental and financial factors; person factors included functional ability, and the minimal need for AT, activity for what AT was used, and motivation. Technology factors included the physical, sensory, and cognitive demands required to use AT, and the training, cost, maintenance, aesthetics and functional and performance features of the device. The model provided a structured assessment process to select the best matched device for the user in the desired context. The MPT included

instruments that explored the strengths, limitations and goals of the user (body-function and role performance). Subsequent publications regarding the model encouraged the user involvement in the assessment and selection process to avoid AT abandonment (Scherer et al., 2005; Scherer, Jutai, Fuhrer, Demers, & Deruyter, 2007).

The "Unifying Functional Model" (Blackhurst et al., 1999) was intended to facilitate technology selection and use from a problem-solving perspective. The model was comprehensive as that could be applied to people with different disabilities, with different degrees of severity, and different ages. The model acknowledged that the user's personal perceptions played a role in exploring options and making AT decisions, and thus emphasized the need for communication with the user during the selection process. The model provided direction for those who made student referrals for special education and related services. The model provided a list of factors (e.g., environmental context, functional demands, personal perceptions, personal resources, external supports), an interaction of which would result in a functional response of AT use. The authors argued that the model clarified the decision-making process for all types of services– including transition services.

"Assessing Students' Needs for Assistive Technology (ASNAT)" model was developed by The Wisconsin Assistive Technology Initiative (Reed, 2009) to guide schools and districts in the AT assessment process. The ASNAT manual included templates, discussion guides, and forms that IEP or AT teams could use to ensure systematic thorough AT consideration (Reed, 2009). The consideration guide described the tasks the team members, which included student "when appropriate" or when the

student was able to participate in the process, needed to do. It also included guidelines on strategies, accommodations, and AT tools that the student was currently using, and other AT tools that could be tried. If it was determined during consideration that a complete AT assessment was needed, additional assessment forms were provided in the manual to facilitate the process. These forms included a student information guide, environmental observation guide, AT decision-making guide, and AT checklist.

"The Human Activity Assistive Technology (HAAT) Model" by Cook and Hussay (2002) was a comprehensive model to provide AT services depending on the user's needs. This model included various factors to be acknowledged during AT selection and use, which were organized under three components: human, activity, and AT. The AT selection process involved user participation in considering user skills and abilities, type of activity, AT, and the context (i.e., setting, and social, cultural and physical contexts). User skills, abilities, and contexts served as data to inform the process but user involvement or feedback in the decision-making process was not explicit. The model was commonly used by occupational therapists, rehabilitation professionals and biomedical engineers, and was primarily aimed at individuals with more severe types of disabilities.

Lenker and Paquet (2004) developed what they argued was a "user-centered" conceptual model that "predicted" AT usage. The model considered device usage as a recurring process over time. The influence of ongoing and consistent intervention, while working simultaneously with AT device, would impact AT usage, and the impact was shown to be a predictor of future AT use. The influencing factors described in the model

were: opportunity and intention to use AT, perceived relative advantage of AT (usability, quality of life), contextual factors (person, activity, AT intervention strength, task, environment), AT usage, impact of AT (usability and quality of life), perceived benefits of AT, and the perceived benefits of parallel intervention options. User involvement in decision-making was less explicit in this model, but the model seemed to encourage user involvement and AT usage by continuously providing AT support, parallel intervention, and strength of treatment.

The "SETT framework" developed by Zabala (1995) was a functional approach used by an AT team to consider and decide on an appropriate tool given the student's needs, the environment, and the tasks. SETT stood for the Student, Environment, Task, and Tools. Key questions included in the Framework facilitated systematic discussion and decision-making. The framework aided the process of gathering and analyzing data to inform problem solving regarding AT decision-making and educational programming for students. The model provided descriptors (functions needed by students) by tools matrix for identifying a list of possible AT tools, which then were prioritized by comparing tool availability and required services for effective use.

Kintsch and DePaula (2002) provided a framework where caregivers, AT specialists, users, and developers could collaborate to assess what would be best for the user in each of four phases: selection, learning, integration, and development. The four stages progressed in circular motion, and depending on the evaluation, adjustments could be made in each phase. Successful adoption of the model required the participation of users, caregivers, AT specialists, and developers.

The "Design for (Every)One" framework (De Couvreur & Goossens, 2011) was a macro model that favored a holistic approach. This model required users and stakeholders to be a part of the team by requiring AT manufacturers to build universally-designed products, and various stakeholders (e.g., users, interventionists, etc.) to take part in providing suggestions for redesign and rebuilding the product. By a technology diffusion approach from a design point of view, various forms of technologies could be designed that were both popular and widely accepted. Because ATs were derived from the mainstream technology and incorporated user information to redesign, they often became more universally accessible to individuals with disabilities.

Models that seemed to lack or were not clear in describing user involvement. "Wile's Model of Human Performance Technology" (Wile, 1996) was a synthesis of five common models of human performance technology. The model included seven variables that were either internal to the performer (i.e., skills/knowledge and inherent ability) or external (i.e., organizational systems, incentives, cognitive support, tools, and physical environment), which affected performance. Despite having internal factors, the decision-making power seemed to rely solely on the professionals. The model did not describe whether and, if yes, how a user would be involved in the process.

"King's Adaptation of Baker's Basic Ergonomic Equation" was another model where King (1999) built on the work by Baker (1986) to describe a framework for understanding the human factors that influenced successful human-machine interactions. Factors associated with successful AT use included: motivation of the AT user to pursue and complete a given task (M), the physical effort (P), the cognitive effort (C), the

linguistic effort (L) and the time load (T). In the equation, King argued that successful AT use would occur when the numerator, (M) exceeded the sum of all effort factors (P + C + L + T) in the denominator. Conversely, failure in AT use could be predicted when the denominator exceeded the numerator. King presented the model as a guide for all stakeholders: user, He concluded that the primary focus of the professions associated with assistive technology must be devoted to maximizing motivation while minimizing all effort factors.

"Edyburn's Model of the Technology Integration Process" (Edyburn, 1998) described the major tasks involved in selecting, acquiring, implementing, and integrating instructional technologies into the curriculum. This model, Edyburn argued, was developed to facilitate integrating technology into the curriculum by serving as a tool for discussing the process among stakeholders, providing a planning guide for technology integration, and assisting in the identification of methods and resources for facilitating the process. Edyburn suggested that although it might take a fairly big amount of time, teachers could work through the process in order to develop a technology toolbox of three to 10 products that could be used to enhance teaching and learning in their classroom.

"The AT CoPlanner Model" developed by Haines and Sanche (2000) synthesized four individual models that were common in special education technology to facilitate team planning and communication. In this model, AT teams used groupware – a computer software – to collaborate and co-plan about AT considerations for students. The use of the co-planner software should help to avoid the time constraints on the school day that might underestimate the time required for such collaborative tasks.

The "Consideration Model" developed by Chambers (1997) helped school AT teams guide AT planning. This model, in the form of a flowchart of guiding questions, facilitated decisions that needed to be made throughout the instructional planning cycle. An important feature of this model was that assessment was informed by a number of factors: interactions between the AT decisions and the instructional plan, currently effective practices in the student's program, the knowledge base of the AT team, and ongoing updates to the student's program.

The "TAPE Framework" (Bouck et al., 2012) aimed to repurpose technology (e.g., video MP3 players, recording pens) to be used as AT. TAPE stood for transportable, available, practical, and engaging technology. By repurposing technologies to serve as assistive technologies for students with high-incidence disabilities, the authors argued that the students' interest in technologies could be harnessed to serve the purpose of AT for students with disabilities, which could be cost efficient, less stigmatizing, practical, and were easily available.

"Education Tech Points" by Bowser and Reed (1995) was another tool intended to help school districts determine system-wide AT needs and evaluate those services. The framework had six steps: referral, evaluation, extended assessment, plan development, implementation, and periodic review. During the process, key questions were considered about each student's needs for assistive technology, and the implications for school districts were discussed.

2.3.4 Summary

Some of the models, particularly among those that described user-involvement in the AT process, included a number of factors such as user perceptions, positive environment, and AT features in the AT decision-making process. These models provided options for stakeholders to select AT that most fitted their decision-making criteria. Among the eight models that described user involvement, one seemed to focus on individuals with low-incidence disabilities and the others were all inclusive.

Eleven of the models reviewed above were all inclusive in terms of disability types. Although some of the models seemed to focus on serving low-incidence disabilities (e.g., aids for daily living), they did not make this explicit and might not be as relevant for individuals with high-incidence disabilities. Among the fifteen models reviewed above, one model (Bouck et al., 2012) seemed to focus on individuals with high-incidence disabilities, but then did not mention about direct user involvement during the decision-making process. Some of the models that had some form of user involvement were not clear about whether or how to incorporate user perspectives in the decision-making process. From the review, there seems to be a need to develop or enhance models to more explicitly consider decision-making by students with high-incidence disabilities and consider differences in the level of support they need and other factors described earlier in the chapter that appear to influence their AT acceptance and use.

Understanding students' perspectives on AT decision-making and use will help researchers and educators design and implement effective interventions for long-term AT

use (Johnston & Evans, 2005). To help address this gap, this study explores the life-experiences and understandings of factors that high school and college students with high-incidence disabilities identify as influential to their decision-making related to AT acceptance and use.

When exploring a phenomenon, theories often provide important guidance for the design of the study and initial analyses of the data. The following section describes the theories used in the study and their relevance in exploring the phenomenon.

2.4 Theoretical Frameworks

This study was guided by the constructs of Unified Theory of Acceptance and Use of Technology (UTAUT) and Self-Determination Theory (SDT). The following section offers detailed descriptions of the constructs of each theory and describes their relevance and ability to inform the study, especially during the initial analyses.

2.4.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT theory aims to explain user intentions in using an information technology (IT) and subsequent usage behavior in organizational contexts. While it is a relatively new theory, it has been widely used in management information systems, health care, and organizational culture literature (Garfield, 2005). This theory was developed through a consolidation of the constructs of eight competing theories that earlier research employed to explain technology usage and behavior: Theory of Reasoned Action, Technology Acceptance Model, Motivational Model, Theory of Planned Behavior, Combined TAM and TPB Model, Model of Personal Computer Utilization, Innovation Diffusion Theory, and Social Cognitive Theory.

For the empirical validation, the theory was compared to the eight above-mentioned theories and their extensions to formulate a unified model that integrated the elements from across the eight theories. Forty-eight separate validity tests (two studies, eight models, three time periods each), using partial least squares, were run to examine the convergent and discriminant validity of the model. Empirical validation showed UTAUT out-performing the previous eight models by explaining 70% of the variance in technology usage intention, which was 17% greater than the best single model (Venkatesh, Morris, Davis, & Davis, 2003). From the analyses, four constructs of the UTAUT model were identified as significant determinants of usage intention and behavior: (1) performance expectancy, (2) effort expectancy, (3) social influence, (4) facilitating conditions. Three non-significant determinants – attitude toward using technology, self-efficacy, and anxiety – were dropped out from the model, and the model was re-estimated (Venkatesh et al., 2003).

Taking advice from several validation and other studies that used UTAUT, Venkatesh and colleagues recently extended the UTAUT model for use in the consumer context (Venkatesh, Thong, & Xu, 2012). This updated theory was named UTAUT2. Validation of the theory in the consumer context added three more constructs: hedonic motivation, price value, and habit. Age, gender, and experience of using the technology were posited to mediate the impact of the seven key constructs on technology usage, intention, and behavior. The seven constructs of the UTAUT2 theory are summarized below.

Performance expectancy is the byproduct of perceived usefulness, extrinsic motivation, job-fit, relative advantage, and outcome expectations of a technology by its user. It is the degree to which a user believes that using the system will help him or her to achieve gains (Venkatesh et al., 2003). This construct includes items that relate to how useful the user perceives the technology to be, what their outcome expectations are for using the technology, and how the technology's capability will help them in their job performance.

Effort expectancy is the perceived ease of use, and/or complexity in using a technology. Given their skills and experience with the technology, it is basically how easy the device or system is to use or how much effort the user thinks he or she has to put into the device. This construct includes user experience, as more experienced users find the same or similar device easy to use.

Social influence is the subjective norm, social factors, or the "image" of the device that comes into play; in other words, how important the user thinks other people think the use of the technology is. It includes the user's belief about how the technology affects their image, how much others believe they should use the technology, and how the technology fits with the social norms of the environment.

Facilitating conditions is the user's perceived behavioral control, facilitating conditions, and compatibility of the device. It includes the accessibility of resources necessary to use a new technology, and the support and training necessary to use the device. It is the "degree to which an individual believes that an organizational and

technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453).

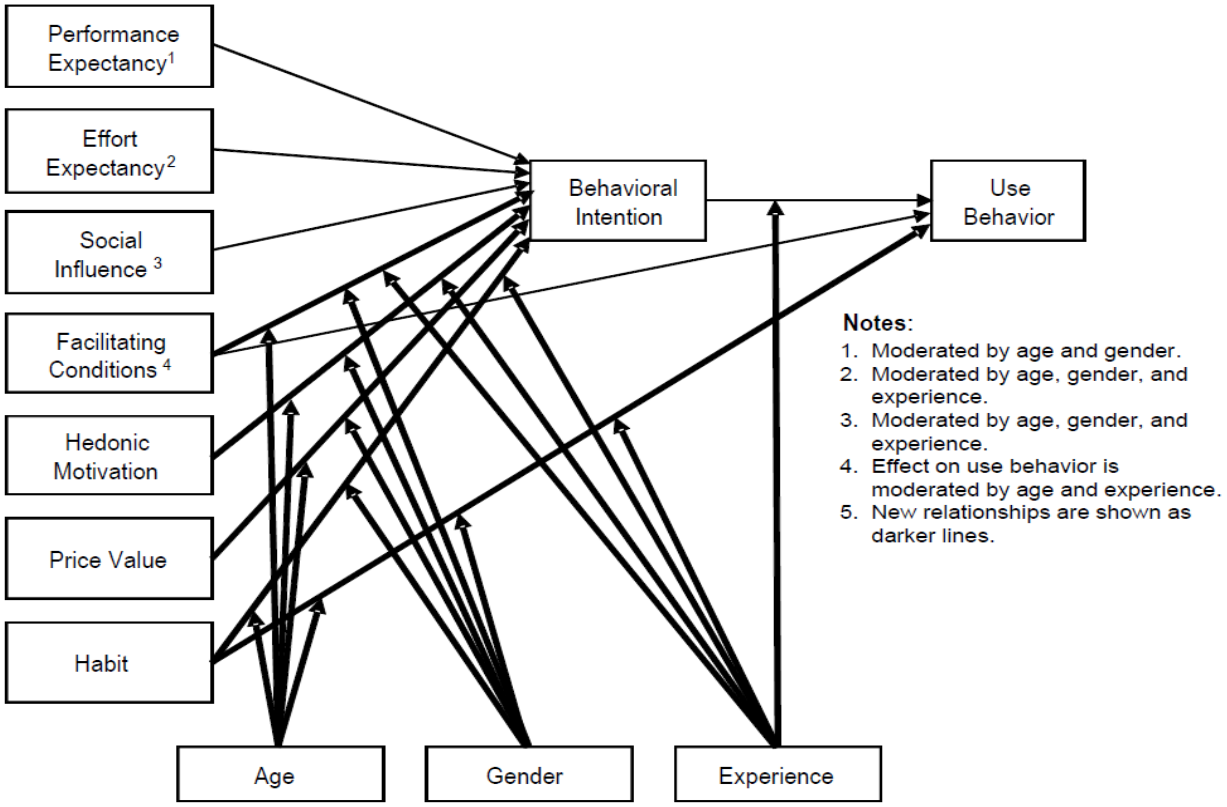
Hedonic motivation is the perceived enjoyment or pleasure in using a technology. Hedonic motivation is a critical determinant of behavioral intention and was found to be a more important driver than performance expectancy in non-organizational contexts (Venkatesh et al., 2012). Along with the increased level of experience, the attractiveness of the novelty that contributes to the effect of hedonic motivation on technology use gradually diminishes and users start to use the technology for more pragmatic purposes, such as gains in efficiency or effectiveness.

Price value of a technology determines its use by individual consumers, because they usually have to bear the monetary cost of the device. During the decision-making process, consumers cognitively trade off the perceived benefits of the technology and the monetary cost related to it (Dodds, Monroe, & Grewal, 1991). The price value is positive when the benefits of using a technology are perceived to outweigh the monetary cost and vice versa. Positive price value has a positive impact on behavioral intention.

Habit has been defined as the behavior that is performed automatically. Although habit is related to experience, they are two distinct constructs. Experience is operationalized as the passage of time from the initial use of a technology by an individual, whereas habit has been operationalized as prior behavior which is measured as the extent to which an individual believes the behavior to be automatic (Venkatesh et al., 2012). Two key distinctions between experience and habit are: experience is a necessary but not sufficient condition for the formation of habit, and different levels of

experience (i.e., chronological time spent performing the behavior) can result in the formation of differing levels of habit. Habit is a self-reported perception (Limayem, Hirt, & Cheung, 2007) that has been shown to have a direct effect on technology use over and above the effect of intention and also to moderate the effect of intention on technology use such that intention is less important with increasing habit. The connections among these and other mediating factors – age, gender, and experience – are illustrated in Figure 3.1 below.

Figure 3.1: UTAUT2 theory's key constructs of and other mediators on technology usage intention and behavior (Venkatesh et al., 2012).



While the UTAUT model is based on organizational considerations of technology acceptance and use, UTAUT2 extends the model to the consumer. However, both

versions of the model seemed to ignore the ability aspect for individuals with disabilities. Randolph and Hubona, on looking at the theory at the individual level from a disability context, argued that "the cognitive and physical ability of the individual was not considered by UTAUT" (2006, p. 389). Describing two case studies of novel interfaces (neutrally controlled web browser and Galvanic Skin Response (GSR) enabled communication system) under development for use by individuals with disabilities, they speculated ability to be a moderating variable for all constructs of the UTAUT model.

Although UTAUT2 has not been validated specifically for the disability population, the constructs of the theory may be helpful in explaining some of the factors for the intended population in the study. As defined earlier in Chapter 1, high-incidence disabilities include various disabilities that are of only mild or moderate impact. The factors influencing AT use as students with high-incidence disabilities transition from high school to college may be similar to those of the general population. The factors proposed by UTAUT2 were considered during initial data analyses of this study.

2.4.2 Self-Determination Theory

Self-Determination Theory (Deci & Ryan, 1985; 1991) is a macro-theory of motivation and well-being. The theory emerged from earlier work on intrinsic versus extrinsic motivation, and first appeared as a fully developed theory only during the 1970s (Deci, 1980). The central premise of the theory is that individuals have innate tendencies towards psychological growth and well-being that are either satisfied or thwarted by their immediate environment. It proposes individuals' fundamental psychological needs for competence, autonomy, and relatedness (Deci & Ryan, 1985; 1991). Social contexts that

support individual's innate desire for a sense of ability, choice in settings, and social connectedness (Deci & Ryan, 2000) facilitate growth in intrinsically motivated behavior and integration of extrinsic motivations. Conversely, those that forestall competence, autonomy, or relatedness are associated with poorer motivation, performance, and well-being (Deci & Ryan, 2000).

Intrinsic versus extrinsic motivation. A basic distinction made between two types of motivation in self-determination theory is intrinsic versus extrinsic motivation (Ryan & Deci, 2000). Intrinsic motivation has been defined as the inner desire to engage in a certain task or learning something for its inherent pleasure, whereas extrinsic motivation requires external contingencies to engage in such activity (Deci, Vallerand, Pelletier, & Ryan, 1991), e.g., a teacher who praises a student for knowing something (Ryan & Deci, 2000). Gradually, it is through a proactive process called internalization that individuals transform actions regulated by external contingencies into regulation by internal processes. Complete internalization or well-internalized extrinsic motivation is when an individual has no conflicting identifications between the individual's coherent sense of self and other values, identities, or actions. Behaviors regulated by integrated processes have some relation to intrinsic motivation as they are parts of autonomous motivation. Such intrinsically motivated behaviors that are fully self-determined appear primarily in adult stages of development (Deci et al., 1991). Such processes when supported can occur in various fields across several life domains including education, workplace, and home (Deci & Ryan, 2008). Conversely, thwarting of such behaviors is associated with less intrinsic motivation and more controlled regulation and amotivation,

which in turn lead to diminished experience, performance, and wellness (Deci & Ryan, 2000).

Intrinsic motivation and autonomy. Autonomy is essential to intrinsic motivation. Being autonomous refers to being self-initiating and self-regulating one's own actions. When extrinsic rewards are provided for doing an intrinsically interesting activity, individuals tend to feel controlled by those extrinsic rewards, which will prompt the shift in their perceived locus of causality for the activity from internal to external; however, when individuals feel less like the originators of their actions, they tend to be less intrinsically motivated (Deci et al., 1991; Deci & Ryan, 2000). On the other hand, when individuals feel they are the cause and have control of their actions, the desire to act is driven by internal happiness or intrinsic motivation.

Intrinsic motivation and competence. Competence in an individual is the ability to engage in optimal challenges and experience mastery in the social and physical world. It involves understanding how to attain those various external and internal outcomes and being successful in performing the required actions. Individual's need for competence is fulfilled by, for example, receiving positive feedback or other extrinsic rewards. Supports for competence will enhance motivation in general; but, it will enhance integrated internalization and intrinsic motivation only if it is administered in autonomy-supportive environments (Deci & Ryan, 2000).

Intrinsic motivation and relatedness. Although not as strong an influence as autonomy and competence, relatedness plays a role in influencing an individual's intrinsic motivation. Relatedness involves developing and maintaining secure and

satisfying relations or connections with others in the social world. Similar to competence, supports for relatedness will enhance motivation in general but will enhance intrinsic motivation and integrated internalization only if the "related" people are autonomy supportive (Deci & Ryan, 1991, 2000).

Self-determination in educational settings. In educational settings, classroom and school environments may either foster or inhibit positive behavior in students (Ryan & Deci, 2000). Students experience greater intrinsic motivation within an autonomy supportive environment (Leroy, Bressoux, Sarrazin, & Trouilloud, 2007). Extrinsic motivation can similarly be internalized by using certain teaching methods (Deci & Ryan, 2008). Intrinsic motivation and well-internalized extrinsic motivation are the bases for autonomous or self-determined behavior, which is an important factor in attaining success in school and adult life (Eisenman, 2007; McDonnall & Crudden, 2009; Wehmeyer & Schwartz, 1997; Wehmeyer & Palmer, 2003).

Individuals with disabilities often have limited opportunities to makes choices and express preferences across aspects of life (Wehmeyer, Kelchner, & Richards, 1996; Wehmeyer & Metzler, 1995). To address this phenomenon in the area of special education, a popular theoretical model, the functional theory of self-determination by Wehmeyer and colleagues (1996) specifies measurable characteristics for the promotion and evaluation of self-determination for students with disabilities. According to the theory, self-determined behavior refers to "volitional actions that enable one to act as the primary causal agent in one's life and to maintain or improve one's quality of life" (Wehmeyer & Metzler, 1995, p. 117). Causal agent implies it is the individual who

causes action to create change in one's life, and makes choices and decisions free from undue external influence or interference.

Individuals who consistently engage in self-determined behavior are described as more self-determined. Self-determined behavior is marked by four essential characteristics: (1) the individual acts autonomously; (2) behavior is self-regulated; (3) the individual initiates and responds to the event(s) in a psychologically empowered manner; and (4) the individual acts in a self-realizing manner (Wehmeyer et al., 2011; Wehmeyer et al., 1996). This theory regards self-determination from a developmental perspective and as an integral part of adolescent development.

There are significant differences between students who engage in self-determined behaviors and those who do not in various domains including choice-making opportunities, behavioral autonomy, self-awareness, self-regulation skills, and perceptions of individual control (Wehmeyer et al., 1996). Higher levels of self-determination have been associated with improved post-school outcomes for students with disabilities (Wehmeyer & Schwartz, 1997; Wehmeyer & Palmer, 2003). This implies, on the other hand, that students who lack such choice-making opportunities or self-determined behavior are likely to have lower levels of self-determination and, thus, poorer outcomes.

Self-determination theory guided initial data analyses in regard to exploring students' perceptions of the motivational aspects of devices, environments, and other factors influencing their AT decision-making. Students who are experienced in using AT should be able to relate the motivational aspects of the use of an AT to their autonomy,

competence, and relatedness, either positively or negatively. As the theory explains, in an individual's progression from extrinsic to intrinsic motivation, students who plan to or start to use AT may possibly look for external motivation, such as positive remarks from teachers, peers, or family members, or the ability to perform certain tasks with ease. Similarly, while deciding on an AT, students may seem to think about "fitting" in with the crowd, which can be explained by the construct "relatedness" in SDT. However, over time and with experience, these extrinsic motivational factors may not be as decisive once the students start to experience the overall progress they made with the use of AT and realize the importance of it in their lives. Students who have experienced that the use of AT increased their "competence" evidenced, maybe, by better grades, independence and efficiency in completing certain tasks, and, as a whole, feeling more "autonomous," may be more likely to continue using AT, regardless of what others may think of them. The constructs of SDT, thus, should be helpful in explaining the motivational factors related to AT acceptance and use.

2.5 Summary

The chapter reviewed the literature on AT abandonment and presented some of the recurring factors that seemed to influence AT use. The second part of the chapter reviewed AT assessment and evaluation models, especially in regard to their consideration of student involvement and decision-making as components in those models. The third part of the chapter discussed two theories and the usefulness of their constructs in framing the study and analyzing the data. The following chapter will discuss

the methodology of the study including grounded theory, researcher's assumptions, and the use of theoretical constructs in the data analysis.

Chapter 3

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter describes the methodology for the study, beginning with a rationale for the use of grounded-theory approach. A description of the research design is followed by explanations of participant selection, data collection, analysis and synthesis. Finally, issues of research quality and subjectivity are discussed.

3.2 Research Design

This study employed a qualitative grounded theory approach (Charmaz, 2011). The grounded theory approach seemed most appropriate to explore and illuminate the understudied phenomenon of the perceptions of transitioning students' with high-incidence disabilities regarding factors that influence their AT decision-making. Qualitative methods of data collection, such as semi-structured in-depth interviews with participants, yield rich data with thick descriptions, while allowing researchers to stay on topic and yet capture relevant but untrodden perspectives and experiences that otherwise could go unnoticed. The grounded theory approach, with its use of constant comparison methods of data analysis, helps researchers to stay on topic and explore a phenomenon in depth (Glaser & Strauss, 1967). Grounded theory guidelines emphasize studying

processes in the field settings, engaging in simultaneous data collection and analysis, adopting comparative methods, and checking and elaborating tentative categories.

Grounded theory leads researchers to go back and forth between data collection and analysis because each informs and advances the other. Using constant comparative methods throughout the analytic processes sharpens the researcher's emerging analysis. This reiterative process keeps the researcher interacting with the data by asking analytic questions of these data and emerging analyses. Researchers have emphasized the robustness of grounded theory approach in indicating the presence of factors and their effects in individual cases, while suggesting their extent in relation to the population from which the participants or cases were drawn (Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005). The constructs of UTAUT (Vanketesh et al., 2003, 2012) and SDT (Deci & Ryan, 1985; 1991) theories that were described earlier in the theoretical framework section were used during analyses to guide further examination of the phenomena of students' with high-incidence disabilities perspectives on AT decision-making and use.

3.3 Sampling

I employed purposive sampling to increase the likelihood of finding participants that met the selection criteria (Johnson & Christensen, 2007; Lincoln & Guba, 1985). I also used snowball sampling by asking the participants to refer other interested potential participants with the required characteristics (Lincoln & Guba, 1985). The number of participants for the study was decided by following the advice of Bernard (2011) and Morse (1994). According to Bernard (2011), a total of 10 to 20 informants should be

sufficient to uncover the categories in a study of lived experience, whereas Morse (1994) suggests a minimum of six informants for a phenomenological study.

During the sampling process, schools, colleges, and universities in Delaware that provided AT tools and services to students with disabilities were identified. To locate the high school student sample, contacts were made with district superintendents, district AT service directors, school principals, AT specialists, and other school personnel. A cover note explaining the study along with consent and assent forms were sent via email to those personnel. They were asked to forward the email and forms to the parents of potential student participants by whatever method was most convenient. Parents were instructed to contact the researcher directly if they consented to have their child as a participant. Once parental consent was received, assent was sought from the respective student to participate in the study. In the case of students who were of legal age, emails were directly forwarded by the schools or colleges to them to seek their consent.

Likewise, to locate the sample of college and university students, disability support services (DSS) offices in seven colleges and universities were contacted to assist with recruitment of students. DSS offices forwarded the cover note and consent form to their listserv of students with disabilities, indicating that students could directly respond to the researcher via email or phone if they were interested in participating. From among the students who responded, only the students with the diagnostic labels who met criteria as having a high-incidence disability were included. Additionally, following each interview, the college participants were asked if they knew others who could possibly fit the criteria and may be interested in participating in the study. This snowball sampling

was an effective method in recruiting college students, which identified 7 of the 10 college students.

During the participant recruitment, the researcher was attentive to the diverse demographics of the sample (e.g., gender, race, grade level within school and college, type of high-incidence disability, prescribed AT device) that could be of interest when exploring variation in the phenomenon. However, specific demographics were not used as selection criteria; it was not the intent to create a representative sample of students with high-incidence disabilities. To do so would have required a much larger participant pool than feasible or necessary given the scope of this qualitative study.

3.4 Participants

Seventeen students who identified as having high-incidence disabilities participated. These included students with learning disability (LD), attention deficit hyperactivity disorder (ADHD), attention deficit disorder (ADD), emotional behavior disorder (EBD), and mild speech language impairments (MSLI) and Asperger's syndrome. Participants who were currently using AT, had used AT in the past and abandoned it, had considered using AT but never used, and/or rejected using AT were included in the study. Since the study's attempt was to understand students' perceptions of decision-making on AT acceptance and use, students who had never been asked to use or considered a technology to support learning or performance were not included as they did not have the opportunity to make any decisions regarding AT. In terms of college participants, students who had graduated from high school within the previous four years and who were enrolled in a college or university were included. One student, who had

recently begun a graduate program, but was also within the timeframe of interest, was also included in the sample. The specific choice regarding college students was made with the intent that those students would be able to inform the study by sharing their transitioning experience from school to college. Participation was voluntary.

3.4.1 Participant Demographics

High-school students. Seven of the participants were current high-school students from various school districts in Delaware. The students had transition program plans included in their IEPs. Five of the students had specific learning disabilities (LD). One student had mild speech and language impairment (MSLI), and one had LD and attention deficit disorder (ADD). They were from grades 9, 10, and 12. Their ages ranged from 15 to 18 years. Only one of the participants was female. Five of them were White and two identified as multiracial. Only one student identified as Hispanic or Latino. Detailed demographics are provided in Table 3.1. A list of AT devices the students mentioned using or had used in the past is provided in Table 3.3.

College students. Ten of the participants were college students from various colleges and universities in Delaware and Pennsylvania. Four of the college students had attention deficit hyperactivity disorder (ADHD). Other disabilities included General Anxiety Disorder (GAD), Acquired Brain Injury (ABI), Dyslexia, Speech Language Impairment (SLI), Obsessive Compulsive Personality Disorder (OCPD), Body Dysmorphic Disorder (BDD), Asperger's Syndrome, and Attention Deficit Disorder (ADD). Three students had multiple disabilities. Students ranged from 19 to 24 years in age, and three of them were female. Detailed demographics are provided in Table 3.2. AT

devices they used or discontinued using included computer, laptop, iPhone, AlphaSmart, audio recording, Kurzweil 3000, MS Office products, and various other applications. A list of AT devices the students mentioned is provided in Table 3.4.

Table 3.1 High-school participant demographics

Name	Grade	Age Gender	Race Ethnicity	Disability	School
Gregory	10	16M	Multiracial, Non-Hispanic	LD	Public HS
Jack	12	18M	White, Non-Hispanic	LD	Public HS
Sean	10	16M	White, Non-Hispanic	MSLI	Public HS
David	12	18M	White, Non-Hispanic	Dysgraphia	Public HS
Xavi	12	19M	Mixed, Hispanic	Dyslexia, ADD	Public HS
Curtis	9	15M	White, Non-Hispanic	Dyslexia	Charter School
Sylvia	12	18F	White, Non-Hispanic	Non-verbal LD	Public HS

Note: ADD= attention deficit disorder, LD = learning disability, MSLI = mild speech and language impairment.

Table 3.2 College participant demographics

Name	Level	Age Gender	Race/Ethnicity	Disability	College Type
Jonathan	Sophomore	19M	White, Non-Hispanic	General Anxiety Disorder (GAD)	Four-year
Frank	Sophomore	21M	White, Non-Hispanic	ABI (OHI)	Four-year
Giana	Senior	22F	Black, Non-Hispanic	ADHD	Four-year
Isabela	Graduate 1st year	24F	Mixed, Hispanic	ADHD/Dyslexia (visual/spatial LD)	Four-year
Nicholas	Freshman	21M	White, Non-Hispanic	MSLI	Two-year
Reuben	Sophomore	19M	White, Non-Hispanic	ADHD; OCPD, BDD	Four-year

Table 3.2 continued

Richard	Sophomore	20M	White, Non-Hispanic	Asperger's	Four-year
Tylor	Sophomore	20M	White, Non-Hispanic	ADHD	Two-year
Michelle	Junior	20F	White, Non-Hispanic	ADD	Two-year
Edward	Freshman	23M	White, Non-Hispanic	LD, MSLI	Two-year

Note: ABI = acquired brain injury, ADD = attention deficit disorder, ADHD = attention deficit hyperactivity disorder, BDD = body dysmorphic disorder, LD = learning disability, MSLI = mild speech and language impairment, OCPD = obsessive compulsive personality disorder, OHI = other health impairments.

Table 3.3 List of AT mentioned by high-school students

Name	AT
Gregory	Laptop, iPad, AlphaSmart
Jack	Smartphone, iPad, iPhone, Safari, e-Dictionary
Sean	SmartPen, iPod, Desktop (MS-Word, e-Dictionary)
David	Laptop
Xavi	Dragon, Kurzweil, co-writer
Curtis	MS-Word, MS-Excel, Calculator, Learning Ally (app), Google Translate,
Sylvia	iPad, Speak it!, Camera, Video, Text-to-Speech, Calculator

Note: MS = Microsoft.

Table 3.4 List of AT mentioned by college students

Name	AT
Jonathan	Computers, word processing, recording, music notation programs, iPod Touch
Frank	LiveScribe Pen, iPad, MacBook Pro, Kurzweil 3000
Giana	Laptop (MS-Word, MS-Excel, PowerPoint, Internet, Multimedia, iMovie), iPhone, iPod Touch, Calculator, Clicker
Isabela	MS-Word, PowerPoint, Email, Internet ShowMe (interactive whiteboard on iPad)
Nicholas	Laptop (Word Editing), iPhone (type-text)
Reuben	SmartPen, Laptop, iPhone, Kurzweil 3000

Table 3.4 continued

Richard	Calculator, audio recorder, classroom video capture, MS-Word and MS-Excel
Tylor	Calculator, Laptop, Math Program, Google, e-dictionary
Michelle	Books on tape, AlphaSmart, Laptop (MS-Office), Dragon Naturally Speaking
Edward	AlphaSmart, Laptop (MS-Word, Adobe Applications, Internet, Google Translate, DragonDictate; iPhone (Google Drive, Notes)

Note: MS = Microsoft.

3.4.2 Confidentiality and Protection of Human Rights

To insure protection and the rights of the participants, the study proposal was submitted for approval to University of Delaware's (UD) Institutional Review Board (IRB). Confidentiality of the participants was maintained as described on the consent and assent forms attached in Appendix B.3 through B.6. IRB-approved Cover Notes and Announcements, Consent, and Assent forms were used. Permission was sought to audio record the interviews. All the information regarding participants and data were encrypted and securely kept in the researcher's password-protected computer and on the secure server operated and maintained by the College of Education and Human Development at University of Delaware.

3.5 Data Collection

A semi-structured interview protocol was used to conduct in-depth qualitative interviews to learn about students' experiences and perspectives on AT decision-making, acceptance, and use. The interview protocol was based on ideas gained from the review of empirical literature and theoretical assumptions of the study and was aligned with the research questions. Appendix A.2 shows how the interview protocol aligned with the

research questions. All the participants were interviewed once, although they agreed to be interviewed more than once or provide further details or explanations to specific questions as needed. Interviews lasted from 36 minutes to 122 minutes, averaging about 60 minutes. Participants were asked to tell stories about their life experiences and perspectives regarding acceptance and use of AT.

All the interviews were conducted in person, audiotaped, and transcribed verbatim. Dragon Naturally Speaking 10 was used to transcribe the audio data. The transcription was checked to eliminate typographical and word choice errors, which are common while using speech-to-text software. Each transcription was emailed to the participant to review and comment on whether the transcribed text reflected what they intended during the interview. Transcribed data files were imported to NVivo 9, a qualitative data analysis software, to facilitate data management and analysis. NVivo is widely used by qualitative researchers for its ease and robustness to analyze data with greater transparency in the analysis (Hutchison, Johnston, & Breckon, 2010).

3.6 Data Analysis

Collection and analysis of data were conducted concurrently to develop an initial set of categories (Glaser & Strauss, 1967), which in turn informed and guided the analysis of new data on a constant basis. Three types of coding – open, axial, and selective – were conducted in the analytic process. After completing each interview, I transcribed the audio and open coded the data. Hierarchal codes or labels were used to organize the coding process. I also wrote memos after each interview briefly describing the meeting with the student, our informal conversations (e.g., their family background or

informal demonstration of AT), and my observations of the interview process. After open coding the first five interviews, I used axial coding to refine and categorize the open codes while exploring relationships among them. I also used selective coding based on theoretical constructs or the factors identified from the literature.

Open coding, as the first step to analysis, was utilized at the sentence level with the intent to explore, interact, compare, and study implicit meanings and explore links between processes in the data (Charmaz, 2011). The process of open coding and the information from the researcher memos about each data source prompted me to inquire further on certain sub-topics in upcoming interviews. However, no substantial revisions to the original interview protocol were required. Axial coding, following the open coding of the data, helped me to draw similarities and connections among different codes. This process also helped me to reorganize the codes and to form categories and themes. Following the open and axial coding, selective coding was applied to examine alignment of data with the *a priori* concepts. This process of open, axial, and selective coding is an inductive approach to data analysis, which starts from the coding of discrete events to the clustering of the codes into large thematic chunks.

In addition, theoretical memos (Glaser & Strauss, 1967) were utilized to systematically seek out my subjective engagement in the issue, reduce researcher bias, and make the research more transparent (Peshkin, 1988). Also, following the analytic process described by Hycner (1985) or what Miles and Huberman (1994) call "case dynamics matrix," data associated with different codes or categories were juxtaposed and compared, which helped articulate what relationships and themes actually emerged from

within the interviews and in theoretical memos. During the analysis, peer debriefing (Lincoln & Guba, 1985) with my research advisor was used to further check on my interpretations of the data.

The reiterative process of interviewing, journaling, transcribing, and analyzing the data was continued until the meanings of additional data were accounted for by the categories already developed or until the data saturation phase (Glaser & Strauss, 1967). This constant comparative process was continued until I started to interpret relationships among the themes, which helped to organize and develop higher-level conceptual categories to explain the emerging picture (Brantlinger et al., 2005). The labels for some of the conceptual categories or themes (e.g., fly high, go-to person) were assigned by the researcher to appropriately describe the emerging picture.

3.7 Researcher's Assumptions

While it is not possible to be completely bias-free, researchers recommend being explicit about personal position, perspectives, and value orientations (Peshkin, 1988) and maintaining subjective neutrality throughout the study (Merriam, 2001; Patton, 2002). In order to ensure credibility and dependability, it is important to discuss the researcher's assumptions. Researchers have their *a priori* knowledge and assumptions about the world, the topic they study, and how they understand phenomena. Reason (1988) uses the term "critical subjectivity" to refer to "a quality of awareness in which we do not suppress our primary experience; nor do we allow ourselves to be swept away and overwhelmed by it; rather we raise it to consciousness and use it as part of the inquiry process" (p. 12). Explicit incorporation of the researcher's assumptions or the bias from

our background, identity, and experience make us and the audience aware of the compounding factors, but also provides a major source of insights and hypotheses to the study (Berg & Smith, 1988).

My reflections on the participants in this explorative study were filtered through my knowledge, experience, and beliefs towards and about school systems, school personnel, students, and assistive technology. From my reading of the research, I was aware that students with high-incidence disabilities may not like to be known by or disclose their disability. High-incidence disabilities are mostly hidden in nature, and students with these disability types may have higher physical and psychomotor skills which help keep their disability hidden. Due to the innate desire to fit in the "normal" group of students, I believed that students with hidden types of disabilities would be more drawn towards new and popular devices and choose to use such devices rather than specialized, less popular devices, even if the popular devices were less helpful in their learning. I also assumed that the naming of assistive technology was stigmatized and that might influence its acceptance and use by the students. I thought they would be less likely to use a tool when it was called AT as it always refers to a tool used only by students who have disabilities. On the contrary, I believed that students who had more experience with AT would be aware of its benefits in their learning, and similarly, students who felt skilled with the technology would be more likely to use it. I also assumed that many students were unaware of the available technology that could possibly help them significantly in their learning.

To assist me in observing students through a researcher lens, I wrote memos after each interview, which involved reflecting on and writing down the different aspects of my experience that were potentially relevant to the study. At times, this helped to generate unexpected insights and connections (Lincoln & Guba, 1985). I cross-checked and cross-validated sources while journaling to ensure that my data collection methods were rigorous and systematic to establish confirmability and dependability (Bloomberg & Volpe, 2008). Additionally, to balance my assumptions with participants' perspectives during the study, I used a peer debriefer. A peer debriefer is a person who can review the data collected and ask questions about the study that may strike a chord with people other than the researcher (Creswell, 2003). The peer debriefer for my study was my advisor, who also provided feedback to me throughout the study. My advisor provided me with feedback in order to refine, and at times deconstruct, my thinking on the process, to look out for different factors in the study as they emerged (Erlandson, Harris, Skipper, & Allen, 1993).

Researchers and consumers of research have confidence the research has been conducted in a trustworthy and credible manner (; Patton, 2002). Lincoln and Guba (1986) consider trustworthiness as the degree to which the researcher is able to present a balanced and fair account of the multiple perspectives of the participants. The following section elaborates on the trustworthiness of this qualitative study.

3.8 Research Quality

Conducting qualitative research requires adhering to multiple standards of quality, variously known as validity, rigor, or trustworthiness (Morrow, 2005). The research

quality of this study was ensured through being consistent in the requirements of what Lincoln and Guba called the four criteria of trustworthiness – credibility, transferability, dependability, and confirmability (Guba, 1981; Lincoln & Guba, 1985). Triangulation of data, thick description, theoretical sampling, member checking, peer debriefing, and an audit trail were some of the techniques used to ensure trustworthiness of the study.

In this study, credibility was garnered by working to ensure that the participants' responses were captured accurately. An important feature of this study was an attempt to explore the factors that students consider while making AT decisions. Thus, accurately capturing the participants' voices was critical to the credibility of this study. To enhance credibility, interviews were recorded and transcribed. Transcriptions were rechecked by replaying the audio to eliminate transcription errors, which are common when using speech-to-text software to transcribe the data. The credibility of my inferences in this study was bolstered through researcher memos. Credibility also requires the researcher to value qualitative inquiry as a philosophical belief (Patton, 2002). My experience as a researcher who has conducted qualitative research under the guidance of graduate faculty also enhanced my work.

Dependability was ensured by identifying and eliminating the inconsistencies in the coding schemes or categorizations (Bloomberg & Volpe, 2008). Inconsistencies in the coding scheme and categories were flushed out during the data analysis phase. The use of the constant comparative method and axial coding helped to strengthen the dependability of the inferences drawn from the data. The dependability of findings from this study was also strengthened by the findings from cross-case analyses that showed a strong pattern,

evidenced by the repetition of codes across multiple participants. Correspondence between transcripts and memos was also checked to support dependability.

Confirmability establishes that the findings of the data were clearly derived from that data and not merely from the researcher's perspective (Lincoln & Guba, 1985). Miles and Huberman (1994) stated that "the meanings emerging from the data have to be tested for their plausibility, their sturdiness, their 'confirmability'…otherwise we are left with interesting stories about what happened with unknown truth or utility" (p. 22). Audit trail or dating and storing all transcripts, audio files, and field notes also supported the confirmability. As the study proceeded, I made periodic methodology memos and stored them in a file, which I considered in data analysis. Moreover, discussions with my advisor on the process of study design, data collection, coding, creation of categories and themes helped me to assess and confirm each step in data analysis and findings. Triangulation of data also supports confirmability of the research findings (Patton, 2002). Triangulation in qualitative research is considered an examination step to evaluate data in order to develop themes (Creswell, 2003). This study used triangulation of multiple cases to analyze consistence among findings (Patton, 2002).

Transferability was another fitting goal of the study. Lincoln and Guba (1985) explain transferability as the degree to which hypotheses from one context may be applied to another. Transferability is achieved when the researcher provides sufficient information about the self (the researcher as instrument) and the research context, processes, participants, and researcher-participant relationships to enable the reader to decide how the findings may transfer. A grounded theory study can be judged to have

transference where thick description with voices, actions, feelings, and meanings is provided to make clear the various levels of meaning (Lincoln & Guba, 1985). In this study, transferability is based upon the extent to which the study accurately captured the perceptions of the participants, whether other researchers would reach similar conclusions based on the data, whether the analysis process was flexible enough to account for variations in experiences, and the degree that study elements were sufficiently described to allow for comparison to other populations and study findings.

3.9 Summary

Chapter 3 explained the research design and methodology used for this study. Starting with a rationale for a qualitative grounded theory approach, the chapter described participants for the study, sampling, data collection, and data analysis process. Then, it presented the researcher's subjectivity and the quality indicators for a qualitative study. The next chapter, Chapter 4, will present the findings from the study.

Chapter 4

FINDINGS

4.1 Introduction

The purpose of this study was to understand the perceptions of students with high-incidence disabilities, transitioning from high school to college, regarding factors that influence their AT decision-making. The following research questions guided this study: 1) What are high school and college students' perceptions of factors that influence their AT decision-making? 2) How do the students describe their decision-making processes about the use of AT in high school and college? 3) How do the students perceive AT in relation to their success in high school and college?

Semi-structured in-depth interviews in which the students described their perspectives and experiences with AT served as the primary data. Chapter 3 described participant selection and recruitment process, data collection methods, and the rationale and process for the grounded theory methodology (Charmaz, 2011) that led to the findings presented in this chapter. Table 4.1 shows the major themes and categories organized under the three main research questions. The themes related to each question are described below and a grounded theory explaining the connections among the themes is presented at the end.

Table 4.1 Major themes emerged as explored under three research questions

Research Question	Major Themes
1. What are high school and college students' perceptions of factors that influence their AT decision-making? (Factors)	• Device features; • Social support; • Skills and experience; • Timing to introduce AT
2. How do the students describe their decision-making processes about the use of AT in high school and college? (Processes)	• Lack of systematic assessment and evaluation; • Little or no involvement in formal decision-making processes; • Lack of training and supervision; • Standard accommodations
3. How do the students perceive AT in relation to their success in high school and college? (Outcomes)	• Flying high with the help of AT; • More competent because of AT

4.2 Research Question 1

The first research question posed in this study was: What are high school and college students' perceptions of factors that influence their AT decision-making? Several categories related to the students' perceptions of factors that influenced their AT decision-making emerged from the analysis of data and were organized into four themes: Performance and physical properties of AT, Social Support, Skill and Experience, and Timing to Introduce AT.

4.2.1 Device Features

The AT devices themselves seemed to play a major role for the students to buy in to using AT. Performance and physical properties of a device such as its portability, size, and appearance seemed to influence students' preferences of choosing one over the other. Except in the case of popular and trendy mainstream devices, students seemed skeptical

when it came to using a new technology to help them in academic learning. The following paragraphs describe how students perceived these factors.

Device performance. Performance of a device to carry out the supposed task as intended for the student's specific needs seemed to be a minimum prerequisite for the device to be used. Students were more likely to abandon the device if it could not perform as expected in addressing their needs. Edward, a junior in a two-year college, recalled using AlphaSmart for a brief period of time while in high school. He was provided with the AlphaSmart by his school to address his writing – note taking, grammar, and spelling – as identified as a need in his IEP. However, he used the device for only about two months and stopped using it because the device performed below his expectations.

> I liked it (AlphaSmart) for the first couple of weeks, but then when everybody started noticing problems with it. Like the screen size and not being able to read everything and deleting stuff without you knowing it…It was worse than the actual laptop. Because, the screen was so tiny; this tiny [hand gesturing about 2x4 inches]; and, you have to type everything and you couldn't see what you were typing. Sometimes, it would automatically erase some documents without you realizing it…for that (AlphaSmart), you had to hook up to a printer, and it did take a while to bring up some file. And you basically have to hook it up to another computer to spell check and all that. It's a long and lengthy process sometimes.

Later on, Edward was provided with a laptop to support his needs, which he found to perform in ways that supported what he needed. Speaking of the laptop, he said, "it pretty much sets everything in it and you don't have to worry as much." Edward continues to use a laptop today in college.

Physical properties. Similar to the expected performance of a device, students often preferred devices based on their physical properties. They compared expected benefits of a device in addressing their needs to its physical characteristics– portability, size, and appearance. Even if a device performed well to meet their needs, they did not want to carry it around unless the physical properties of the device met their preferences. Students preferred a device that they deemed to be more portable, better sized, and one that did not look very unique to others. A unique device, students indicated, would not only draw other people's attention but it may also reveal their disability. Students seemed clear about staying away from such devices as much as possible. Moreover, if provided with choices among the mainstream devices or the devices that would not reveal their disabilities, students wanted to pick devices that were preferably smaller and similar in size to typical devices. Xavi, a senior in a public high school who had dyslexia and ADD, preferred to use an HP tablet. The tablet looked more like an iPad in size and weight, but it had Windows 7 operating systems and other programs like a regular computer or laptop. He was aware that laptops were usually more powerful and ran programs more efficiently, but still he preferred to use the tablet due to its portability and size.

> It's always good to have a laptop preferably the Mac or smaller but much more fast and efficient. But a tablet helps a lot too because that's much more smaller than a Mac. Not as efficient just because they're slower; they do everything that any of the computers can do, but they are just slower because they don't have as much space to run all the programs and everything...but I still like it just because it's like a regular PC or laptop and it's more portable.

David, a senior at a different public high school, asked his parents to buy him a new laptop when he started his high school since the one he was using during his middle school years was old and heavy.

> I asked my parents for it because the one that we had is very very old model. So it's really heavy and not easy to carry around. So I wanted something that was easier to bring around in high school…I thought it would be more of a hassle if I needed to run between classrooms occasionally. So, it would be easier if I could have it with me all the time, and then it would be better.

David's issue with the old laptop was not related to performance as he was "pretty much" using only the MS Word software. In middle school, the "heavy" laptop did not seem to be an issue for David, who was diagnosed with dysgraphia and primarily used MS Word and Notepad for note taking, because he did not have to walk around the classrooms as much as he was "with the same people every time and it was a very small school."

Mainstream devices. Students seemed to be aware of the availability of mainstream devices that could carry out the tasks they generally needed help with. They often compared the device they were asked to use or were using to other similar devices on the market that they perceived to be better performing. Students indicated their preference for devices that were popular and trendy in the mainstream market. Apple products such as iPad, MacBook, iPhone, and iPod, and International Business Machine (IBM) and other compatible products such as various branded laptops and tablets were popular or preferred by the students. Students either used or expressed their preferences for popular word editing applications (e.g., MS-Word, MS-Excel, PowerPoint) to internet

browsers and search engines (e.g., Safari, Chrome, Google Search) to need-specific yet general applications (e.g., voice recording, camera, calculator, e-dictionary, calendars, speech-to-text, text-to-speech).

Students indicated that a primary reason to choose mainstream devices over the special ones intended for the disability population was due to the invisible nature of high-incidence disabilities the students had. Due to the hidden nature of their high-incidence disabilities, students considered whether to discard a peculiar device to look "cool" or to use the device and appear uncool or "stupid." Michelle, now a junior in a two-year college, said that at first she felt embarrassed to use books on tape while back in high school. She recalled being in ninth grade. She knew she always struggled in reading, possibly linked to her dyslexia and ADD. During one of her IEP meetings, her English teacher recommended that books on tape might help her read and comprehend particularly during accelerated reading (AR) classes. She reluctantly agreed to try listening to books on a compact disc (CD) player.

Interviewer:	How was your experience [with books on CD]?
Michelle:	My experience, I was kind of little bit embarrassed because I was like well I don't wanna bring in this big CD player and everybody makes fun of me. But if I wanted to do my reading, and for my AR that's what I had to do.
Interviewer:	When you said it was embarrassing, was it just your feeling or you heard comments from others?
Michelle:	It was just the way I felt. No one else had said anything.
Interviewer:	Why did you think that was embarrassing?
Michelle:	I thought they would probably call me like stupid or retarded, carrying around this the CD player listening to books.

After trying it for some time, Michelle surprisingly found that the books on tape were quite helpful. "When I actually did really try it, it was a really big difference. I

understood the book more, like I wouldn't just listen to it; I would listen and read along with the book, which helps my reading comprehension a lot." However, despite experiencing the improvements after using books on tape back in high school and despite being portable "about half of a size of a tablet," she was still reluctant to carry the CD player around and used it while at home. Most of her college texts books were available only on CDs or cassette tapes and she chose to listen to them at home. Some books for her college, however, were provided on iPod, which she preferred the most; she said the iPod was her "life." When asked how she would prefer to listen to her books and what difference would it make, she said that it was convenient to listen to books on tape using iPod even at college. She further said, if she were listening to books on tape with her iPod, people might think that she was carrying an iPhone, which she said was "cool" and "the new thing right now."

> I mean if I could get it on my iPod, that's what I would do. I would stick it on my iPod…the difference would be like, okay, people might think I'm listening to music on YouTube. I'm listening to music that I downloaded on there. It's not like the CD player like of a big, chunky; and so, they might think oh she's got an iPhone. And iPhone's cool, you know… every time you turn around you've got someone's got an iPhone and it's like I'm so out of the loop now.

4.2.2 Social Support

Students often referred to the social support their received at school or at home when it came to their AT acceptance and use. Students reported a mix of such social supports. Some had a go-to person either at school or at home while others did not mention having a single approachable person to look after their AT needs. None of them reported having such support both at school and at home. Students who reported having a

go-to person at school, compared to those students who had such support only at home, seemed to enjoy better AT supports and resources. Having a go-to person at school seemed to go align with the school's provision of better AT resources and support. Other social supports that students reported included technology supportive classroom and school environments and encouragement from teachers, school staff, peers, and family.

Support at school. School and classroom environments seemed to play a major role in influencing students' AT decision-making. For both positive and negative AT experiences, students considered the school environment and the surrounding school personnel, teachers, and peers in playing a critical role in influencing their AT decisions. Students who had positive AT experience credited the encouragement of certain school personnel (e.g., a case manager or a teacher) and peers in supporting their AT use. Students indicated that their schools had a mix of some supporting, some indifferent, and a few inhibiting individuals. None of the students mentioned being completely encouraged or completely discouraged by all school personnel. However, students who felt strong support from designated school personnel (e.g., a case manager) cared less about and, thus, less influenced by indifference from others. One important factor in creating a supporting environment appeared to be having an approachable go-to person for students' AT and all other issues. The person would either solve the AT issue or notify the designated personnel to take care of the issue. Xavi was one among the students who reported having a go-to person:

> She was the teacher that I had last year and I got along really good with her. So it's not like that's what she is there for. She is not a teacher; she's more of a case manager. She helps with the transition from high school to college. But since she knows me so well and since you have such a good

> relationship, I can just go in there and she'll help me out. It's more of a, it's not really part of my IEP but [I go whenever I need help or just to chat]...She beats me up if I don't do good stuff, you know. You kinda have no choice [laughs]. That's the kind of relationship we have.

Similarly, Michelle, a college student, recalled having a mix of supporting and indifferent personnel while in high school, “My special ed teachers like Ms. Henderson, and there was like Ms. Smith, the special ed teachers that were there [to support]. The ones who didn’t really encourage were the regular teachers who taught regular kids; honors kids basically.” Students who did not describe having a single go-to person at school reported experiencing rather discouraging environments. Students did not know who and what to ask for if they needed any help.

Students who went to nonpublic high schools perceived that their schools fared even more poorly compared to public schools when it came to accepting and serving diverse student needs. Despite the many positive features of nonpublic high schools students described, they indicated that personnel in private schools were not aware and did not have structural support systems to address the issues of students with special needs. Isabela, a first year graduate student, saw public schools as more accepting and having more resources to support diverse student needs.

> I feel like the public schools are [better] just because they have more resources, they have more diverse population, so they are ready for the student that comes in and needs extra help. In a Catholic school you are just one of the same and I am, I mean I'm Catholic. I have been to Catholic schools my whole life and obviously I do like it. I think there are great things about it. I like how they are structured. I like how they are strict but when it comes to special case they have no idea how to handle it and they don't have the resources for it.

Isabela said that she always felt that she would have benefitted if she could have audio recorded the lectures. She felt like she was missing some of the teacher talk while taking the notes. But, she was not allowed to use an audio recorder.

> In high school, my father asked and teacher said "no." Also, I went to a Catholic school. So, this might give you some more insight. They were like very strict and it was like almost taboo that I had a LD. Like they were very nervous to accept me in because, like, no. There was this stigma attached to LD. They felt that I was like dumbing down their school.

Frank, a sophomore in a four-year college who went to a private high school, held views similar to others who went to nonpublic high schools. "I think they [public schools] are more open. It feels like they are not obnoxious. There's stuff out there that they can help with. It's just the mentality of the school was the old school type of learning." He recounted his high school days when he needed AT support to accommodate his brain injury needs. Frank said that he was not allowed to use a laptop to support his learning. Instead, he was allowed to use a smart pen, which was not of big help since he also had handwriting issue:

> I had really big issues with taking notes, comprehension, and listening and stuff like that. And, I was telling this to the director, and she was like well some people do use this (LiveScribe pen). They said some people with ADHD use it but that would be an okay option to carry on stuff like that. So, we bought it and I tried it and it just didn't work, and liked I said, I tried it for like a month. It would only work better but my handwriting was still bad that basically I was just kinda like something and something there but then I would have to go home upload the audio, then listen to audio, and type the notes. So, it was extra step and extra hurdle to type it at home but that was kinda of the process.

Support at home. Family involvement and support seemed equally, if not more, important when it came to students making AT decisions and continuation of AT use. It

was often the parents who encouraged the students to start a new technology. For example, Reuben, a sophomore in a four-year college, was given a smart pen by his mother. She had even set it up and made it ready to use. Despite her constant requests and reminders, however, he resisted using it for various reasons. He said he had OCPD, ADHD, and BDD, which he attributed being among the reasons to put the pen off. He recalled:

> My mom was the one who actually went out and got me the smart pen. So, she did the research… actually the first time I used it was, I think, a third of the way through fall semester. I didn't do so well in tests, and then I said, then my mom reminded me again by phone "all you've to do, take this notebook, press this button, and start writing" and I did. And then, it was amazing. It helps so much. I got a B in the class; I probably would've failed it. but it was just really the initiation of setting it up, because I would have never, in a million years, take it upon myself to open the box myself, set it up on the computer, and set the dates, the times, the everything that goes with setting the smart pen. If my mom didn't do all that, and say "Reuben, all you've to do is take it out, press the button on the pen, and press the button on the pad," I would've never used it.

Students who said they got a constant push from their family members often used AT devices at home. However, despite having a supportive family member, they often seem to have difficulties in acquiring and having permission to use AT at school. Students reported their family member's tussles with the school personnel or administration to have the required AT and other support services put in place. Curtis, a freshman at a nonpublic high school, reported having a supportive mom, who taught him how to use various applications on computer – MS-Word and its grammar and spelling correction features, books on tape (or audio and e-books), e-dictionary, Spanish dictionary, and some websites to help with chemistry and other subjects. Although he had

books on tape and a word editing program among other accommodations, he was not allowed to use a laptop or a similar device in class to listen to audio book or take notes. His family was constantly grappling with the school to have a computer with the needed features in his accommodation list. Students reported that it was often the parents who were dealing with the school administration about AT. Family members seemed to play a vital role not only in purchasing or advocating in acquiring AT devices, but also in encouraging and constantly reminding their children on AT use. The family members also played a vital role in participating and supporting their children in IEP and other school meetings.

4.2.3 Skills and Experience

Students' own skills and prior experience in using AT seemed to positively influence their perspectives on AT. The more experience they had, the better they perceived their skills to be, which in turn influenced their future AT acceptance and use. However, students at times indicated that they did not always have positive AT experiences. Their arsenal of AT skills and experience was shaped by their overall AT experience over time. To get a comparative perspective, it was important to differentiate the experienced user of AT from those who had tried different AT devices and then switched or abandoned. For this purpose, students who reported to have at least one year of experience with a particular AT device were considered as experienced users. This distinction was based on a clear difference among students' reports of their length of AT device use. The students in this study either tried AT for up to two months and discontinued use or they continued using a device for more than a year. Experienced

students reported that their academic performance was better over time and they wished to have learned and used the AT sooner. Also, some experienced students reported to have started balancing and minimizing AT use as they had gotten better in specific subjects over the years and started performing more independently of the device.

I should have used it earlier. College students emphasized the importance of earlier exploration and start of AT to support academic learning. They reflected on the benefits of AT they had used recently and the possible benefits of other unfamiliar technologies, which they did not get to use or did not learn about while in high school. After being in college, the students found college course loads and professors' expectations to be more demanding compared to their high school. Due to the increased course load, more time was required to learn the subject matter, and thus, they perceived a need to use possible technology. College students often used some type of audio recorder to record lectures to which they could listen at a later time, pausing and re-listening to comprehend ideas and to take detailed notes. They assumed that there could be other technologies that could be even more effective to address their specific needs. They showed a sense of regret for not attempting to learn and use AT earlier in school. Students who had more experience with the technology in general reported using them and benefitting more than the students who started to use it late.

Michelle did not know that she could listen to most of her books on iPod until lately:

> I would have probably wanted to try my iPod a lot sooner. If I could go back in time, I would think I would probably ask one thing for Christmas would be for an iPod because this has been amazing. I think it would have helped me a lot better being feel more confident about listening to books

> on tapes. It would be a whole much, changing, different…I would've probably inform them [school] about the Dragon (a speech-to-text software) and probably like, "look, I wanna try it."
>
> Michelle said she was rather skeptical about IEP meetings and AT:
>
> Looking back, I know a lot more about disabilities now. So, then I would have known if I would have had that perspective, I would have probably been like "no, I'm fine." Now I know that, if they are doing the best practice, they would have been doing what was best.

Giana, a senior in a four-year college, recalled having a difficult time in chemistry class in high school. She reported using a laptop to take notes in college, which she found really helpful, and she thought that would have probably helped her in high school Chemistry class:

> I think if I had used my MacBook during chemistry it would have helped me because I fell behind during the notes because I didn't know what he (the teacher) was saying I was trying to write it down and understand the same time and if I could have written it down faster I might have had more time to process it. So that might have actually helped me.
>
> Giana did not bring her laptop to school, because "nobody did."

I want to be more independent. Experienced students who were using AT for a long period of time and who had experienced academic improvements over time shared their intentions of gradually becoming more and more independent of AT. Students who used to depend a lot on AT in the early years of school indicated that they were performing much better than they would have without the use of AT. The use of AT over the years also seemed to improve some of their academic skills, and the students indicated that they did not have to be as dependent on AT as they used to. Students also said they were cautious about how technology may change the way of life, making

people more dependent on it. They thought that people might get lazy as they get more dependent on AT. For such reasons, students indicated that they started attempting to perform tasks independently when they thought they could perform those tasks without or with less use of AT. For example, Tylor, a sophomore in a two-year college, said that he was using calculators over time and gradually got better with simple calculations because he used to practice and learn after each addition or subtraction he performed using a calculator. When asked what it seemed like to be less dependent on AT such as his e-dictionary, he replied:

> I wouldn't wanna rely on it, like "okay, I know I can't spell this. I am gonna type it" and then after a few times, "okay I know how to use it, I know how to spell it, I know what it means. Okay, I don't need it quite as much anymore." And, I can use it for next thing that I can't do because there's always something that you can't spell. You don't know every word.

Students also mentioned experiencing hard times due to AT failure, although these were often one time experiences. Incidents such as a dead battery in a calculator or a laptop, computer outages due to possible virus or other attacks seemed to make the students ponder the alternatives– one being able to carry out tasks independently. Xavi always used AT to support his various learning needs. He was an experienced user of Kurzweil 3000, CoWriter, DragonDictate, and other Windows based applications including MS Word and e-dictionary. He depended on technology for many years during elementary through high school, which he credited for enabling him to learn a lot more than he could without its use. But, the limited AT availability during his middle school prompted him to think of becoming independent of AT.

> In middle school because we got bugged, somebody bugged the whole district computers. So I didn't have it for quite a bit there. And then I also went to different school during middle school and then I didn't have technology for a couple months and then I was like yeah, I need to learn…I realized that I needed to be more independent from the technology just because the technology is great when it works and when you have it. Now the technology you won't always have it are sometimes there will be moments when it doesn't work because there are viruses and it's expensive too.

Xavi said that he had started practicing that in the recent years and made improvements in reading and writing. "My reading and writing has improved greatly lately just because I know I won't always have that and it's not good to be completely dependent on it although it's very great and useful for the technology to use."

4.2.4. Timing to Introduce AT

Students indicated the importance of timing when a new AT was being introduced. Students indicated that, from their perspective, an AT was often introduced to them at the wrong time. High school students did not want to be introduced to a new AT during their initial years in high school. During their initial year, they put more emphasis on building social circles. Timing also seemed to play an important role in influencing AT decision for college students, but for a different reason. College students who were introduced to AT in the middle of a semester reported they were unable to follow up or invest more time in learning a new AT.

Freshman versus senior year. Students during their initial year at high school put more emphasis on creating and maintaining social relationships than on using AT. Students who were introduced to AT in their freshman year shared their concerns about the possibilities of AT negatively impacting their social relations as they were in the

initial period of making new friends and social circles. On the other hand, students who were in their senior years at high school described stronger social circles, had close friends, and did not think that AT use had or would have affected their social lives, as they felt they had enough time to mature in their friendships. The seniors were more confident about their strong social circles and cliques even if the device had exposed their disability, which otherwise were hidden. Some had already shared about their disability with their friends and some others thought their friends already knew as it could be evident over time. Similarly, they provided explanations about other students and how that was related to addressing the needs of those with various hidden disabilities. Xavi, a senior in high school said that his use of AT devices did not affect his social life.

> Everybody is accepting, everybody extremely accepting… because they see that yes I have a disability but that disability does not affect me in the sense of -hey I'm me like it doesn't affect me socially like it's more just reading and writing. It's not like… and they learn to understand and then everybody in my class, I'm extremely good friends with everybody in my class; no enemies [laugh].

Even the high school seniors and college students, who were not introduced to new AT while they were freshmen in high school, thought that they would have been concerned about the impact on their social experience it they were introduced to AT in their freshman year. Frank, a sophomore in a four year college, used LiveScribe pen while in 12th grade, which he said did not affect his social life, but said the case would have been probably different if it were in 9th grade.

> I think it if I was a freshman or sophomore, probably it would have been different. But like since I was a senior, I pretty much knew everyone and it was just kinda like yea, he has that. And I had told up front what happened but I feel like if I was placed in a new school even in a senior class but if

> you were in a new school it would definitely impacted the way I interact with others and something like that. But because I know the people, it's not as challenging per se.

And again, it is often at the discretion of the students whether to hide or disclose their disability, as Richard, a sophomore in a four year college, puts it:

> Asperger's is one of the least understood disabilities, I think. It's not very evident. I have the looks of a normal student. And, at the same time I have difficulties in trying to learn…I can express myself in a way that they're not gonna be able to know my exact special needs specifically. So, yea people won't be able to tell unless like they're autism experts, like if they know a lot about it.

It's that time of the semester. Students who were introduced AT during their freshmen year or, in the case of college students, during the middle of the semester or the academic year could not or did not continue. They attributed this to either a lack of time to allocate to learning the tool or that they did not want to start the tool in the new setting. For college students, middle of the semester meant the courses were in progress with assignments and tests coming up and students needed to invest more time studying. So, they were not able to allocate extra time to learn the new tool. Reuben was introduced to a new tool, Kurzweil 3000, during the middle of his fall semester. He was provided with a 10-minute quick tutorial at the disability support office on how to use the software. He was then provided with a link to download the software on his laptop on his own and start from there; and, there was no follow up. He tried downloading it once, he could not, and he did not follow up.

> The thing is, it would have to be like a very start of a course for me to actually take advantage of it. For example, we're in the middle of the semester, and even if I were failing a class right now, and you came to me

> and said "here's technology, a tool to get you through the rest of the class" to be honest with you, I don't think I'd utilize it because the stress of me being already in the middle of semester saying "oh, there's no clean sheet of paper. And if I were to start this in the middle of semester would just kinda throw off everything" I wouldn't probably use it. However, if you told me at the start of a semester, with a clean sheet of paper, "Okay, nothing has started yet. This technology is what's going to get you through." I probably would do it. But again, it goes back to the training and also goes back to my time management and the way I prioritize.

4.3 Research Question 2

The second research question posed in the study was: How do the students describe their decision-making processes about the use of AT in high school and college? Students' responses indicated the decision-making process was more about what the school did than the students' own decision-making process. Students perceived themselves as having very little involvement in the AT decision-making process. Their responses indicated that their decision-making processes were largely influenced by the school's own procedures and resources. Thus, this research question can be better phrased as "*the* decision-making processes" rather than "*their* decision-making processes." Students reported a lack of systematic assessment and evaluation, limited opportunity for user involvement, little or no training and supervision, and being confronted with standard rather than individualized accommodations.

4.3.1 Lack of Systematic Assessment and Evaluation

Students indicated that they were not aware of any formal guidelines or systematic assessments to identify their AT needs. Lack of systematic AT assessment seemed to be a consistent issue. Students indicated that the selection of AT device was based more on certain teachers' individual recommendations of what device might help

them improve in the subjects in which they were falling behind. Rather than considering the specific disability issues and the limitations the student may have had to identify an appropriate tool, school personnel often recommended a device that they had heard some other student was using, regardless of disability type or limiting conditions.

Despite the lack of systematic assessment in place, students had positive views about the schools that either provided them with the tools or let them use their own that the students found to be helpful. In one of the public high schools, where students described having a positive AT experience, school personnel discussed possible helpful tools that they had heard about and would bring that up in the following meeting, and possibly test it with the student. Students who had good AT skills and had prior positive experience with AT had found ways to learn the new tool to make it work for them. Xavi, one of the experienced AT users, mentioned himself as being a "lab-rat" for the district:

> I was using cowriter all the way up to middle school and then I started using, there was a new program that came out, I forgot what it's called, the reader or something, and since I've been using the assistive technology for such a long time, and since I was incredibly good at getting it to work for me. They wanted to test that program out to see if it would be an efficient program, so they used me, as a lab rat pretty much [he chuckled] for the district. But, I actually like the program, which was pretty good. It was better than cowriter. And yea, I still use Kurzweil. Kurzweil has been one of those programs that have been with me the whole time.

Lack of systematic assessment and evaluation also seemed to result in uninformed distribution and inefficient utilization of AT. Tylor, a sophomore in a two-year college, recalled unequal distributions regarding the availability and use of AT:

> The kids that actually need it (AT), it's probably underused; probably because budgeting constraints and whoever control the budget. But for the kids that don't really need it, like most of the certain point where they can

> probably do by themselves, but they still give it to them anyway, when they don't actually need it, it becomes handicap because then they're like "well, why am I actually gonna put an effort to spell by myself" so it's kinda like those double edge things, if they focus on the kids that really needed it and give it to them all the time and the kids that you shouldn't really need this anymore couz you weren't that bad at the first place. Once you can kinda show that they didn't really need too much anymore, towards the scene like they are lazy or misusing it or something like that. Or they just don't want them, they'll do it themselves.

In nonpublic high schools, it seemed difficult even to have an appropriate technology to be approved for classroom use. Frank was not allowed to use a laptop although he knew it could help his handwriting/note taking, spelling and grammar and comprehension issues. He said:

> They said "try to use the LiveScribe pen," which is – you write and it records – but it still in paper. But one of the issues from brain injury was my handwriting is really bad. So even though I recorded the class, I couldn't read my notes. So, that was a big kinda challenge and they were really resistant regarding me bringing a laptop or like iPad in school.

Similarly, Sean, a sophomore in a nonpublic high school, shared his experience with his educational diagnostician (ED), who was in charge of Sean's AT decisions.

> She (ED) said, when I write, she said, I'll always have this challenge. Like I'll never learn how to write, because the person really bad at math is always gonna need a calculator until they die. They're basically saying so. And then the ED said to them (the teachers who attended IEP meeting) that I can always call my mom if I can't spell a word and stuck. And, I was like "I know that." I don't always wanna depend on her because what if she dies next the day, what are you gonna do, you wanna be independent. You know what I mean.

4.3.2 Little or No Involvement in Formal Decision-Making Processes

Students who participated in formal meetings said that they were usually in IEP meetings when someone suggested trying an AT. The suggestions usually came from their teachers in whose classes they were struggling more. There often seemed no communication with the student in or out of the meeting to ask for their perspectives, and no considerations were made about students' preferences. Those formal meetings seemed more like rituals, and students often disliked those meetings. Sean, a sophomore in a private high school, did not seem to feel involved although he had attended most of his IEP meetings:

> When I'm saying something, she (educational diagnostician) likes to take charge of the meeting like go over-talk everybody and she like interrupts. And, that's why the meetings are so long because she talks a lot…they mainly ask my mom but I'm trying to have them to ask me because it's about me and my meeting and everything.

He further said that even his teachers had much less of a say:

> I wish the regular ed teachers could talk more than the ED because the ED only sees me like a last couple of days and then at the end of the year when we have IEP meetings. I wish regular ed teachers could kinda involve because regular ed teacher just basically sat there and I wish they could say or put more input.

Similarly, Michelle attended most of her IEP meetings but she did not feel involved or heard when the team made an AT decision for her – to use books on tape:

> I kind of felt a little left out at that point because it was like I don't wanna do that, they're not listening to me. I don't wanna do it. It felt like they were just pushing me aside and just talking to my grandmother and be like oh she needs to do this and she needs to do that, so I felt a little pushed aside.

Other such formal meetings, where students indicated that they felt welcomed, seemed to have individuals present who were enthusiasts about AT tools and who seemed passionate about addressing students' AT needs. Those meetings were not necessarily attended by AT experts. However, students indicated that the positive attitude and caring environment made students' feel positive and more involved.

4.3.3 Lack of Training and Supervision

Training on how to use a tool did not seem to be included in the AT implementation process. Availability of trained professionals and training and ongoing support to students seemed to be a major concern. Resources and supervision varied depending on the schools. For devices with specific purposes (e.g., AlphaSmart and LiveScribe pen to take notes), school personnel seemed to either assume that the student would know how to use the device or did not have the personnel to teach the necessary skills and training associated with using the device. Students who did not have prior experience or skills learned certain applications (e.g., MS-Word, MS-Excel) by trial and error or with the help of a family member.

College students, who received tools from DSS offices, indicated that they were provided with a cursory walkthrough on how to use a tool in the initial process. There were no follow-ups to see if the student was able to use the tool or if it addressed the students' learning needs. Frank, a sophomore in a four-year college, reported that Kurzweil training provided by the college's disability support office was a onetime lecture about the application, which was not sufficient for him to start using the application.

> It was like a 10 minute lecture about what it is…They, rather like help support students and then teacher who is not proficient, help them kinda like work together, which is kinda like an introductory thing, than here, kick it in, go... I think because of that, when I did use it, I mean you didn't see all the stuff that probably could be done. That's why I just did what I remembered and what I saw, and when I did look up on the website a little bit, but the way it read, it was just I couldn't deal with it.

Sean, a sophomore in a private high school, said that there was no training at all even if they provided with a device. "Well, they shouldn't just like give them out. They should have like tutorials and tell us how to on them and stuff, and then try it. Because, if it's just, "here it is," you won't really know how to use.

Experienced users or students who had used similar tools in the past, however, were more likely to self-learn and use the new tools. They were also more accepting and tolerant in learning about such new tools. Xavi, who finds himself more proficient in using various computer applications, said that a brief tutorial was good enough as he has had more experience to learn it by himself:

> Just because I've been using technology for so long and I know it so well they just gave me a brief explanation on how to use it just because I tend to be tech savvy. I know how to get around. So they just gave me a brief tutorial.

Gregory, when asked how he learned to use MS-word and other programs he used to support his academic needs, replied, "I would just, growing up, each student uses it to type in a computer class. When I was younger, I had that thought in my head that they're gonna teach you "how, what to do on a computer "like HTML (Hypertext Markup Language). I also know how to do that, other stuff like that. I thought they would gonna teach us that. But no, they teach you this is a keyboard and this is a mouse [chuckle]."

Among five high schools, one seemed to provide newer high-end technologies overall for their students. Jack, a high school senior, said his school offered a lot of brand new MacBooks and iPads to every student as needed for specific classes. They were used under the guidance of the teachers. The teachers were watchful about students' using of laptops and iPads, "they just check, the teachers are with me when I'm using it. Make sure I'm doing what I should be doing. They have like a sheet, they check it, and see if I'm still doing good. And ask me all different questions…My teachers care a lot about me. They want me to succeed." Jack's learning issues were addressed by the application he was provided with in his Mac. He also had his personal MacBook and iPhone, on which he had a variety of word editing, e-dictionary and other apps to support his learning. He considered himself a geek. He boasted about the highest typing speed among his classmates. Overall, with the resources and supervision he was provided with, he seemed more confident about his learned needs being addressed.

4.3.4 Standard Accommodations

Some accommodations (e.g., extra time) including the use of some AT tools (e.g., calculator) seemed to be standard whenever a student was diagnosed with a disability. Students indicated that although they did not need some specific AT tools, their schools still provided them. Depending on their specific needs, some students chose not to use a calculator unless it was needed for all the students, and some other students did not use extra time or quiet location that was offered to them. Michelle said she did not need a calculator and did not ever use one unless doing tasks where all students needed to use one. Yet, she always had calculator as one of her accommodations. She mentioned that a

calculator as an accommodation was provided to "everybody who has disability. All disability IEPs were pretty much standard. Everybody could use a calculator. Everybody could use a dictionary. Everybody got [extra] time. So it was like everybody was standard, everybody was the same." Isabela, who attended a Catholic school, shared similar experiences about having extra time and quiet environment in her IEP. "It was pointless. I honestly should have just stayed in there the classroom. It was pointless but that's what they said to do." Similarly, Johnathan, a sophomore in a four-year college, reported having a quiet environment as one of his standard accommodations which actually seemed counterproductive, "…accommodations, if they didn't wanna be in a room full of noise, for testing. Though, I never thought that to be the issue because I actually work better around noise." Those accommodations, that came standard for every student, were more about accommodating students' needs in testing environments than in other learning activities. Students described those accommodations, and sometimes those accommodations only, when they were asked about the accommodations they were using, had used, or had in their IEPs. Students indicated that the IEP meetings were more like the formalities or "rituals" that were repeated every year.

4.4 Research Question 3

The third research question posed in the study was: How do the students perceive AT in relation to their success in high school and college? Students were positive about the support AT could provide in their academic success. Students indicated that with the help of AT, they performed and comprehended subject matter at a level that they would have been otherwise unable to achieve. They felt more competent in the areas where they

improved. They also indicated that the use of AT to attain competence in one area positively influenced their sense of competence in other areas of learning. The themes that emerged in response to this research question were: "flying high with the help of AT" and "more competent because of AT," which are presented in the following section.

4.4.1 Flying high with the help of AT

Experienced users of AT (the students who had been using AT for at least a year) indicated immense improvements in their academic performance. In addition to students' reports of better grades over time, they indicated comprehending the subjects at the depth that they would have never been able to if they were not using AT. Some students shared life changing stories regarding their academic and social skill improvements. Sylvia, a senior in a public high school, crediting all her improvements to her iPad, said that many other students could improve if every school did provide them with iPads:

> It's way past my expectations. I'm telling you every school should have an iPad rule that you can have an iPad if you can afford it. But not every school does that; I'm lucky that I have been allowed. Because a lot of kids aren't allowed you know. They have disabilities, they have ADHD and stuff like that and they are not allowed and they struggle in schools when they don't do good. And I'm lucky, I was allowed because I give it a try and everyone liked the way it was working for me.

Giana, a college senior, said that she could keep up with the notes and listening to lecture while using laptop for note taking although she never did that in high school:

> …in college at first I didn't and then I noticed some people using it [laptop] in class and then one day I couldn't keep up in class and I was like I'll bring my computer next time. When I did I stayed up with the notes fine and class and then I was like why don't I do this for every class. That would be so much easier and all my stuff will be in one place.

Jack seemed confident that that was the way to go. When asked what he had to say to students who do not prefer to use AT, he replied:

> That's their [students who do not like to use technology] choice. If they don't wanna learn, that's up to them. But people who do that, with disabilities and everything, I think it's more important to focus on school work so that way, they will do it with high school. Gradually, everyone needs to succeed. If you don't, you're not gonna get a diploma, not gonna get a good job.

Gregory had self-learned various applications and started creating websites for professionals. He thought that laptop could help him with his studies, and when he tried he noticed some immediate improvements and requested himself to have it listed as an accommodation in his IEP.

> I've been using computers all my life, that's my favorite thing to use. So, back in middle school when I was in eighth grade, I started my own web making business, well, semi business. And I make websites for three different people right now. I did it. So I am more into art on computers, like icon programs. And, when I started I was like oh this might be better for me and asked if I was using the laptop. And then, I started using it for school because it was better.

Computers along with various specific applications were used by all the students. The need and versatility of a laptop seemed to be ingrained as a necessity for all to perform in academic learning. College students took it more as a necessity, whereas some students who were attending nonpublic high schools were still having a hard time getting accommodations so that they could use laptops or similar technologies in classroom or as needed. However, those nonpublic high school students were still using computers at home to support their needs and to improve on what they had already achieved. Students indicated using a computer whenever possible whether it was in their accommodation list

or not. Richard, a sophomore in a four year college, said, “apart from my accommodations I always use my laptop. I use Microsoft word processing [for note taking] and Excel to maintain schedules.”

All participants reported experiencing academic gains, while using appropriate devices to support their learning needs. High-end and trendy devices did not just seem to improve students’ academic performance; such devices also seemed to boost their confidence associated with the ownership of such devices. In Michelle’s words, “I like it for the apps that I can get on here; I like how small it is…I like my iPod. It's my life. My life revolves around this thing.”

4.4.2 More competent because of AT

Students indicated that they started performing better with the use of AT to support their specific needs. Students also seemed to transfer their success from their specific learning areas to their general sense of competence. Their feeling of achievement in being skillful at AT and certain academic subjects also seemed to influence their overall sense of competence, and they seemed to feel proud of themselves. Students, who benefited from long-term – a year or more – AT use, spoke of their improved competence both academically and in learning and adapting to newer technologies to exploit the benefits. On the other hand, students who were more reluctant about using AT to support their learning did not express any improved competence.

Gregory indicated that his computer skills had made him one of the best students in his computer class:

> With my computer class, I was pretty much like the top student in there, because I already knew what the teacher would be showing up to the

> students, I would have already done on mine. So, I actually pretty much learned by myself basically, because other people would show me something but I know another way around. So, like people saying it file, save. I don't do that; I use commands. I know the keyboard commands. For typing in Spanish, where you have to had the accents and stuff like that, I memorized half of those, you have to hit Alt and the numbers, and I have memorized half of those already…well, I had to take a test and I had to take a class. I just started messing around with it and I'm like a genius with it now. So, like when the teacher has a problem with it, I actually fix it really…well, I'm a computer person. So I've been using it all my life basically.

He recalled how he designed a poster in PowerPoint while others were using paper and glue:

> For me like inside of my Spanish class now they let you choose PowerPoint or poster. Me doing even though I like arts and craft and stuff like that, but I hate glue. So, when you're doing pictures to posters then instead of doing a PowerPoint where you can actually present, it's not that messy and you can get it done more efficiently and it's better than like using posters.

He further added about his use of YouTube videos to learn different subjects:

> Sometimes I watch YouTube videos if I don't know how to do something, I watch YouTube videos and then YouTube is very interesting, you'll find out a lot of information. YouTube can teach you a lot better than your teacher can answer.

Jack, a high school senior, said he was the geek and the fastest keyboarder in his class. Answering a question about what he would do if he did not know how to use a computer, he said:

> I'm the fastest typist in my class. I can type like four more pages done in like half an hour - 45 minutes. I don't usually tell people this but most kids in our school I'm kind of the geek, among my friends. Like I got plenty of geek friends but I like to learn…if I didn't have any experience at all, I'm telling you, like if I literally didn't have an experience at all with the

> technology and I'm really interested, I would be so on it. I really don't care what it takes for me to learn. I would just ask for the technology from where I can get it, learn and practice it every day, I don't care for how long. I don't care if it would take my weekend away; I'll practice it to get better and to be good at it.

He mentioned that he self-learned about using a computer starting from basic steps like turning on and off to more advanced computer programs by himself, which seemed to inject a boost of confidence. Similarly, Reuben tried LiveScribe pen and experienced improved academic performance. Still he was reluctant to use the pen and try other tools due to possible stigma.

> Well the number one thing is the smart pen. I didn't really discover it until last semester. So, my whole freshman year I just did paper pen, it was really difficult and then the smart pen came around. I actually had it during my freshman year. I just never used it because that's part of me is putting things off and off forever. But when I did finally use it, it really did help. I attribute to the fact that I was able to pass some of these classes because of the smart pen, and even now. So, the smart pen it's amazing because when I'm in class, I cannot really pay attention and take notes at the same time. It's either one or the other. And, that's on a good day, either one or the other. Most days, I just can't pay attention at all. So, to go back and to see when I wrote things down responding to what the professor was saying is amazing. Yeah, it'd be best if had taken advantage of it earlier…It's like oh that kid needs a note taker, he must be out there, strange. Because of that embarrassment and because of the complete blow to my confidence that has caused I haven't even trust myself. There's no perfect answer to solving any of this, I would say, because there's always gonna be an opportunity caused. I have never taken advantage of a note taker because it's too discouraging to my self-esteem.

4.5 Grounded Theory: Acceptance and Use of AT

High school and college students with high-incidence disabilities often perceived AT as a means to reach new heights in learning. Students recalled their experiences with certain devices being more positive than others. Mainstream trendy tools that met their

needs were particularly well-liked. Students recalled having academic issues before using AT and the academic improvements they experienced after using AT. The equation of expected burden and associated risks of using a device relative to expected academic benefits seemed to largely influence students in considering specialized AT devices. Despite the possibility of social stigma and other such disadvantages affecting their social lives, students credited AT for improving their academic performance evidenced by better grades, positive teacher feedback, and overall enhanced learning experience.

Some students did not continue using AT despite experiencing academic improvements. Discontinuance of AT was related to device factors such as poor performance, unique appearance, and less portability; the skills students needed to use AT; and inappropriate timings when the AT was introduced. When an AT failed to meet their expected performance, it seemed to be an easy decision to abandon it or replace it with another AT. Students also thought highly of other AT features such as appearance and portability. Students seemed reluctant and felt forced when they had to try an AT that they perceived to be revealing their disability. Students also thought about device's portability, although they did not seem to consider it as strongly as they did for performance and appearance. Students reported that the timing to start on a new AT was another deterrent. Specific timings when an AT was introduced in school and college influenced its abandonment. For high school students, being introduced to AT in the freshman year was not something they preferred. They put more emphasis on their social lives at school than the AT's possible benefits. They did not want to try new AT at the cost of possibly losing social relationships or status. For college students, it was more

about finding enough time to learn and try new AT. When A were introduced in the middle of a semester, they could not allocate time to learn and try new AT given the demanding course load that increases as the semester goes on. Timing, however, was not an influencing factor when it came to mainstream technologies.

Students who thrived and continued their AT use had a well-rounded support system – they had an approachable go-to person at school for all their AT needs. Support from designated school personnel (e.g., case manager) or individual teachers, healthy social relations with peers, and other people they interacted with on a daily basis all seemed to contribute to their better AT experience. Similarly, students reported continuous support from their family members regarding AT use. Family support included acquiring AT for the student (either purchasing or working with school to acquire AT), teaching them how to use it, encouraging its use, and participation in school meetings. Students, who were experienced AT users or who had been using AT for more than a year, considered themselves more proficient at using such technologies. Those students seemed to transfer their knowledge of current AT to new AT when they were provided with one to adapt to and address their changing needs. They reported that they did not expect any help from others in teaching them how to use the new AT. Rather they found ways to teach themselves to get the new AT to work for them. They not only experienced improvements in their academic leaning but also demonstrated a sense of competence influenced by their knowledge of and confidence with AT and other such technologies.

Across experienced and less experienced users, students did not experience systematic assessment and evaluation procedures. It was usually the teachers or the parents who recommended using certain AT. Their recommendations often seemed to be based solely on what the teachers or the parents saw other students or children with similar disabilities using. Despite apparent reluctance in some cases, students agreed to test out AT to see if a particular device would also address their needs. The reluctance was often due to the device features: being skeptical about its performance, poor portability, and unique appearance – possibly revealing their disability. Students who had a well-rounded support system followed through via the trial and error approaches to find the AT that matched their needs and self-learning the skills required to use the AT. Students indicated that they felt little or not at all involved in schools' AT decision-making processes. Students reported being offered some standard accommodations regardless of their learning needs. Those standard accommodations were automatically tagged on to any student who had an IEP or Section 504 plans.

In addition to those several factors that positively or negatively influenced their AT acceptance and use, students considered AT just as a tool to help them perform better academically and not as a life saver. They had an "it's not the end of the world" perspective. Despite the academic benefits of using AT, these students did not consider the use of AT to be unavoidable. The words of Xavi, an experienced AT user, echo those of all the students who participated in the study:

> I can perform most of the tasks. I can perform all the tasks without using it. It's just in the rate or the speed in which I perform the task; like, with the programs, I can do right then and there. Without the programs did say reading a paragraph it takes you one minute to read a paragraph and it will

> take me five minutes to actually read and understand the whole paragraph…[So, even] if I didn't have it, it would probably be okay. Not the best, but just good enough. But it (tablet) makes it better.

4.6 Summary

Chapter 4 described the findings from the study. Themes were organized under three main research questions, which explored students' perceptions of factors, processes, and outcomes in AT decision-making and use. Finally, a grounded theory explaining the students' AT decision-making process was presented. The following chapter will present a discussion of the findings and conclusions of the study.

Chapter 5

DISCUSSION OF FINDINGS AND CONCLUSIONS

5.1 Introduction

The purpose of this study was to describe transitioning students' with high-incidence disabilities perceptions of factors that influenced their AT acceptance and use. Students in this study shared their AT experiences and stories about what influenced their AT decision-making. Several themes related to various factors, processes, and outcomes emerged that seemed to explain their AT acceptance and use. In this study, factors that influenced their AT acceptance and use included device-related features such as expected performance, appearance, and portability; social support factors such as having a go-to person at school for all AT issues; skills and experience factors such as prior AT skills; and timing-related factors such as appropriate timing in introducing AT to avoid possible social stigma and, for college students, academic pressure during certain times of the semester. Students described lack of systematic assessment and evaluation process and lack of user involvement in AT decision-making processes. Their AT decision-making processes, thus, were largely influenced by the school's decision-making practices. Students indicated that they were often reluctant and skeptical about trying new AT. The skepticism and reluctance was not, however, present in trying new mainstream technologies, which also addressed their specific learning needs. Preference for

mainstream and trendy devices seemed to be influenced not only by the performance and physical characteristics of AT but also by their intentions to own such a device. Such mainstream and trendy technologies, as students indicated, not only helped students perform better but were associated with social status quo or "fit in" with the general population and trend.

In fact, abandonment was not always a negative choice. Students sometimes abandoned one device for another that was more mainstream or because they had outgrown it. Despite some discontinuance due to advancing to better and more mainstream devices, poor performance, or mismatch between device and needs, students were using a mix of AT and mainstream technologies. Excluding those discontinuance factors, students credited AT in addressing their academic needs as indicated by better grades, more in-depth comprehension of subject matter, and more efficiently performing various tasks. Students who perceived themselves as better and more proficient at using AT and other such technologies seemed to demonstrate an overall sense of competence. In this chapter, I will discuss the findings in light of the existing literature and conceptual frameworks and offer implications for practice. I will then briefly describe the study's strengths and limitations, recommendations for future research, and conclusions.

5.2 Discussion of Findings

Many of the findings of this study seem to align with previous findings on AT acceptance and use or rejection and abandonment. Since no prior studies were located that investigated user perspectives on AT acceptance and use particularly for transitioning (high school and college) students with high-incidence disabilities, findings

are compared to studies that were a close match to the study either by disability type or age group, or by a focus on user perspectives (e.g., perspectives of students with all disabilities, or other stakeholders' perspectives on students with specific high-incidence disabilities such as LD or other various disabilities). Constructs of UTAUT2 and SDT theories are also reviewed in relation to findings from this study about AT acceptance and use. The constructs, whenever used, are *italicized*.

Students in this study indicated that AT device characteristics, social support, skills and experience, and timing were influential factors to AT acceptance and use. Device related factors such as performance and physical features of the device and preference was an influential factor in previous findings (Craddock, 2006). In addition to the factors reviewed in literature, the constructs of UTAUT and SDT theories also seemed to explain AT acceptance and use. One of the constructs of UTAUT2 theory (Venkatesh et al., 2012), *performance expectancy* (translated as device performance) was one of the influencing factors for technology acceptance and use. Other device related features such as appearance and portability were also indicated as influencing factors (Wessels et al., 2003) by individuals with all disabilities. The findings from this study suggested that students preferred to own and use more mainstream devices than traditional assistive technologies. This was described by the construct *social influence* where social norms or users' perceptions of how technology affects their image influence their decision-making. Social influence also includes the users' perceptions of how others believe they (the users) should use the technology and how the technology fits with the social norms of the environment (Louise-Bender et al., 2002). In the study, owning and

using high-tech, mainstream, trendy devices were not only associated with device features (e.g., performance) but also associated with their perceptions of "fitting in" and keeping up with the mainstream culture.

The popularity of the mainstream and trendy devices among the students with high-incidence disabilities can be attributed to the nature of such disabilities. Although different students often reported to be using different AT, most of the students' learning needs could be addressed by a laptop or a tablet with specific applications installed. The type of learning needs they had – e.g., handwriting, note taking, spelling, grammar, books on tape, voice recorder – could be addressed by a unique special device such as AlphaSmart or an audio recorder. And, these learning needs could be addressed by a mainstream device such as a laptop that performs both of the above mentioned and other functions that not only students with high-incidence disabilities but their counterparts without disabilities may find helpful. Similar to the findings from previous studies, students in this study did not want to risk revealing their disability by using customized, special devices (Craddock, 2006; Johnson et al., 2006; Parette & Scherer, 2004). Students not only described what did and did not work for them, but also provided rationales behind choosing a specific device; typically, balancing a device's perceived academic benefits versus the device's possible encroachment in stigmatizing their social lives.

Students indicated that well-rounded social support at school (Anderson-Inman et al., 1999; Todis, 1996) and home (Defur, Todd-Allen, & Getzel, 2001) were related to higher rate of AT acceptance and use. Earlier studies (Anderson-Inman et al., 1999; Izzo et al., 2009) indicated that positive support and incorporation of AT use by teachers

seemed to encourage their students to use AT. A UTAUT2 construct, *facilitating conditions,* described the user's perception of organizational infrastructure as an important factor influencing technology use. The construct also included accessibility of resources necessary to use a new technology, the support and training necessary to use the device, and the organizational and technical infrastructure that support the use of the system in influencing technology acceptance and use. Students in this study described social support at school as having a go-to person for all AT needs; a school's AT resources, services, and policies; and positive attitude from teachers. Although new users were discouraged by the lack of positive attitudes from teachers towards their AT use, experienced users reported that they were less or not influenced by negative attitudes from some teachers if there were some other school personnel or teachers supporting their AT use.

Skills and prior experience in using new or similar AT were also influential factors in the study. Another UTAUT construct, *effort expectancy* described the effort vis-à-vis the skills put forward or required by the user in influencing AT acceptance and use. Effort expectancy includes prior skills and experience as they make it easier to use the device. Similarly, earlier studies (Burton et al., 2008; Hemmingsson et al., 2009) associated user awareness, skills, and training with long-term AT use. Recommendations from the literature have focused on the importance of equipping students with the required AT skills, because students with high-incidence disabilities often lack necessary skills and trainings to use AT appropriate for their academic learning (Mull & Sitlington, 2003). Lack of trained personnel in facilitating student use of AT devices and services

(Bausch & Hasselbring, 2004; Kochhar-Bryant, 2003), on the other hand, often resulted in AT abandonment. These findings are also supported by the perspectives of students in this study who were experienced users of AT and who either seemed to possess the skills to use similar AT or were competent in self-teaching similar technologies. These experienced users expected less or no support from the school personnel but seemed to be intrinsically motivated by their prior skills and experience as compared to new users. This is related to the idea of *intrinsic motivation and competence* in SDT theory (Deci et al., 1991; Deci & Ryan, 2000).

Timing of being introduced to new AT was another influential factor explored in this study. Inappropriate timing to introduce a device did not seem to be highlighted in the earlier studies. Students in this study considered the introduction of new AT in the early years of high school as potentially interfering with their social status or relationships. The importance of social relationships, for example, for high school freshmen, was also explained the UTAUT construct *social influence* described earlier while describing students' intentions to own and use mainstream and trendy devices. Students' perceptions of *social influence* was positive when it came to owning or using popular mainstream and trendy devices and negative when it came to using typical AT devices. Earlier studies indicated the role of such social factors in influencing AT acceptance and use (Hemmingsson et al., 2009). Timing of being introduced to new AT, however, was not the case for experienced students who were using AT for more than a year. In college, the timing issue was related to time constraints that students faced during the middle of the semester when the course load was getting heavier. Given the strong

perceptions that students had about their social or academic priorities, schools should be advised to carefully consider timing of introducing new AT, technology options, and the types of supports students may need.

Students who used AT consistently for a longer period of time considered themselves more proficient in using specific AT and other such technologies (Craddock, 2006). Previous studies have associated user experience with higher self-confidence and motivation (Burton et al., 2008). Students in this study indicated to transfer and extend their AT knowledge and skills from one to another. Students who considered themselves better at using such technologies and experienced improved outcomes in specific learning issues also seemed to demonstrate a sense of *competence* (Deci & Ryan, 1985; 1991) influenced by their sense of accomplishments in being proficient at using ATs (Brackenreed, 2008; Burton et al., 2008). They seemed to be intrinsically motivated as they seemed to feel competent in using such technologies compared to new AT and other technology users. The sense of *competence* and *relatedness*, two constructs of self-determination theory, seemed to boost their intrinsic motivation as compared to other students who might be less proficient. Thus, experienced students were less likely to abandon AT due to the *intrinsic motivation* they developed over time.

Students who did not have prior AT experience, on the other hand, did not seem to know how much effort (*effort expectancy*) they might have needed to acquire the skills and use AT. Not knowing the expected effort they need to put into learning the skills, students might become more skeptical about learning to use new AT. Students who were new to using AT needed to be extrinsically motivated by the factors such as training and

support, school's organizational structure and technical infrastructure (*facilitating conditions*) to positively influence AT acceptance and use. Thus, it seemed important to start extrinsically motivating students to encourage them to use technology until they feel a sense of achievement and *competence* (Brackenreed, 2008).

Two other constructs of UTAUT2 – *hedonic motivation* and *price value* did not seem to influence AT acceptance and use for this population. *Hedonic motivation* or the enjoyment of pleasure in using a technology was a critical determinant of behavioral intention and was found to be more important driver than performance in non-organizational settings in the mainstream, which used to gradually fade over time when users used a technology for pragmatic purposes, such as gains in efficiency or effectiveness. Although hedonic motivation could explain the students' preference toward popular and trendy devices to some extent, the students did not indicate that devices they used were primarily for enjoyment of pleasure. It could be because this study asked about their experiences with AT or technology in supporting their needs, they often talked about the efficiency or effectiveness of such technologies in addressing their needs and the use of such technologies was not just for sheer pleasure in their case. Similarly, *price value* did not seem to be an influencing factor in deciding on an AT. Students often mentioned that that the AT tools were either provided by the school or bought by their families, so they seemed to care less about the price of those devices. Some students mentioned that they were not aware of the prices of the devices and for others the *price value* factor did not matter much.

In response to the second research question posed in this study, students indicated lack of systematic assessments and evaluations, little or no involvement in formal decision-making processes, lack of training and supervision, and provision of standard accommodations regardless of their individual needs. There was a seeming gap between public and nonpublic high schools (based on the experiences of college students who went to nonpublic high schools) in their openness toward diverse student needs and provision of accommodation. Nonpublic schools seemed to fare worse in their awareness and tolerance towards students with diverse learning needs, conducting meetings to address those needs, or letting students use the devices that might have helped them to address their disability-specific learning needs.

While talking about accommodations, students often described testing accommodations because those seemed to be the ones identified in their IEPs. Some of the college students who came from nonpublic schools had them as the only accommodations while in high school. Nonpublic schools were more stringent in adding another accommodation despite the likely necessity given a student's specific disability or a family's attempts to have it listed as an accommodation.

Lack of systematic assessment or evaluations (Alper & Raharinirina, 2006; Todis, 1996) and lack of AT training (Bailey et al., 2006) still seemed to be a hurdle for the students, in both public and nonpublic schools, to acquire, learn, and use appropriate AT. This lack of systematic AT processes, services, and resources, largely influenced the students' decision-making processes. Despite the existence of the Assistive Technology Act of 2004 that ensures a major source of funding for assistive technology for

individuals with AT needs and the requirements of IDEA and Section 504 on the provision of AT resources and services, the schools seemed to fall behind in effectively implementing such federal regulations. The Least Restrictive Environment (LRE) provision of IDEA and Section 504 require general education programs (e.g., school districts) to consider AT in order to provide least restrictive and nondiscriminatory access to education for all students with disabilities. Although schools that receive federal funds are required to consider AT devices or services to meet the LRE requirements of IDEA, students in this study indicated that the schools did a minimum in providing such individual needs. Accommodations that had to be individualized seemed to be rather standard for all. All students with disabilities had accommodations such as calculators, extra time on tests, and quiet location whether they needed them or not. Students' experiences in the study revealed a strong need for procedural changes in AT assessment and evaluation, in creating supportive social structures, and in providing necessary AT training and support.

In line with some of the findings related to user involvement (Alper & Raharinirina, 2006; Phillips & Zhao, 1993), students did not find themselves being heard during meetings where AT was discussed or while AT decisions were being made, which added to their reluctance with using the provided AT. Their reluctance seemed to be influenced by a lack of *autonomy* in having a say on deciding on an AT. Thus, providing them with the opportunities to be involved in AT decision-making and having their voices heard would likely to give them a sense of *autonomy*, which, over time, might motivate them in using such technologies.

During the course of this study, the students seemed happy to participate in the interviews. They revealed that they had never been asked about their perspectives or their side of the story, and they appreciated the possibility of some future impact for others due to their voices being heard. The interviews provided the students an opportunity to reflect upon and share their experiences. The students were interested in knowing whether other students' experiences were similar to theirs. Through the students' voices in the study, it became increasingly apparent that the perceptions of their sense of involvement had an inherent value to AT decision-making. Lack of training and supervision in using AT also seemed to influence AT rejection and abandonment (Bailey et al., 2006). Earlier studies explored the importance of user awareness, training, and supervision as indicators of long-term AT use (Burton et al., 2008; Hemmingsson et al., 2009). Since students often lack the required skills and trainings to use AT appropriate for their academic learning (Mull & Sitlington, 2003), it seems important for schools to provide such trainings and support as needed to the students.

In addition to the student awareness and training, teacher trainings that include use and integration of AT in classrooms are likely to enhance teacher's comfort level and knowledge to teach and use technology (Bausch & Hasselbring, 2004; Bryant & Bryant, 1998; Parette et al., 2006; Sze, 2008). Trainings for teachers and other school personnel may help creating a supporting environment and encourage AT use among students. Teacher knowledge of AT and incorporation of AT in classroom instruction (e.g., use of Accessible Instructional Materials) may positively impact AT use in classroom (Morrison & Jeffs, 2005; Woodward & Rieth, 1997).

The third and the last research question in this study explored students' perceptions of success in relation to AT. Student responses indicated that they had positive views of AT in relation to their academic success. Students often indicated better grades, more in-depth comprehension, and efficient use of time as some of the benefits experienced, which is in line with earlier studies (e.g., Blankenship et al., 2005; Dolan et al., 2005; Raskind & Higgins, 1999). Also, their academic success over the years and proficiency in using AT and such technologies also seemed to influence their overall sense of *competence* and *relatedness* compared to their peers. Both the perception of being more independent in learning and performing at a higher level with the use of AT and the gradual steps in becoming more and more independent from AT by outgrowing the previously used AT seemed to instill a sense of *competence* in the students. While in the same process, the students often seemed to compare themselves to their peers with or without disabilities. Their remarks about how they could make new AT benefit them in learning and their skills in fixing even some of the unexpected and more difficult AT issues also showed a sense of *competence*. Also, their *relatedness* or comparison of themselves to other peers in their classroom while describing their competences in various AT skills seemed to intrinsically motivate them in better preparing and performing such activities, influencing long term AT acceptance and use. Also, from the study, it seemed that some factors that negatively influenced their traditional AT acceptance and use were mitigated by the utilization of mainstream technologies. The ownership of such popular and trendy devices was yet another way they related themselves to their peers in the classroom. This ownership and use of those devices not

only enabled them to "fit in" the social norms of the school environment but also made them intrinsically motivated to stay ahead of their peers (who did not own such devices) in owning and using such popular and trendy devices.

During the course of this study, there was a shift in regard to describing the purposes of AT. The initial phases (e.g., Chapters 1 and 2) described the purposes of AT for assisting both daily living and academic learning. However, Chapters IV and V focused on the latter purpose only – academic learning. This shift was due to two factors. First, the scarcity of AT abandonment literature focusing on high-incidence disabilities meant that the literature reviewed in the first chapters of this study considered the wider variety of AT needs of students with more significant disabilities. Second, students who participated in this study had high-incidence disabilities that were more subtle and hidden in nature, which did not severely affect activities of daily living. They described using AT primarily for academic purposes and seemed to have little experience with AT for other purposes.

5.3 Implications for Practice

Results from this study have implications for practitioners, especially the AT decision-making teams at schools. The review of existing models in Chapter 2 indicates a wide availability of assessment and evaluation guidelines that schools can use. Findings from this study contribute to the existing AT models by suggesting the need to more explicitly incorporate user perspectives and provide steps in detail about how the user's perspectives will be incorporated in the process.

5.3.1 AT Assessment and Evaluation

Previous research emphasized the importance of comprehensive AT assessment and evaluation for promoting long-term AT use (Hemmingsson et al., 2009). Students in this study indicated that the meetings in which their AT needs were to be considered proceeded as formalities with little room for discussion and lacked engagement for systematic assessment and evaluation. They indicated that some schools had designated AT persons, but the support students received from AT persons was negligible. Students mentioned people talking about AT during their IEP, Section 504, or other meetings, which happened once or twice a year. Students indicated people who recommended AT did not seem to know students' specific needs and preferences, and the meetings offered few opportunities for students to share such information. In most cases, AT recommendation came from their teachers. Although previous research indicates that high-school teachers are often unprepared to conduct AT assessments due to the lack of training (Benitez et al., 2009), their inputs during the IEP and other such meetings seemed important for the team to make better AT decisions. General education teachers in those meetings were seen by students as important informants to make the team aware about the learning issues that students had in their respective classrooms or courses. Similarly, at other times, AT recommendations also came from parents based on their experiences of seeing another student with a seemingly similar disability using the technology. However, parents are often unaware about AT assessments and options in addressing their children's individual needs (Lahm & Sizemore, 2002). In addition to the user involvement, which seems very crucial in the decision-making process, it seems

important to include the general education teachers and parents alike in the process to assess student needs.

Lack of systematic assessment and evaluation practice perceived by the students indicates a need for schools to develop and follow systematic procedures for assessing individual student needs (Sze, 2008). Systematic assessment and evaluation practice can help identify appropriate technology that is accepted by the student and collect data to evaluate whether the assigned device continues to be a good fit. Rather than requiring the student to confront new AT that often came from a single individual's recommendations, implementation of such systematic assessment and evaluation processes by identifying and engaging the stakeholders in each step are likely to provide better AT options, devices, and services for students influencing better AT acceptance and use.

As described in Chapter 2, several assessment and evaluation models exist. Schools may use guidelines that best fits their students' needs or incorporate those guidelines to develop school-specific procedures. In addition to implementing systematic assessment and evaluation methods, efforts should be made to empower students to understand and advocate for their needs and to reduce the stigma that may be attached with disability status and device use. And, above all, it is important to have trained professionals engaged in systematically implementing such assessment and evaluation procedures.

College students did not report on systematic evaluations or lack thereof in college. This may be primarily due to the students' responsibility to reach out to the disability support office themselves and provide documentation of the accommodation

needs. Often, college disability support offices seemed to provide the needed AT. However, students often commented that the training they received was not sufficient for the students to start using a new AT. There were no follow ups to see if the students were using the provided AT. From the study's findings, it seems important for colleges to provide required trainings and regular feedback to encourage continued use.

5.3.2 Blurring Lines Between Assistive and Mainstream Technologies

The term "assistive technology" rather than "technology" or "educational technology" is widely used in special education. Many students in this study, however, indicated they had never heard the term "assistive technology" before. While the two popular legal definitions provided by IDEA (20 U.S.C. 1414(d)(3)(B)(v)) and The Assistive Technology Act (P.L. 108–364, 29 U.S.C. § 3002) clearly associate AT with individuals with disabilities, the students in the study, who had not heard the term before, guessed that any technology that "assists" a person in doing something could be called assistive technology. Along the lines with the students' interpretations, assistive and mainstream technologies are more and more converged – AT being more and more multi-functional and universally designed and mainstream technologies adding more and more accessibility features. This convergence has resulted in devices designed to support individuals with disabilities (e.g., audio books, e-books, speech-to-text and text-to-speech applications) and mainstream technologies (e.g., word editing programs) now being used by all individuals regardless of disability. Individuals, regardless of disability status, can benefit from technologies such as smartphones and smartwatches with the use of voice assistants – e.g., Siri, Google Voice, Cortana –to set reminders; create calendar entries;

call, text, or email people; make restaurant reservations; purchase movie tickets; navigate to a destination; and etc. Such devices offer accessible features such as magnification, strong colors and contrasts, voice over commands, text-to-speech, speech-to-text, and voice and haptic feedback that enable individuals with various disabilities to use and benefit from the device.

This study included students with high-incidence disabilities only. These students primarily used mainstream devices (e.g., laptop, tablet, smartphones, iPads, iPods, SmartPens) and software (e.g., MS-Word, calendars, audio recording programs, speech-to-text and text-to-speech programs, calculators). Some students had used more traditional AT tools such as AlphaSmart or book-on-tape, but switched to computer based word-editing and high-end audio book devices (e.g., laptop, iPod). Rather than using an AlphaSmart just for note taking or a book-on-tape device just to listen to books, students preferred a mainstream device such as a laptop that could not only meet their specific needs but offer a multitude of other benefits to support their academic learning and other recreational features. A laptop or a tablet that is typical equipped with audio/video recording capability and various productivity applications could be an all-encompassing AT device for students with high-incidence disabilities.

5.3.3 Provision, Availability, and Appropriate Use of Technology

Technology is becoming an integral part of education. Computers to access digital publications, e-library, and classroom management programs and the use of various word editing and other applications are becoming a necessity in college. High schools are following the trail by building infrastructures to promote such methods of learning with

the installation of computer labs, print stations, Smartboards, and e-libraries. Similar to previous findings (e.g., Bolt, Decker, Lloyd, & Morlock, 2011), college students in this study indicated that the AT tools they learned to use in high school were not only helpful but at times necessary in college. They seemed to regret the fact that they did not learn about some AT tools until they were in college, because they believed these tools would have helped them in high school.

An efficient and effective use of such technology infrastructure requires skilled personnel. From the students' experiences, in contrast with the visible school equipment infrastructures, it seemed that schools lacked in providing training and support for school personnel on how to use the technology effectively. The students who had continued well-rounded long-term support used AT and had developed a sense of competence and seemed intrinsically motivated. From the findings, it seems important to provide continued support so that students will continue to use AT in the starting phase when the abandonment chances are high to gradually learn the skills and become an experienced user. School personnel, thus, should be trained not only to make to them proficient in AT skills and incorporate of AT in their instructions but also to encourage and positively support students in using AT.

Teacher roles are important in providing social support to students in AT use. Prior studies suggest teacher training that include the use and integration of AT in classrooms (Bausch & Hasselbring, 2004; Bryant & Bryant, 1998; Morrison & Jeffs, 2005; Parette et al., 2006; Sze, 2008). Inclusion of AT component in teacher training and professional development is likely to enhance teachers' comfort level and knowledge for

teaching and using technology. Such technology-integrated trainings are needed to keep teachers abreast of AT options, skills, and effectiveness so that they can be primary go-to persons for students and promote positive attitudes towards AT. Schools, including private schools, must seek to promote a positive social environment that embraces student diversity and ensures that all students feel comfortable advocating for and addressing their needs.

Similarly, teachers can incorporate and use accessible instructional materials (AIM) (e.g., www.aim.cast.org) in their classroom to provide students with multiple and easy ways to access materials. Both the NCLB and IDEA include compelling requirements for state and local education agencies to ensure that all students, including those with disabilities, receive the supports and services they need to access, participate, and achieve in the general educational settings. With the use of AT and supporting students' AT use in their classrooms, teachers can provide the materials in multiple forms to the students. ATs can help student access and convert those materials from one form to another. For example, a student may use a text-to-speech program or "speak" features available in various mainstream technologies. Other ways to encourage student participation and involvement in classroom and use of technology include the incorporation of technology into universal design for learning (UDL) (e.g., www.udlcenter.org; Meo, 2010). In addition to the AIM, there are several groups – such as Center for Applied Special Technology (CAST) (e.g., www.cast.org) – that support teachers and others to learn about UDL and technology incorporation in teaching and learning. Offering teacher trainings not only on how to use AT but how to incorporate

instructional materials and utilize such resources in classrooms may create AT supportive environments that increase AT acceptance and use. Thus, it seems imperative for schools that intend to capitalize on the potential benefits of technology to offer technology trainings to teachers and other school personnel in ways that foster universally designed and accessible environments conducive to students learning about and applying different technologies to their learning.

Appropriate use of technology in educational settings may result in the use of technology for maximum academic benefits. High-end technologies such as laptops, tablets, and smartphones offer a multitude of functions. However, depending on of the particular apps or software, a student can use a device in ways that may or may not be related to learning. For example, recreational applications such as online games, social media, and sites entice users for different reasons and can be distracting for students. Such distractions, if unaddressed, can gradually attract students so much that it becomes their habit – spending a significant amount of time. High school students in this study mentioned that the schools restricted Wi-Fi access to personal devices, be that a student's or a teacher's personally owned device. The students had mixed reactions to controlled Wi-Fi, which could be accessed only via school-owned devices. Student reactions that supported limited Wi-Fi access included avoiding social networking, online gaming, and other recreations apps and sites, which would result in distractions from instructions and staying off tasks. Curtis, a freshman in a public high school, seemed intrigued by the question and was not sure about what a solution might look like, and for lack of a better solution, he liked the idea of schools controlling the Wi-Fi access. "They would be on

twitter, Facebook, YouTube like it'll be very...well, that'll be worse...I don't know. There should be a middle line." Student reactions that opposed the situation included them not being able to use certain apps – such as speech-to-text – email or print assignments and projects, look up word meanings and usages, and teachers not being able to use educational sites and videos and respond to student emails in timely manner. School policies need to account for the beneficial aspects of teachers' and students' access to Wi-Fi in certain educational and email applications. School personnel need to be trained about ways to limit or provide internet strategically – by machine, by application, by site, by time – that may offer a win-win situation for appropriate use of internet in the school. Proper measures to promote user responsibility and accountability can be put into place.

5.4 Strengths and Limitations of the Study

Quality indicators and credibility measures described by Brantlinger and colleagues (2005) are important in conducting qualitative studies in special education. Quality indicators were carefully employed in all phases of this study including design, data collection, and analysis. By including multiple cases with personalized stories of several similar participants, I triangulated the sources of data and examined them for common themes. Researcher memos were used not only to record the additional information about students (e.g., my interactions with the participants that were not recorded in the interviews) but also as audit trails to keep track of the interviews conducted and to document and substantiate my involvement in the field. Member checking was done by emailing interview transcripts to students to confirm the accuracy of the data. Similarly, my advisor's role as a peer debriefer helped me to receive and

incorporate critical feedback on all phases of the study: design, data collection, data analysis, and interpretations. Thick detailed descriptions of students' responses are provided in quotes to support my interpretations and conclusions. Documenting cases with such thick descriptions also employs particularizability, which helps readers to determine the degree of transferability depending on their situations. Similarly, an explanation of researcher reflexivity (Brantlinger et al., 2005) is provided in Chapter 3 in an attempt to understand and self-disclose my assumptions, perspectives, values, and biases. I explicitly described my personal position and perspective as the researcher (Peshkin, 1988).

Despite the credibility procedures employed, there are some limitations to the study. I employed convenience snow-ball sampling due to the intricacies associated in locating possible participants for the study. Despite my mindfulness and attempts, this sampling method may not have generated a population with a diversity of experiences that fully represent the phenomenon. The sample used in this study may not necessarily facilitate transferability of the findings. The students were from high schools and colleges in a small region. If conducted in another location or even in a particular school district or college, the results might be different because of the district AT policies, resources, and services. Recruitment of students that were either in college or in high-school planning for college was another limitation of the study related to sampling. The study does not include participants who were in employment or independent living or planning to do so right after high school. So, it lacks a more holistic exploration of all transitioning students – college, employment, and independent living – due to the limitation in sampling.

This study includes brief case studies of a small group of students based on single interviews, limited in regard to time spent with the students and limited in regard to their perspectives. Having more interviews or soliciting multiple stakeholder perspectives such as students, school personnel, and parents might have led to varying or alternate representations of the phenomenon.

5.5 Future Research

While this study explored the factors that influenced students' with high-incidence disabilities AT decision-making and use, the findings suggested a need for future research in several related areas. Future studies may focus on design research (e.g., device or product, developing methods for decision-making process, and skill trainings for user and school personnel) and outcomes research (e.g., effectiveness of mainstream devices). The device factors in the findings suggest design implications. Further research on design of devices may help manufacturers produce devices that may be better accepted and used. Thus, research investigating the nature of the devices – especially effectiveness or the use and possible misuse of mainstream devices – would be helpful. In addition to the product designs, further research related to methods for engaging students in the AT decision-making process might be important. Researchers could compare the AT experiences and outcomes of students who were involved in the decision-making process and those who were not. The research would investigate whether schools could make a difference in students' AT acceptance and use by conducting systematic assessments and evaluations.

Future research should also look into designing AT trainings for students and school personnel. Examination of how school personnel are being trained to support students' use of AT in light of the impact of the initiatives such as AIM and UDL is also important. Research could also compare AT experiences and outcomes of students who were taught in classrooms that incorporated AT or that followed AIM UDL or similar initiatives to those that did not.

To further explore the findings related to timing to introduce a new AT, future research could investigate how students perceive when is a good and when is a bad time to start on a new technology. This study had a very small sample but there was a noticeable difference between experienced users (who had used AT for at least a year) and likely abandoners (who tried AT for up to two months and abandoned it for various reasons). However, it was not clear whether the long-term AT use was connected to the time an AT was introduced. So, it seems important to research the issue of timing to introduce AT and timing for continuation of support, especially during that brief initial period of use to better understand the possible impact on continued use.

Future research could include comprehensive case and focus group studies that include multiple stakeholders –students, school personnel, and family member that are involved in AT decisions – to explore the phenomenon more holistically. Also, the present study focused primarily on high-school and college students with high-incidence disabilities. It would be helpful to conduct the study with a different subset of the population– students with high-incidence disabilities who have dropped out of high-school and those who completed high school but did not continue to college. That may

shed more light on the factors that influenced their decision-making and if AT or lack thereof played a role for their decision to drop out of high school or not continuing to college. Likewise, students who transitioned to the work force rather than college might provide additional insights into AT acceptance and use.

Some sample questions that future research may look into are:

1. What should developers consider in designing ATs that are both effective and well accepted by students with high-incidence disabilities?
2. What are the differences among students who had systematic AT assessment and evaluation in place and those who did not?
3. How can schools make students feel involved and heard in the AT decision-making process while implementing effective AT processes?
4. Whether and how should schools provide technology trainings to school personnel and students? What should schools consider for efficient delivery of such trainings?
5. What are the AT abandonment rates of students who were taught using AIM or UDL methods compared to those who were not?
6. What makes a novice user become an experienced user? What are the supports students may need in becoming an experienced user?

5.6 Conclusions

Transitioning students with high-incidence disabilities make up a subpopulation who may consider themselves detached from the students with disabilities population in general in two ways: they perceive their disability being more subtle and their learning

needs less severe. They often perceive their disability conditions being less severe in limiting their learning and, thus, they may balance the possibility of using specialized AT to benefit academically and the cost of possibly revealing their disability. However, this does not seem to be the case when it comes to using mainstream technologies such as a laptop or e-dictionary application to support their learning. In this study, although students who were experienced users were still using some specialized applications such as Kurzweil 3000 in some cases, they had moved from specialized devices to more mainstream ones over the years. Students perceived the use of AT contributing to their academic success. Their academic success over the years and proficiency in using AT and such technologies also seemed to influence their overall sense of competence.

Students perceived certain factors – such as unique device features, their lack of skills or no prior experience, the feeling of being ignored or not having the opportunity to involve in AT decisions, AT not matching to their needs, and inappropriate timing – to negatively influence AT acceptance and continued use. Students who thrived with AT over the years had well-rounded support system at school or at home; but having a well-rounded support system at school (e.g., school's provision of AT resources and services, a go-to person, support from individual teachers) seemed more important for better AT acceptance and continued use.

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Appendix

A DATA COLLECTION TOOLS

A.1 Interview Protocol

Hello, my name is Bishwa Poudel and I am a student from the University of Delaware. I am interested in listening to your experiences with technology in learning. If you use technology, did use in the past, or had ever thought or somebody had ever mentioned about using it – I'm interested to listen about the overall process involved and your thoughts about it. Thank you for volunteering to participate in this study. Today's interview will last about an hour.

[Notify about the voice recording of the interview.]

First let's review your rights as a participant in this study. [Explain participant's rights]

Notes: "Technology" or "device" will be replaced by tool, program, software, AT etc. as appropriate with the case.
Interview questions order:
For Current users: 1, 2, 4, 7–9, 11–14
For Past users: 1, 2, 5, 7–9, 11–14
For Non users (who outright rejected): 1, 2, 6–9, 11–14 (as applicable)
For College students: 1, 2, (4/5/6), 7–14
For those who can't mention technology: 3 (and all others as mentioned)
Repeat device-specific questions for each device identified.

Pre question: Is there anything that you would like me to tell before we begin?

1. INTRO: Before we get started, I would like to know you a little better.
    a. Name:
    b. Grade/Level:
    c. School/College:
    d. Age/Gender:
    e. Race/ethnicity:
    f. Disability:

g. Technology(ies) used (AT & other): (give examples from the AT list: Appendix A.3)

2. ACQUISITION PROCESS: Let's now go back in a time machine to when you or someone else first talked about you needing a technology to support your learning.
    a. Was a systematic process followed in figuring out what technology met your needs? What happened in that process?
        i. When did you know that you needed technology to assist you in learning?
        ii. How did you know? Could you tell me more about this?
        iii. What did you or your family member(s) do to help you get it?
        iv. Who were involved in deciding that technology? Could you tell more of that?
        v. How were you involved in that process?
    b. Is your family happy that you use this technology?
    c. Who paid for it? Was/Is it worth it?

3. (IF 2 FAILS): If they say no I don't use AT.
    a. Apart from books, notebooks and simple pens, do you use any technology or that kind of stuff to help with your studies in some way? (give examples from the AT list: Appendix A.3)
    b. What is it? How do you use it?
    c. How did you get it? Tell me more about that.

4. EXPERIENCE - USING the device(s)
    a. How long have you been using this device?
    b. When/How often do you use it? (certain subjects/tasks, hours per day)
    c. Do you use the device elsewhere? Where? (e.g., school, home, other places)
    d. Why do you use it? (E.g., to perform certain tasks, assignments…)
    e. Are you using it because you like it or because others (teachers, parents) want you to use it? Tell me more?
    f. From your experience, what are its good things and bad points?

5. EXPERIENCE - USED in the past but stopped using
    a. For how long did you use? When?
    b. How often and where you used to use the device? (per day, classroom)
    c. What made you to stop using it? [ask to explain in detail]
    d. What were its good and bad points?
    e. Are you thinking of using it or a similar device in future? Why/why not?
    f. Did you use it because you liked it then or because others (teachers, parents) wanted you to use it? Tell me more.

6. EXPERIENCE – NEVER USED (offered but rejected)

a. Could you tell me about how far you went in the process of getting it?
b. Who were involved in that process? Could you tell more about that?
c. What made you decide not to use the device?
d. Cold you recall what you thought of most that made you say – no, I won't use it.
e. Are there other disadvantages? Like?
f. Are you aware of any advantages of using it? Tell me more.

7. TRAININGS & SERVICES (including evaluation and follow-up)
    a. How did you learn to use the device? How difficult it was to learn?
    b. Can you tell me about the services and/or trainings offered to learn to use or maintain/upgrade the device?
    c. Can you get a newer version of it if it's available? What would be the process?
    d. What is needed to use it more appropriately (efficiently)? (e.g., training, teacher's guidance etc.). How do you get that?
    e. How do teachers, parent(s) or others know if the device is helping you learn?
    f. How often do they check with you regarding the device? What do they do?

8. INTEGRATED IN CURRICULUM/CLASSROOM + MOTIVATION
    a. For which subjects do you mostly use it (or for all)?
    b. Who else uses the device in your classroom?
    c. What about teachers? Do they use it while teaching?
    d. How does he/she (teacher) use it?
    e. Do your teachers appreciate you for using this device? Like? How?
    f. Do you get to use it during exams/tests?
    g. What makes you feel that you should use it (or not use it) in classroom?

9. TRANSITION
    a. How confident are you about using the device in college/work after you leave high school?
    b. How, do you think, the new environment (college/work) will be different than here? Like?
    c. How would you get the device? How would you use it?

10. LEGAL/ENVIRONMENTAL DIFFERENCES: for college students
    a. Could you tell me about the process of getting the device? What did you have to do?
    b. Did you use this or other technology while in high school?
    c. How was the process different than in high school?
    d. Did you know about the process before coming to college? When? Where?

e. How about using it? How did you learn?
f. Can you share your experiences of using it now in college vs. in high school?
g. Who paid for it now?
h. Do other people in your classroom use this/similar device?
i. Do other students in your class know that you have a disability? How did they know?

11. THE DEVICE
    a. Tell me little more about the device. What's so good about it?
    b. Are you happy with the model/version?
    c. How often do you upgrade? (…want to upgrade)
    d. How about its looks/layout? (suggested: visibility/invisibility issue)
    e. How does it help you?
    f. Can you perform the task that you use it for (e.g., assignments) without using it? What's (would be) the difference?
    g. What else do you use it for?
    h. Can it be used for purposes other than what you're supposed to? For example?
    i. Are you doing better in school/college after starting to use it? How do you know?
    j. How difficult it is to use the device?
    k. Where do you use it mostly? (weight, size, transportability)
    l. What were your expectations before getting/using the device compared to now? Examples?
    m. How time saving/consuming it is to use the device?
    n. How much does it cost? Would you buy if you had to pay for it? Do you think it's reasonable for what it does or the functions it has?
    o. What are some positive things about using this device? (likes)
    p. What are some disadvantages of using this device? (dislikes)
    q. Do you think there's another better device that does the same thing?
        i. Why do you like that device?
        ii. How would you use it?
    r. Would you have preferred to see it in a different layout/design? Like what, can you name a device? And, functions, performance?

12. SOCIAL ENVIRONMENT
    a. Are there other students in your classroom who use it (or a similar device)?
        i. Why does he/she use it?
        ii. Do your friends without disabilities use it?
        iii. Does the device affect your social life/friendship etc.? How?
        iv. Do your classmates (other students) know about your disability?

v. Do your friends (or other students) make comments about its use? What do they say? How do you feel?

b. How do teachers (and your parents) know if you are benefiting from the use of the device?

13. CONTINUED USE
    a. Are you planning to use this device in future?
    b. What makes you (feel that you will) use/not use this device in future?
    c. Do you know if you can use the device in future (in college, work) like you do now? Why/why not? (Acquiring process; differences in legal requirements)
    d. How do you think the use of the device (and other such devices) will help your preparation for college/work better?
    e. Do you think you're/you'll be prepared for the college/job?
        i. Why/why not?
        ii. Would a different technology help in that matter? What is it? How?
    f. Do you think that using AT in high school helps you do better in future? How?

14. Is there anything I forgot to ask that I should know?

Thank you for your time!
[Remind about the possibility of getting back with clarifying/further questions if needed.]

A.2 Interview Questions Aligned with Factors

Table A.1 Interview protocol items aligned to respond to the probable factors and theoretical constructs described in the proposal.

Factors		Related questions from interview protocol
Device	Design and layout	4f, 11b, 11d, 11r,
	Performance expectancy	2h, 4f, 11c, 11l, 11q, 11r, 13f
	Effort expectancy	4a, 4b, 4f, 5, 7a, 10b, 11j, 11r,
	Facilitating conditions/Social influence	4b, 4c, 5a, 5b, 7b, 7c, 7f, 8b, 8e, 8f, 10h, 11d, 11k, 12aii,
	Hedonic motivation	4f, 11a, 11b, 11r,
	Habit	4a, 4b, 5a, 10b, 11j,
	Price value	2h, 4f, 11n
	Universal design	4b, 4c, 4f, 5b, 9a, 11d, 11h, 11k, 11q, 11r, 12aii,
	Time	11m
School	Teachers + curriculum	2d, 4e, 6b, 7d, 8c, 8d,
	AT Trainings & Services	2g, 7a-f,
	Transition (School vs. College)	9a-c, 10c, 10d, 10f, 13a, 13c, 13d,
	AT evaluation	7e, 7f, 8a, 8f, 11i, 11l, 12b,
	Legal difference/change in settings	10a-i, 13c, 13d, 13e
Family	Family involvement	2c, 2d., 2f, 4e, 6b,
Student	Student involvement in the process	2d, 2e, 5c, 6b, 10a,
	Self-Advocacy	2e, 10a,
	Student's understanding of AT	3a, b, c, and elsewhere
	Self-Perceptions of disability	5c, 10i, 12iii, 12iv, 12v,
	Stigma	4f, 5c, 8b, 8g, 12av,
	Extrinsic Motivation	5c, 8e, 11i, 13b
	Autonomy	2e, 4e, 5c, 5f, 13a,
	Relatedness	5c, 5e, 8b, 8g, 10h, 10i, 11r, 12a, 12aii, 12aiii, 12aiv, 12av, 13a

Note: These are expected links between factors and related question. Open-ended questions may elicit responses about multiple factors.

A.3 Sample List of AT Tools to Initiate Topical Conversation

Accessible (customized) tools
Assignment/Project management programs
Audio-visuals
Calculators
Clickers
Course management program
Digital reminders
Electronic dictionaries
Electronic organizers
FM
Hearing aids
Tablets, iPads
Laptops/PCs
Note takers
PDAs
Reading tutorial programs
Recording pens
Remotes
Scanners, OCR
Screen magnifiers
Smart boards
Software for math
Smartphones (e.g., Blackberry, iPhone, Sidekick)
Specific program on Windows, Mac or other platforms
Speech-to-text (dictation) programs
Spell and grammar checkers
Story writing programs
Text-to-speech programs
Touchscreens
Vocabulary building program
Voice/Audio recorders
Websites
Word processors
Writing tutorial programs

B IRB DOCUMENTS

B.1 School/College cover note sample

Dear […],

I am a graduate student in the School of Education, University of Delaware. For my dissertation, I am studying technology use by high school and college students with high-incidence disabilities*. I will explore their views about using technology to support their academic learning.

I plan to interview a total of 20 students. I would greatly appreciate your support in helping me to reach potential participants. Would you please forward the attached cover note and consent[/assent] form[s], which describe the project in more detail to [parents of] students with high-incidence disabilities who have or had IEPs or 504 plans? [If they agree that their child may participate, they can simply contact me by email. Interviews will not be conducted during school hours, and all arrangements will be made through the family.]

Please feel free to contact me if you have any questions about the study or if you have suggestions about how best to reach [parents of] potential participants.

Thank you!

Regards,

Bishwa Poudel, M.A.
Doctoral Student, School of Education
University of Delaware

**Students with high-incidence may include: Learning Disability (LD), Attention Deficit Disorder (AD/HD or OHI), Emotional/Behavior Disability (EBD), mild Intellectual Disability (ID) or other disabilities that may not be easily visible to others. Students with multiple, severe disabilities or sensory impairments are not being recruited for this study.*

B.2 Parent cover note

Dear Parent,

I, Bishwa Poudel, am a graduate student in the School of Education, University of Delaware. I am studying technology use by high school and college students with high-incidence disabilities (LD, AD/HD, EBD, ID, or OHI) to explore their views about technology.

I would like to invite your child to participate in the study. Even if your child has not used technology to support learning, I am interested to learn more about their views of technology. It will be a ~45 minute interview to listen to your child's experiences and perspectives on technology. The interview will be conducted at your (and your child's) convenient time and location.

There are no risks and direct benefits of participating in the study. However, by understanding the issues that affect their decisions, educators can help students in providing the right technology and environment for its continued use.

I will be happy to respond if you have any questions or need more information.

Thank you!

Regards,
Bishwa Poudel, M.A.
Doctoral Student, School of Education
University of Delaware
Email: *******@udel.edu
Cell Phone: **********

B.3 Parent consent form

University of Delaware
Informed Consent Form

Title of Project: **Acceptance and Use of Assistive Technology: Perspectives of High School and College Students with High-Incidence Disabilities**

Principal Investigator: Bishwa Poudel
Other Investigators: Laura Eisenman (Advisor)

WHAT IS THE PURPOSE OF THIS STUDY?

For my doctoral dissertation, I am exploring students' perceptions of assistive technology used to support academic learning. The study involves high school and college students with high-incidence disabilities* and their experiences with assistive technology. Students' experiences and perspectives may inform educators about how to support appropriate assistive technology use.

> ** High-incidence disabilities include: Learning Disability (LD), Attention Deficit Disorder (AD/HD or OHI), Emotional/Behavior Disability (EBD), mild Intellectual Disability (ID) or other disabilities that may not be easily visible to others. Students with multiple, severe disabilities or sensory impairments are not being recruited for this study. If you have questions about whether your child's disability is considered "high-incidence", you may contact Bishwa Poudel at the number given below.*

A total of 20 students with high-incidence disabilities from high schools and colleges in Delaware are being interviewed for the study. Any student who has or had an IEP or 504 plan related to a high-incidence disability is being invited to participate in this study.

WHAT WILL YOUR CHILD BE ASKED TO DO?

With your permission, your child will be invited for an interview which will last about 45-60 minutes. During the conversation, I will ask your child about his/her experiences with assistive technology used for academic learning. Even if your child has not used assistive technology, I am interested to learn more about their views of assistive technology.

For the interview, we will set up a time and public location that is convenient for your child, with your approval. Alternatively, we can use Skype or telephone if your child

prefers. If needed, I may ask for a follow-up meeting to finish the conversation or clarify topics mentioned in the interview. The total time commitment for an interview and any follow-up conversations will be less than 90 minutes.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

Other than the time committed during the interview, there are no risks in taking part in this study. Your child's responses will be private.

WHAT ARE THE POTENTIAL BENEFITS?

Taking part in the study provides no direct benefit to you or your child. However, the knowledge gained will help educators to better support students' assistive technology needs.

HOW WILL CONFIDENTIALITY BE MAINTAINED?

All individual responses are confidential. Your child's privacy will be maintained. Your child's name and any identifying information will not be included in written materials. All files related to your child will be encrypted and saved in a password-protected folder in a secure server located at the University of Delaware. Also, the consent/assent (permission) forms that include your child's name will be kept separate from the interview responses.

The interviews will be audio-taped and transcribed. Only my advisor and I will hear the audio recordings. Hard copies of the interview materials and notes will be kept in a locked file cabinet at the University and accessible only to me and my advisor. Digital copies of audio recordings and transcriptions will also be encrypted and saved in a password-protected folder in the university's secured server. Both the hard and digital copies of data will be saved for three years after completion of the study. Digital data will then be securely erased in May 2016. Similarly, all the hard copies of the data will be destroyed in May 2016.

I will make every effort to keep all research records that identify your child confidential to the extent permitted by law. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

WILL THERE BE ANY COSTS RELATED TO THE RESEARCH?

There are no costs associated with participating in the study.

WILL THERE BE ANY COMPENSATION FOR PARTICIPATION?

There will be no compensation for participating in the study.

DOES YOUR CHILD HAVE TO TAKE PART IN THIS STUDY?

Taking part in this research study is entirely voluntary. Your child does not have to participate in this research. If your child chooses to take part, he or she has the right to stop at any time. If your child decides not to participate or if he or she decides to stop taking part in the research at a later date, there will be no penalty or loss of benefits to which your child is otherwise entitled. Your or your child's refusal will not influence current or future relationships with the University of Delaware. As a student, if your child decides not to take part in this research, his or her choice will have no effect on your child's academic status or grades.

WHO SHOULD YOU CALL IF YOU HAVE QUESTIONS OR CONCERNS?

If you have any questions about this study, please contact the Principal Investigator, Bishwa Poudel at 703-598-4384, or Advisor, Laura Eisenman at 302-831-0532.

If you have any questions or concerns about your rights as a research participant, you may contact the University of Delaware Institutional Review Board at 302-831-2137.

Your signature below indicates that you are permitting your child to take part in this research study. You have been informed about the study's purpose, procedures, possible risks and benefits. You have been given the opportunity to ask questions about the research and those questions have been answered. You will be given a copy of this consent form to keep.

_____	_____
Signature of Parent/Guardian	Date
_____	_____
Printed Name of Parent/Guardian (Student)	Printed Name of Participant
_____	_____
Parent/Guardian's Telephone Number	Parent/Guardian's E-Mail Address

B.4 Student assent form

University of Delaware
Informed Assent Form

Title of Project: **Acceptance and Use of Assistive Technology: Perspectives of High School and College Students with High-Incidence Disabilities**

Principal Investigator: Bishwa Poudel
Other Investigators: Laura Eisenman (Advisor)

I would like to invite you to participate in an interview for a study about assistive technology. I am interested in learning about your views of assistive technology. Your parent/guardian has given permission for you to participate in the study. This form tells you about the study including its purpose, what you will do if you decide to participate, and any risks and benefits of being in the study. Please read the information below and ask me questions about anything you do not understand before you decide whether to participate. Even if your parent/guardian has agreed for you to participate in the interview, you do not have to if you choose so. Your participation is voluntary and you can refuse to participate or withdraw at any time. If you decide to participate in the study, you will be asked to sign this form and a copy will be given to you to keep for your reference.

WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of this study is to learn about students' views on assistive technology that they use to support their learning. The study involves high school and college students with high-incidence disabilities* and their experiences with assistive technology. Your experiences and perspectives may inform educators to provide more appropriate assistive technology and environment for continued assistive technology use.

> ** High-incidence disabilities include: Learning Disability (LD), Attention Deficit Disorder (AD/HD or OHI), Emotional/Behavior Disability (EBD), mild Intellectual Disability (ID) or other disabilities that may not be easily visible to others.*

A total of 20 students with high-incidence disabilities from high schools and colleges in Delaware are being interviewed for the study. Any student who has or had an IEP or 504 plan related to a high-incidence disability is being invited to participate in this study.

WHAT WILL YOU BE ASKED TO DO?

If you plan to participate, you will be invited for an interview which will last about 45-60 minutes. During the conversation, I am interested to hear about your experiences with assistive technology used for learning. Even if you have not used assistive technology, I am interested to learn more about your views of assistive technology.

For the interview, we will set up a time and public location that works best for you, with your parent's approval. We can use Skype or telephone if you prefer. If needed, I may ask for a follow up meeting to finish the conversation. The total time commitment for an interview and any follow-up conversations will be less than 90 minutes.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

Other than the time committed during the interview, there are no risks in taking part in this study. Everything you say will be private.

WHAT ARE THE POTENTIAL BENEFITS?

Taking part in the study provides no direct benefit to you. However, the knowledge gained will help educators to better support students' technology needs.

HOW WILL CONFIDENTIALITY BE MAINTAINED?

Everything you say in the interview is confidential. Your privacy will be maintained. Your name and any identifying information will not be included in written materials. All files related to you will be encrypted and saved in a password-protected folder in a secure server located at the University of Delaware. Also, the consent/assent (permission) forms that include your name will be kept separate from your interview responses.

The interviews will be audio-taped and transcribed. Only my advisor and I will hear the audio recordings. Hard copies of the interview materials and notes will be kept in a locked file cabinet at the University and accessible only to me and my advisor. Digital copies of audio recordings and transcriptions will also be encrypted and saved in a password-protected folder in the university's secured server. Both the hard and digital copies of data will be saved for three years after completion of the study. Digital data will then be securely erased in May 2016. Similarly, all the hard copies of the data will be destroyed in May 2016.

I will make every effort to keep all research records that identify you confidential to the extent permitted by law. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

WILL THERE BE ANY COSTS RELATED TO THE RESEARCH?

There are no costs associated with participating in the study.

WILL THERE BE ANY COMPENSATION FOR PARTICIPATION?

No compensation will be provided for participating in the study.

DO YOU HAVE TO TAKE PART IN THIS STUDY?

Taking part in this research study is entirely voluntary. You do not have to participate in this research. If you choose to take part, you have the right to stop at any time. If you decide not to participate or if you decide to stop taking part in the research at a later date, there will be no penalty or loss of benefits to which you are otherwise entitled. Your refusal will not influence current or future relationships with the University of Delaware. As a student, if you decide not to take part in this research, your choice will have no effect on your academic status or your grades.

WHO SHOULD YOU CALL IF YOU HAVE QUESTIONS OR CONCERNS?

If you have any questions about this study, please contact the Principal Investigator, Bishwa Poudel at 703-598-4384, or Advisor, Laura Eisenman at 302-831-0532.

If you have any questions or concerns about your rights as a research participant, you may contact the University of Delaware Institutional Review Board at 302-831-2137.

Your signature below indicates that you are agreeing to take part in this research study. You have been informed about the study's purpose, procedures, possible risks and benefits. You have been given the opportunity to ask questions about the research and those questions have been answered. You will be given a copy of this form to keep.

_____ _____

Signature of Participant Date

_____

Printed Name of Participant

_____ _____

Telephone Number E-mail Address

B.5 Student consent form for age of majority high school student

University of Delaware
Informed Consent Form

Title of Project: **Acceptance and Use of Assistive Technology: Perspectives of High School and College Students with High-Incidence Disabilities**

Principal Investigator: Bishwa Poudel
Other Investigators: Laura Eisenman (Advisor)

WHAT IS THE PURPOSE OF THIS STUDY?

For my doctoral dissertation, I am exploring students' perceptions of assistive technology that is used to support academic learning. The study involves high school and college students with high-incidence disabilities* and their experiences with assistive technology. Students' experiences and perspectives may inform educators about how to support appropriate assistive technology use.

> ** High-incidence disabilities include: Learning Disability (LD), Attention Deficit Disorder (AD/HD or OHI), Emotional/Behavior Disability (EBD), mild Intellectual Disability (ID) or other disabilities that may not be easily visible to others. Students with multiple, severe disabilities or sensory impairments are not being recruited for this study. If you have questions about whether your disability is considered "high-incidence", you may contact Bishwa Poudel at the number given below.*

A total of 20 students with high-incidence disabilities from high schools and colleges in Delaware are being interviewed for the study. Any student who has or had an IEP or 504 plan related to a high-incidence disability is being invited to participate in this study.

WHAT WILL YOU BE ASKED TO DO?

If you plan to participate, you will be invited for an interview which will last about 45-60 minutes. During the conversation, I am interested to hear about your experiences with assistive technology used for academic learning. Even if you have not used assistive technology, I am interested to learn more about your views of assistive technology.

For the interview, we will set up a time and location of your convenience. Alternatively, we can use Skype or telephone if you prefer. If needed, I may ask for a follow up meeting

to finish the conversation or clarify topics mentioned in the interview. The total time commitment for an interview and any follow-up conversations will be less than 90 minutes.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

Other than the time committed during the interview, there are no risks in taking part in this study. Everything you say will be private.

WHAT ARE THE POTENTIAL BENEFITS?

Taking part in the study provides no direct benefit to you. However, the knowledge gained will help educators to better support students' technology needs.

HOW WILL CONFIDENTIALITY BE MAINTAINED?

All individual responses are confidential. Your privacy will be maintained. Your name and any identifying information will not be included in written materials. All files related to you will be encrypted and saved in a password-protected folder in a secure server located at the University of Delaware. Also, the consent/assent (permission) forms that include your name will be kept separate from your interview responses.

The interviews will be audio-taped and transcribed. Only my advisor and I will hear the audio recordings. Hard copies of the interview materials and notes will be kept in a locked file cabinet at the University and accessible only to me and my advisor. Digital copies of audio recordings and transcriptions will also be encrypted and saved in a password-protected folder in the university's secured server. Both the hard and digital copies of data will be saved for three years after completion of the study. Digital data will then be securely erased in May 2016. Similarly, all the hard copies of the data will be destroyed in May 2016.

I will make every effort to keep all research records that identify you confidential to the extent permitted by law. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

WILL THERE BE ANY COSTS RELATED TO THE RESEARCH?

There are no costs associated with participating in the study.

WILL THERE BE ANY COMPENSATION FOR PARTICIPATION?

No compensation will be provided for participating in the study.

DO YOU HAVE TO TAKE PART IN THIS STUDY?

Taking part in this research study is entirely voluntary. You do not have to participate in this research. If you choose to take part, you have the right to stop at any time. If you decide not to participate or if you decide to stop taking part in the research at a later date, there will be no penalty or loss of benefits to which you are otherwise entitled. Your refusal will not influence current or future relationships with the University of Delaware. As a student, if you decide not to take part in this research, your choice will have no effect on your academic status or your grades.

WHO SHOULD YOU CALL IF YOU HAVE QUESTIONS OR CONCERNS?

If you have any questions about this study, please contact the Principal Investigator, Bishwa Poudel at 703-598-4384, or Advisor, Laura Eisenman at 302-831-0532.

If you have any questions or concerns about your rights as a research participant, you may contact the University of Delaware Institutional Review Board at 302-831-2137.

Your signature below indicates that you are agreeing to take part in this research study. You have been informed about the study's purpose, procedures, possible risks and benefits. You have been given the opportunity to ask questions about the research and those questions have been answered. You will be given a copy of this consent form to keep.

_____ _____

Signature of Participant Date

_____

Printed Name of Participant

_____ _____

Telephone Number E-mail Address

B.6 Consent form for college student

University of Delaware
Informed Consent Form

Title of Project: **Acceptance and Use of Assistive Technology: Perspectives of High School and College Students with High-Incidence Disabilities**

Principal Investigator: Bishwa Poudel
Other Investigators: Laura Eisenman (Advisor)

WHAT IS THE PURPOSE OF THIS STUDY?

For my doctoral dissertation, I am exploring students' perceptions of assistive technology that is used to support academic learning. The study involves high school and college students with high-incidence disabilities* and their experiences with assistive technology. Students' experiences and perspectives may inform educators about how to support appropriate assistive technology use.

> ** High-incidence disabilities include: Learning Disability (LD), Attention Deficit Disorder (AD/HD or OHI), Emotional/Behavior Disability (EBD), mild Intellectual Disability (ID) or other disabilities that may not be easily visible to others. Students with multiple, severe disabilities or sensory impairments are not being recruited for this study. If you have questions about whether your disability is considered "high-incidence", you may contact Bishwa Poudel at the number given below.*

A total of 20 students with high-incidence disabilities from high schools and colleges in Delaware are being interviewed for the study. All students at your college who have identified themselves as having high-incidence disabilities to the disability support services office are being invited to participate in this study.

WHAT WILL YOU BE ASKED TO DO?

If you plan to participate, you will be invited for an interview which will last about 45-60 minutes. During the conversation, I am interested to hear about your experiences with assistive technology used for academic learning. Even if you have not used assistive technology, I am interested to learn more about your views of assistive technology.

For the interview, we will set up a time and location of your convenience. Alternatively, we can use Skype or telephone if you prefer. If needed, I may ask for a follow up meeting to finish the conversation or clarify topics mentioned in the interview. The total time commitment for an interview and any follow-up conversations will be less than 90 minutes.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

Other than the time committed during the interview, there are no risks in taking part in this study. Everything you say will be private.

WHAT ARE THE POTENTIAL BENEFITS?

Taking part in the study provides no direct benefit to you. However, the knowledge gained will help educators to better support students' technology needs.

HOW WILL CONFIDENTIALITY BE MAINTAINED?

All individual responses are confidential. Your privacy will be maintained. Your name and any identifying information will not be included in written materials. All files related to you will be encrypted and saved in a password-protected folder in a secure server located at the University of Delaware. Also, the consent/assent (permission) forms that include your name will be kept separate from your interview responses.

The interviews will be audio-taped and transcribed. Only my advisor and I will hear the audio recordings. Hard copies of the interview materials and notes will be kept in a locked file cabinet at the University and accessible only to me and my advisor. Digital copies of audio recordings and transcriptions will also be encrypted and saved in a password-protected folder in the university's secured server. Both the hard and digital copies of data will be saved for three years after completion of the study. Digital data will then be securely erased in May 2016. Similarly, all the hard copies of the data will be destroyed in May 2016.

I will make every effort to keep all research records that identify you confidential to the extent permitted by law. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

WILL THERE BE ANY COSTS RELATED TO THE RESEARCH?

There are no costs associated with participating in the study.

WILL THERE BE ANY COMPENSATION FOR PARTICIPATION?

No compensation will be provided for participating in the study.

DO YOU HAVE TO TAKE PART IN THIS STUDY?

Taking part in this research study is entirely voluntary. You do not have to participate in this research. If you choose to take part, you have the right to stop at any time. If you decide not to participate or if you decide to stop taking part in the research at a later date, there will be no penalty or loss of benefits to which you are otherwise entitled. Your refusal will not influence current or future relationships with the University of Delaware. As a student, if you decide not to take part in this research, your choice will have no effect on your academic status or your grades.

WHO SHOULD YOU CALL IF YOU HAVE QUESTIONS OR CONCERNS?

If you have any questions about this study, please contact the Principal Investigator, Bishwa Poudel at 703-598-4384, or Advisor, Laura Eisenman at 302-831-0532.

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Your signature below indicates that you are agreeing to take part in this research study. You have been informed about the study's purpose, procedures, possible risks and benefits. You have been given the opportunity to ask questions about the research and those questions have been answered. You will be given a copy of this consent form to keep.

_____ _____

Signature of Participant Date

_____

Printed Name of Participant

_____ _____

Telephone Number E-mail Address

B.7 Announcement to college students.

Dear Student,

I am a student in the School of Education here at UD. For my dissertation, I am studying technology (i.e., assistive, educational) use by high school and college students with high-incidence disabilities (LD, AD/HD, EBD, mild ID, or other health impairments).

If you are an undergraduate student and have a high-incidence disability, I would really appreciate if you can participate in the study. An interview at your convenient time/location will be conducted to listen to your perspectives and experiences with technology.

Please email me if you want to know more about and/or participate in the study.

Thank you!

Regards,
Bishwa Poudel
bpoudel@udel.edu