Assistive Technology Outcomes and Benefits
Volume 14, Spring 2020, pp. 52-76
 ISSN 1938-7261
Available online: www.atia.org/atob

Mastery of Assistive Technology in High School and Postsecondary Performance

Ben Satterfield, Ed.D.

Center for Inclusive Design and Innovation
Georgia Institute of Technology

Corresponding Author
Dr. Ben Satterfield
Center for Inclusive Design and Innovation
512 Means Street
Suite 250
Atlanta, GA 30318
Phone: (404) 618-3414
Email: rsatterfield8@gatech.edu

Abstract

A survey of 47 students with high incidence disabilities in the university system in Georgia who received assistive technology (AT) supports was conducted to discover: (a) what percentage of students came to postsecondary education comfortable with assistive technology, and (b) how does the success of students who come prepared to use AT compare to that of students who come and are not prepared to use AT? Performance (measured by grade-point average) in high school was compared to that achieved during the first year of college. Anecdotal comments by students confirm the survey's findings that students who have become comfortable using AT before coming to college have a greater likelihood, but no guarantee, of success in college.

Keywords: assistive technology, disability, transition, postsecondary education, higher education

Introduction

The Center for Inclusive Design and Innovation (CIDI (formerly known as AMAC)) is part of the College of Design at the Georgia Institute of Technology. CIDI serves the entire University System of Georgia as an accessible educational materials center, providing textbooks in alternative format (e-Text and Braille) and classroom supports such as real-time closed captioning for students in college classrooms.

The team at CIDI had observed that assistive technology (AT) was becoming a staple tool that students with high-incidence disabilities (such as learning disabilities, ADHD, etc.) were using in postsecondary settings in Georgia (N. Sinclair, personal communication, May 23, 2018). Students who qualify have access to textbooks in electronic format through CIDI. Students use computer software and tablet-based apps to help them read their textbooks and enhance comprehension. CIDI provides a help-desk team to support students who are using these services.

The help-desk team at CIDI reported frequent encounters with students who were struggling with assignments and who called in for assistance with the AT which they had chosen. As the team attempted to help, they noticed that students who had little familiarity with AT were struggling to both learn to use their AT and to keep up with their assignments. It soon became a working assumption that students who learned to use these AT tools while still in high school would have a distinct advantage over students who came to college without having had experience with these tools (N. Sinclair, personal communication, May 23, 2018). However, the team found little evidence in the research literature to confirm this assumption. They sought to discover whether there was any relationship between student mastery of AT in high school and their performance at the postsecondary level.

Target Audience and Relevance

Students with high-incidence disabilities are attending postsecondary institutions in increasing numbers (Francis, Duke, Bringham, & Demetro, 2018; Hansen & Dawson, 2019). However, only 20% of college students with disabilities successfully graduate from 4-year institutions (Grogan, 2015). Transition to postsecondary education is frequently difficult for students with disabilities as they often fail to develop the necessary proficiencies in high school that are vital to success at the next level (Francis, Duke, Bringham, & Demetro, 2018). Hall (2016) suggests that students with high-incidence disabilities who persevere in college grasp the importance of AT and its value in helping them complete classwork assignments.

This article addresses the impact that learning to use AT while in high school might have on student success in postsecondary settings. The early research cited speaks specifically to the impact of AT upon outcomes such as graduation from high school, future independence, and positive work outcomes for students with high-incidence disabilities. Our research illuminates further the value of early availability of AT for students with high-incidence disabilities. For these reasons, teachers and administrators in K-12 settings will find this article valuable and informative relative to their decision making regarding the integration of AT in their local setting. Parents and advocates will find this paper instructive as they seek

the best for their charges. Researchers will find the article helpful in its summary of research on AT and transition and for its identification of areas that merit deeper and more detailed study.

Literature Review

For the past three decades, the field of AT has held to an abiding assumption that properly adapted technology can have a beneficial impact upon individuals with high-incidence disabilities. In its early days, the AT field was largely a "boutique" enterprise (Colker, 2002). Company resources went into the development of solutions that addressed the needs of individuals with visibly challenging disabilities (Edyburn, 2000). Positive results were noted. Yet early on little research was devoted to the effects of AT use by students with "mild" disabilities (Behrmann, 1994; Edyburn, 1996, Bryant, Bryant, & Raskind, 1998; Raskind, Higgins, Slaff, & Shaw, 1998).

Nevertheless, the assumption that AT did have a positive impact was expressed in federal law in the Assistive Technology Act of 1988 (P.L. 105-394), which defined assistive technology as "…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." (29 U.S.C. Sec 2202(2)). The language in the act went on to stipulate that:

> *"Substantial progress has been made in the development of assistive technology devices, including adaptations to existing devices that facilitate activities of daily living, that significantly benefit individuals with disabilities of all ages."*

Despite broad acceptance and consensus in this regard, a research base providing evidence to support this assumption was yet to emerge.

Emergence of Research

As the AT field has evolved into an industry, studies done in this area have suggested that use of AT in school promotes independence, self-confidence, and productivity among students with disabilities. (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).

Other studies have pointed to improved academic performance of students using AT in K-12 settings (Brackenreed, 2008; Geary, 2004; Hasselbring & Glaser, 2000; Hetzroni & Shrieber, 2004; MacArthur & Cavalier, 2004; MacArthur, 2009; Mazzotti et al., 2010; Raskind & Higgins, 1998; 1999). Other studies have noted the association between AT use in high school and the greater likelihood of enrollment in postsecondary educational opportunities (Anderson-Inman et al., 1999; Mitchem et al., 2007; Stodden, Conway, & Chang, 2003), and between AT use in high school and positive employment outcomes (Gamble, Dowler, & Orslene, 2006; Luecking & Certo, 2003; Wehmeyer et al., 2006). Still other studies have linked AT use in high school with better outcomes with regard to the transition to independent living

(Anderson-Inman et al., 1999; Mazzotti et al., 2010; Mull & Sitlington, 2003; Riffel et al., 2005; Sharpe, Johnson, Izzo, & Murray, 2005).

Students with High-Incidence Disabilities

There is limited research with regard to AT use by students with high-incidence disabilities and postsecondary education (Sharpe, et.al., 2005; Alper & Raharinirina, 2006; Floyd, 2012). This group of students has been defined as students with learning disabilities, emotional-behavior disorders, mild intellectual disabilities, attention deficit/hyperactivity disorder (ADHD), and sometimes high-functioning autism spectrum disorder (Murray & Pianta, 2007). Students with high-incidence disabilities represent about 70% of all students with disabilities (Aud et al., 2011). This group is attending college in ever increasing numbers (Francis, Duke, Bringham, & Demetro, 2018).

For this group of students as a whole, the literature suggests that there have historically been several difficulties with transition. Among students with high-incidence disabilities there are historically low levels of enrollment in postsecondary education (Garza, 2005), high rates of unemployment (Curtis, Rabren & Reilly, 2009), and lower rates of independent living as compared to their typical peers (Wagner et.al., 2005). This particular group of students appears to face challenges associated with literacy (i.e., reading and writing) as well as mathematics (Murray, 2002). Even though there are AT products that can help address these challenges, AT use among these students has been limited (Kaye, Yeager, & Reed, 2008; Malcolm & Roll, 2019; Parette & Scherer, 2004; Woodward & Reith, 1997).

The reasons for this have included the cost of technology as well as how stigmatized the AT made the students feel (Parette & Scherer, 2004). Students with “invisible disabilities” received accommodation less frequently than students with more obvious disabilities (Lightner, Vaughan, Schulte, & Trice, 2012) and were less likely to self-identify as an individual with a disability to qualify for AT as an accommodation (Newman & Madaus, 2015; Malcolm & Roll, 2019). Other problems associated with AT use for students with special education needs include: availability of financial resources for family and school, lack of knowledge about AT, and a tendency toward abandonment of the technology (Kaye et al., 2008; LaPlante, Hendershot, & Moss, 1992; Phillips & Zhao, 1993; Woodward & Reith, 1997; Ofiesh, Rice, Long, Merchant, & Gajar, 2002; Parette & Scherer, 2004).

Specific Features: Inconclusive Results

Some of the most promising and substantive studies pointed out how AT might be particularly helpful for students with high-incidence disabilities who struggled with reading and writing. Lindstrom (2007) as well as Wolfe and Lee (2007) observed an increase in the frequency with which students with learning disabilities were receiving assignments and text materials in digital form at both K-12 and postsecondary level. Ostensibly this was for the purpose of using AT to aid in reading and comprehension.

Raskind and Higgins (1995) had illustrated how tools that employed speech synthesis could be helpful for students with reading difficulties in proofreading. Elkind, Black and Murray (1996), Raskind and Higgins (1998), Perelmutter, McGregor, and Gordon (2017), as well as Wood, Moxley, Tighe and Wagner

(2017) pointed to indications that text-to-speech, supported by optical character recognition (OCR), could enhance reading speed and comprehension. Stodden and Roberts (2005) suggested that speech recognition could be used to aid students who struggled with handwriting and organization of writing assignments. Perelmutter, McGregor, and Gordon (2017) also found positive effects with AT used for word processing by students with high-incidence disabilities. However, O' Neill et al. (2012) found that AT as an accommodation in testing was not as high a predictor of graduation as other accommodations.

Ultimately, these studies that have pointed to positive impacts of AT use upon students with high-incidence disabilities often lacked the size or methodology to be able to produce conclusive findings regarding outcomes of AT use (Anttila, Samuelsson, Salminen, & Brandt, 2012; Edyburn, 2013). Overall, research on AT use by students with high-incidence disabilities suggests that not all AT products produce the same level of results (Holmes & Silvestri, 2012 and Lewindoski, Wood & Miller, 2016).

National Longitudinal Transition Study

The National Longitudinal Transition Study (NLTS2, 2012) provided an extensive look at how AT factored into the transition of students with disabilities to postsecondary life. The study was conducted over a 10-year period from 2000 to 2010 and included over 305,000 students with disabilities as they completed high school and moved on to work or school or whatever was next for them. Information was collected from students, families and educators about the outcomes for these students in the areas of postsecondary education, work, and independent living (NLTS2, 2012).

The National Longitudinal Transition Study (2012) indicated that a small proportion of students with disabilities actually used AT while in high school (Bouck, 2016). However, students with low-incidence disabilities were reported to use AT in high school at a higher rate than students with high-incidence disabilities. In fact, only 7.8% of students with high-incidence disabilities reported receiving AT while in high school. The most frequently recommended AT for these students was a calculator – followed (distantly) by laptop and audible books (NLTS2, 2012).

Nevertheless, students with high-incidence disabilities who had received AT in high school were found to have more positive outcomes in terms of a paid job, wages, and participation in postsecondary education (Bouck, Maeda, & Flanagan, 2012). According to the National Longitudinal Transition Study (NLTS2, 2012), 99.8% of the students who received AT in high school graduated whereas only 79.6% of those who did not receive AT graduated. Among students who received AT in high school, 80.9% went on to attend a post-secondary institution, but only 40.1% of students who did not receive AT did so. It was also noted that 80% of those students who received AT in high school held a paying job after high school. Only 50.8% of those in this survey who did not receive AT in high school had a paying job.

Since NLTS2

Since the Longitudinal Study ended in 2010, two subsequent developments appear to have impacted the use of AT in K-12 settings. The first is the availability to schools of American Recovery and Reinvestment

Act (ARRA) funds. These funds were made available by the Department of Education in 2008 with the expectation that local districts would invest in tools and strategies, including AT, that would strengthen and transform their instruction of students with disabilities (Naik, Yorkman, & Casserly, 2010). Second was the emergence of consumer technology platforms such as the Apple iPad. Apps that provided AT supports followed quickly. Some of these tools have become part of a Universal Design for Learning approach at the local level. Some school districts have launched "one-to-one computing" and "bring-your-own technology" initiatives (Sennott & Bowker, 2009).

Together, these developments have opened the door for an increase in the use of technology for reading and writing. We have observed that screen reading software (text-to-speech) and electronic dictionaries have been more widely used to help students with reading. Speech recognition (speech-to-text), talking word processors, talking spell-checkers, word prediction, and digital graphic organizers are tools that have come into greater use to help students with writing. Our experience and observations in the field have gathered that there is a general impression that AT is more commonly available in K-12 schools than in the past and that AT use is becoming more widespread. It would be valuable to know whether AT is becoming a more regular accommodation for students with disabilities. If so, it would be important to discover whether students with disabilities are developing a level of mastery over this technology and whether the technology is making a difference in academic performance.

The Question of Mastery

Poudel (2014) explored the question of competence or mastery of AT, suggesting that a sense of confidence comes as the student attains a comfort level with the AT tools they use. Deci and Ryan (2000) have suggested that in our social and physical dimensions, as people encounter and wrestle with the challenges we face, we develop competence and mastery. This process involves the discovery of the actions that lead to success and the development of skills to perform those actions. As we build patterns of action that result in success, the positive feedback we experience reinforces our intrinsic motivation – particularly as we build successful patterns independently. Rotter (1966) posited that, as the locus of control over a skill or an activity moves from external to internal, individuals demonstrate greater evidence of achievement. Could it be that students with high-incidence disabilities who master AT while in high school have developed skills and positive patterns of action that lead to success at the postsecondary level?

Method

In order to examine this assumption that students who have learned to use AT tools while still in high school may have a distinct advantage over students who come to college without AT experience, and to gain insight into the use of AT by college students, 1570 students (who have made use of the CIDI services since 2014) were invited to take part in a survey to determine the following: (a) What percentage of students with disabilities who are referred to CIDI are coming prepared to use AT? (b) How successful are these students in college? (c) How does the success of students who come prepared to use AT compare to that of students who are not prepared to use AT? (d) Have the AT services provided by CIDI

(AMAC) been effective and helpful to these students?

Participants

Participants in this project were drawn from a list of students who were referred to CIDI by their local college Office of Disability Services and who received classroom materials in alternative media. These participants were located primarily in the state of Georgia, but included a few students who reside in other states. Of the students invited, 47 students with high-incidence disabilities completed the survey in sufficient enough detail that their replies could be included in this research.

The participants included both males and females, and ranged in ages from 19 to 25. Participants represented a broad range of ethnic backgrounds including: African-American (20%), Asian (2.5%), Caucasian (72%), and Hispanic (5.5%). The group included individuals with learning disabilities such as dyslexia, dysgraphia, etc. (66%), ADHD (19%), autism spectrum disorder (6%), and other (23%). Some identified with more than one disability area.

Instruments and Data Analysis

The study employed a survey that was conducted online and employed a web-based survey tool (Qualtrics) to collect responses. The survey consisted of 27 questions. It was divided into three parts: (a) high school experiences, (b) postsecondary experiences, and (c) personal reflections on use of AT. The questions were in one of 3 forms: Likert Scale with five choices, check-off lists, and short-answer. The survey is included in the Appendix.

For the purposes of this study, for the definition of competence or “mastery” we selected the phrase “comfortable using AT” because it connotes the internalization of control and a level of confidence with the tool. We applied this phrase when we asked the participants in this study about their competence and confidence using AT.

Qualtrics software (2019) was used to collect data and to conduct preliminary analysis of participant surveys. The chi-square calculations and other analysis were done using Microsoft Excel (2007).

Results

Participants in the survey were asked to characterize their level of comfort with AT when they came to the postsecondary level. Over one-half of the respondents (55.1%) said they were very comfortable or confident with AT prior to college. There were 44.9% who said they were uncomfortable or unsure of their ability to use AT.

In order to operationalize the impact of AT on postsecondary academic performance, participants were asked to disclose their grade-point average (GPA) upon finishing high school and their GPA at the end of their freshman year of college. These GPAs were compared to reflect the academic performance of each participant as they transitioned from secondary to postsecondary settings. We looked first at the

change in GPA (up or down) of students who said they were comfortable with AT and then at participants who said they were unsure or not comfortable with AT.

Among all students who were comfortable with AT, GPAs went up or stayed the same for 80.77% of the respondents. Grades went down for 19.23% of those who came comfortable with AT (see Table 1). For participants who were unsure or not comfortable with AT, 47.62% reported that GPA stayed the same or went up in their freshman year. Here, 52.38% of those who said they were unsure or uncomfortable with AT reported that their grades went down in their first year in postsecondary education (see Table 1).

Table 1: Change in GPA for Students with High-Incidence Disabilities

	GPA Up/No Change	GPA Down
Comfortable with AT	80.77%	19.23%
Uncomfortable with AT	47.62%	52.38%

We used the chi-square test for independence to establish the significance of this calculation. The chi-square statistic is 5.6957. The critical value at the 0.05 level is 3.8410. Since the chi-square statistic is greater than the critical value, we must reject the null hypothesis that AT mastery and performance at postsecondary level are independent.

When asked if they believed that AT made a difference, the great majority of respondents said that AT probably or definitely made a difference (See Table 2). No participants said that they did not believe that AT made any difference.

Table 2: Did AT Make a Difference? (Students with High-Incidence Disabilities)

Definitely	64%
Probably	17%
Maybe	10%
Not	0%
No Answer	8%

Participant Comments

Participants were given the opportunity to comment on the impact AT made on their postsecondary performance. Their comments suggest that AT was important to their success.

One student said,

> *"My grades and GPA has [sic] gone up dramatically with the [AT] I have been given."*

Another student remarked,

> *"I … need all the help [I can get]. I cannot write — was never taught how to use tech in High School. It helped make learning in college easier to understand… Typing is excruciatingly painful for me; I don't think I would've been able to write the required essays in my intro*

humanities courses without the use of speech recognition technology. Now I use assistive technology and my grades have improved."

Another student observed:

"I feel [AT] should be more readily available to students from the time they are diagnosed through their entire education in order to better enable them for a successful education and learning environment."

How Was AT Mastered?

When asked about the ways that participants learned to master the AT they used (see Table 3), most said that they were self-taught to some degree (68.09%). Others reported that they were aided by their Office of Disability Services (44.68%) and by CIDI (AMAC) Accessibility service (19.15%). Some were helped by viewing tutorials on a product website (14.89%) or by a friend or peer tutor (12.77%). A smaller percentage attended a formal training (4.26%).

Table 3: How Participants Learned to Use Their AT

Self-taught	68.09%
Support from the Office of Disability Services	44.68%
Support directly from AMAC (CIDI)	19.15%
Viewed tutorials on product website	14.89%
Friend or peer showed me how to use it	12.77%
Attended a training	4.26%

What Kinds of AT?

Students were asked to indicate the kinds of AT to which they had access in high school (see Table 4). The most commonly available AT were a calculator (76.06%) and a spell checker (38.30%). Screen reader (25.53%) and audible text (23.40%) were the next most common. It is worth observing that 23.04% of students in this student reported they did not use AT in high school.

Table 4: Kinds of AT in High School

	Available	**Used**
Calculator	76.60%	65.96%
Spell checker	38.30%	29.79%
Screen reader (text-to-speech software)	25.53%	12.77%
Audible textbooks	23.40%	21.28%
Audio recorder	17.02%	12.77%
Magnification/Enlargement tools	8.51%	6.38%
Word prediction	6.38%	8.51%
Graphic organizer	6.38%	4.26%
Speech recognition (speech-to-text software)	12.77%	8.51%
Electronic dictionary	10.64%	6.38%
Talking word processor	2.13%	2.13%
Other	1.13%	0.00%
None of these	14.89%	23.40%

Regarding AT use at the postsecondary level (as compared to AT use in high school), participants in this study reported greater use of auditory support for reading tools (audible books and text-to-speech). Slightly more common use of audio recorders for capturing classroom lectures and electronic dictionaries for vocabulary support were also noted (see Table 4).

Discussion

The results of the CIDI/AMAC Survey appear to confirm many aspects of previous research regarding use of AT in high school. While this study's results suggest a positive impact from mastery of AT in high school upon performance at the postsecondary level, the findings do not guarantee this. This is consistent with Bouck, Maeda, and Flanagan's (2012) analysis of the National Longitudinal Study. While the CIDI/AMAC survey results appear to confirm the findings of the National Longitudinal Study (NLTS2) that calculators remain a highly recommended K-12 accommodation for students with disabilities, this study suggests that a broad range of AT is now more commonly available and is being used by more students with high-incidence disabilities. Whereas Bouck et.al. (2012) found that only 7.8% of students with high-incidence disabilities were being provided with AT, this study found that 76.6% of students in this study used AT in high school. While 23.4% of students not using AT is still high and is not optimal, this study's findings would suggest that progress is being made in providing AT to students with high-incidence disabilities in high school.

Poudel (2014) observed that the AT items provided to students with high-incidence disabilities often suggested a practice of generic assignment of AT based on disability label and not based on individual need. This study did not examine the basis on which AT is provided to students with high-incidence disabilities. It seems reasonable to assert that use of an evidence-based model, such as the SETT Framework (Zabala, 1995), that takes into consideration the strengths and weaknesses of the individual, would be essential.

Perhaps the fact that many students who do use AT continue to be self-taught (68.09%) is reflective of an "andragogical" approach to problem solving (McGrath, 2009). Yet researchers continue to observe this phenomenon despite the growing body of supports made available online and via supporting agencies (Rashid & Asghar, 2016). However, it is also likely that this is an indication of the need for better planning and support for implementation of AT. Clearly, simply providing AT is not sufficient.

It is somewhat encouraging to observe that the survey results suggest that over half (55.1%) of participating students are coming to college having become comfortable with AT in high school. This provides encouraging evidence that students with high-incidence disabilities are receiving AT more frequently. Further, 1-to-1 computing and "Bring Your Own Technology" (BYOT) initiatives as well as the prevalence of consumer–based platforms for AT may be reducing the perception in students' minds that use of AT may set them apart or cast them in a negative light. Nevertheless, the study also reveals that a sizeable number (23.4%) used no AT while in high school, suggesting that work remains to be done on providing access to AT.

Conclusions and Future Study

The success of students with high-incidence disabilities who have mastered AT in high school is noteworthy. The fact that 80.77% of the students who came to postsecondary education having a comfort level with their AT maintained or improved their high school GPA stands in contrast to the finding that only 47.62% of students who lacked AT mastery maintained or improved their GPA during their freshman year. Only 19.23% of the students mastering AT in high school had GPAs that were lower than their high school GPAs, as compared with 52.38% of the participants who came without mastery of AT. These findings do not suggest that mastery of AT is a guarantee of success at the next level. They do, however, reinforce the insight that the postsecondary level represents significant challenges for students with high-incidence disabilities and that becoming equipped and prepared for what they will face in the new environment is important.

It seems clear that in order to be effective, AT must be appropriate for the individual using it. Mastery implies taking ownership and establishing competence and confidence with the tool. Yet, this study has not fully addressed the question of what the concept of AT mastery represents. One aspect that might be worthy of further investigation would be the degree to which a student's confidence (or comfort level) with AT impacts the level of their self-advocacy. It is clear that at the postsecondary level, it is up to the student to self-identify as an individual with a disability and to advocate for the accommodations that help them (Garrison-Wade, 2012; Getzel & Thoma, 2008). Our experience has been that, in order to master a tool, the individual must develop their own strategies for its use. These are likely to be individualized as each student establishes a pattern for using the features of the tool that are personally most helpful. We have observed that two individuals may use the exact same set of tools, yet use them in different ways to accomplish the same tasks.

Undoubtedly, there are other elements that must be considered in any list of factors contributing to success. Nevertheless, mastery of AT appears to enhance the chances for success of students with disabilities.

Effectiveness of CIDI/AMAC and Office of Disability Services (ODS)

As previously observed, the findings of earlier research suggested that many students were self-taught when it came to their mastery of AT. This finding was echoed in this survey. The next most frequent source of AT support and training reported was that provided by the local campus ODS (44.68%). The fact that support from the CIDI/AMAC Accessibility Lab (19.15%) was ranked third most frequently employed could be understated. Many of the services provided by CIDI/AMAC are delivered by the local ODS as a seamless pass-through process, and might not be observed by the student as coming from CIDI. The number of respondents who actually identified CIDI/AMAC probably relates to the help-desk support and training provided to students directly. While the extent to which students received services and support for AT use is sizeable, there remains room for CIDI and the local ODS teams to expand their influence and impact.

Limitations

This study was conducted with survey data from 47 students who exercised the option to take part in this project. Participants volunteered information about their experiences that was not validated through observation, nor were grade-point averages confirmed with the appropriate educational institutions. No attempt was made to identify what other accommodations might have been in place which could have contributed to the results reported. Given these limitations, care should be taken when attempting to apply or generalize the results of this study.

Outcomes and Benefits

This study appears to point to an advantage that mastery of AT while in high school gives a student with a high-incidence disability as they transition to a postsecondary setting. If this is true, then several benefits should follow.

Students still in K-12 settings can take heart that investing time and effort learning to use the AT tools that help them with reading, writing, and math will pay dividends as they complete high school and also when they transition to postsecondary opportunities. Having mastery over AT can bolster their confidence and encourage them to believe that they can succeed at that next level. If teachers and school administrators in K-12 recognize and apply the outcomes from this study, and seek to appropriately apply AT in their local setting for students with high-incidence disabilities, this should ultimately be reflected in higher graduation rates and better outcomes as their students transition to college or technical school.

Parents and advocates can leverage this study and the other research cited here that points to positive outcomes from AT use, to call for the early exploration and adoption of AT solutions for their charges. By introducing AT early on, students stand a better chance of staying with their classroom peers with regard to the understanding of content while they address reading and writing challenges. Parents and advocates can be encouraged that, rather than experience frustration and failure, their students can experience success and grow in confidence in their ability to use AT to help them overcome challenges.

Researchers will find that this study generally affirms the findings of studies that have preceded it. However, there are many aspects of this study which suggest the need for further research, such as the impact of mastery of AT upon other outcomes such as self-confidence and self-advocacy. The indication that mastery of AT can affect performance in postsecondary educational settings raises the question as to whether there might be a similar impact for students with high-incidence disabilities upon employment. This study has illuminated the need for individualized AT recommendations in high school as opposed to generic prescriptions based on disability (i.e. if a student has a learning disability they are provided with a calculator). Furthermore, students need individualized support and training in order to effectively use the AT they receive. Mastery will require use of an AT tool over an extended period of time. A more systematic approach to the recommendation and implementation of AT is indicated.

The need for further research on what is involved in the concept of mastery of AT has been identified

here. Deeper exploration of this concept should yield useful insights into how schools can prepare students with high-incidence disabilities for greater success in school as well as in the workplace.

Declarations

This content is solely the responsibility of the author(s) and does not necessarily represent the official views of ATIA. No financial and no non-financial disclosures were reported by the author(s) of this paper.

References

Alper, S., & Raharinirina, S. (2006). Assistive technology for individuals with disabilities: A review and synthesis of the literature. *Journal of Special Education Technology, 21*(2), 47-64. doi: 10.1177/016264340602100204

Anderson-Inman, L., Knox-Quinn, C., & Szymanski, M. (1999). Computer-supported studying: Stories of successful transition to postsecondary education. *Career Development for Exceptional Individuals, 22*, 185-212. doi: 10.1177/088572889902200204

Anttila, H., Samuelsson, K., Salminen, A.-L., & Brandt, Å. (2012). Quality of evidence of assistive technology interventions for people with disability: An overview of systematic reviews. *Technology & Disability, 24*(1), 9-48. doi: 10.3233/TAD-2012-0332

Aud, S., Hussar, W., Kena, G., Bianco, K., Frohlich, L., Kemp, J., … National Center for Education Statistics (ED). (2011). The Condition of Education 2011. NCES 2011-033. *National Center for Education Statistics.* doi: 10.1037/e581062011-001

Behrmann, M. M. (1994). Assistive technology for students with mild disabilities. *Intervention in School & Clinic, 30*, 70-83. doi: 10.1177/105345129403000203

Bouck, E. C. (2016). A national snapshot of assistive technology for students with disabilities. *Journal of Special Education Technology, 31*(1), 4-13. doi:10.1177/0162643416633330

Bouck, E. C., Maeda, Y., & Flanagan, S. M. (2012). Assistive technology and students with high-incidence disabilities: Understanding the relationship through the National Longitudinal Transition Study-2. *Remedial and Special Education, 33*, 298-308. doi:10.1177/0741932511401037

Brackenreed, D. (2008). Assistive technology as an accommodation for a student with mild disabilities: The case of Alex. *Exceptionality Education International, 18*(2), 69-81.

Bryant, D. P., Bryant, B. R., & Raskind, M. H. (1998). Using assistive technology to enhance the skills of students with learning disabilities. *Intervention in School and Clinic, 34*(1), 53-58. doi: 10.1177/105345129803400109

Colker, D. (2002, April 29). Gaining access: Small companies pioneer advances for people with severe disabilities – sometimes by accident. *Journal – Gazette*, 6D. Retrieved from http://prx.library.gatech.edu/login?url=https://search-proquest-com.prx.library.gatech.edu/docview/410997797?accountid=11107

Craddock, G. (2006). The AT continuum in education: Novice to power user. *Disability & Rehabilitation: Assistive Technology, 1*(1/2), 17-27. doi: 10.1080/09638280500167118

Curtis, R. S., Rabren, K., & Reilly, A. (2009). Post-school outcomes of students with disabilities: A quantitative and qualitative analysis. *Journal of Vocational Rehabilitation, 30*(1), 31-48. doi: 10.3233/JVR-2009-0451

Deci, E. L. & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227-268. doi: 10.1207/S15327965PLI1104_01

Edyburn, D. L. (1996). *Assistive technology for students with mild disabilities.* Proceedings of LRP Educational Technology Conference and Expo, San Francisco, CA.

Edyburn, D. L. (2000). Assistive technology and mild disabilities. *Special Education Technology Practice, 8*(4), 18-28.

Edyburn, D. L. (2013). Critical issues in advancing the special education technology evidence base. *Exceptional Children, 80*(1), 7-24. doi: 10.1177/001440291308000107

Elkind, J., Black, M. S., & Murray, C. (1996). Computer-based compensation of adult reading disabilities. *Annals of Dyslexia, 46*, 159-186. doi: 10.1007/BF02648175

Englert, C. S., Manalo, M., & Zhao, Y. (2004). I can do it better on the computer: The effects of technology-enabled scaffolding on young writers' composition. *Journal of Special Education Technology, 19*(1), 5-22. doi: 10.1177/016264340401900101

Fichten, C. S., Asuncion, J., Barile, M., Fossey, M. E., & Robillard, C. (2001). Computer technologies for postsecondary students with disabilities I: Comparison of student and service provider perspectives. *Journal of Postsecondary Education and Disability, 15*(1), 28-58.

Floyd, K. (2012). Postsecondary students with learning disabilities: Can we do more? *Journal of Special Education Apprenticeship, 1*(1), 1-13.

Francis, G., Duke, J., Brigham F., Demetro, K., (2018). Student perceptions of college-readiness, college services and supports, and family involvement in college: An exploratory study. *Journal of Autism*

and Developmental Disorders, 48, 3573-3585 doi: 10.1007/s10803-018-3622-x

Gamble, M., Dowler, D., & Orslene, L. (2006). Assistive technology: Choosing the right tool for the right job. *Journal of Vocational Rehabilitation, 24*(2), 7380.

Garrison-Wade, D. F. (2012). Listening to their voices: Factors that inhibit or enhance postsecondary outcomes for students with disabilities. *International Journal of Special Education, 27*, 113-125.

Garza, N. (2005). Engagement in postsecondary education, work, or preparation for work. *After high school: A first look at the postschool experiences of youth with disabilities: A Report from the National Longitudinal Transition Study-2 (NLTS2), 1*, 3-1–3-6.

Geary, D. C. (2004). Mathematics and learning disabilities. *Journal of Learning Disabilities, 37*(1), 4-15. doi:10.1177/00222194040370010201

Getzel, E. E., & Thoma, C. A. (2008). Experiences of college students with disabilities and the importance of self-determination in higher education settings. *Career Development for Exceptional Individuals, 31*, 77-84. doi: 10.1177/0885728808317658

Grogan, G. (2015). Supporting students with autism in higher education through teacher education programs. *SRATE Journal, 24*(2), 8-13.

Hansen, K. D., & Dawson, D. L. (2019). “We can do better”: Community college faculty preparedness for teaching students with learning disabilities. *Journal of Diversity in Higher Education. Advance online publication.* doi: 10.1037/dhe0000142

Hasselbring, T. S., & Glaser, C. H. W. (2000). Use of computer technology to help students with special needs. *The Future of Children, 10*, 102-122. doi: 10.2307/1602691

Hall, L. (2016). *A participatory action research study of students with disabilities success at a rural community college: Understanding the heuristics in the black box experience.* Available from ProQuest Dissertation and Theses Global database (UMI No. 10172913).

Hetzroni, O. E., & Shrieber, B. (2004). Word processing as an assistive technology tool for enhancing academic outcomes of students with writing disabilities in the general classroom. *Journal of Learning Disabilities, 37*, 143-154. doi:10.1177/00222194040370020501

Holmes, A., & Silvestri, R. (2012). Assistive technology use by students with LD in postsecondary education: A case of application before investigation? *Canadian Journal of School Psychology, 27*(1), 81-97.

Higgins, E. L., & Raskind, M. H. (2004). Speech recognition-based and automaticity programs to help

students with severe reading and spelling problems. *Annals of Dyslexia, 54*, 365-388. doi:10.1007/s11881-004-0017-9

Institute of Education Sciences. (n.d.). National Longitudinal Transition Study 2012. Retrieved from http://ies.ed.gov/ncee/nlts/

Jutai, J., Rigby, P., Ryan, S., & Stickel, S. (2000). Psychosocial impact of electronic aids to daily living. *Assistive Technology, 12*, 123-131. doi:10.1080/10400435.2000.10132018

Kaye, H. S., Yeager, P., & Reed, M. (2008). Disparities in usage of assistive technology among people with disabilities. *Assistive Technology, 20*, 194-203. doi:10.1080/10400435.2008.10131946

LaPlante, M. P., Hendershot, G. E., & Moss, A. J. (1992). Assistive technology devices and home accessibility features: Prevalence, payment, need, and trends. *Advance Data from Vital and Health Statistics*, (217), 1-11. Retrieved from http://www.cdc.gov/nchs/data/ad/ad217.pdf

Lewandowski, L. J., Wood, W., & Miller, L. A. (2016). Technological applications for individuals with learning disabilities and ADHD. In *Computer-Assisted and Web-Based Innovations in Psychology, Special Education, and Health* (pp. 61-93). Elsevier. doi: 10.1016/B978-0-12-802075-3.00003-6

Lindstrom, J. H. (2007). Determining appropriate accommodations for postsecondary students with reading and written expression disorders. *Learning Disabilities Research & Practice*, 22, 229-236. doi: 10.1111/j.1540-5826.2007.00251.x

Lightner, K. L., Vaughan, D. K., Schulte, T., & Trice, A. D. (2012). Reasons university students with a learning disability wait to seek disability services. *Journal of Postsecondary Education and Disability, 25*, 145-159. Retrieved from http://files.eric.ed.gov/fulltext/EJ994283.pdf

Luecking, R. G., & Certo, N. J. (2003). Integrating service systems at the point of transition for youth with significant support needs: A model that works. *American Rehabilitation, 27*(1), 2-9.

MacArthur, C. A. (1999). Overcoming barriers to writing: Computer support for basic writing skills. *Reading and Writing Quarterly, 15*, 169-192. doi: 10.1080/105735699278251

MacArthur, C. A. (2009). Reflections on research on writing and technology for struggling writers. *Learning Disabilities Research & Practice, 24*(2), 93-103. doi:10.1111/j.1540-5826.2009.00283.x

MacArthur, C. A., & Cavalier, A. R. (2004). Dictation and speech recognition technology as test accommodations. *Exceptional Children, 71*, 43-58. doi: 10.1177/001440290407100103

Malcolm, M. P., & Roll, M. C. (2019). Self-reported assistive technology outcomes and personal characteristics in college students with less-apparent disabilities. *Assistive Technology, 31*, 169-179. doi: 10.1080/10400435.2017.1406414

Mavrou, K., Meletiou-Mavrotheris, M., Kärki, A., Sallinen, M., & Hoogerwerf, E. (2017). Opportunities and challenges related to ICT and ICT-AT use by people with disabilities: An explorative study into factors that impact on the digital divide. *Technology & Disability, 29*, 63-75.

Mazzotti, V. L., Test, D. W., Wood, C. L., & Richter, S. (2010). Effects of computer assisted instruction on students' knowledge of postschool options. *Career Development for Exceptional Individuals, 33*(1), 25-40. doi: 10.1177/0885728809338714

McGrath, V. (2009). Reviewing the evidence on how adult students learn: An examination of Knowles' model of andragogy. *Adult Learner: The Irish Journal of Adult and Community Education, 1*, 99-110.

Mechling, L. C. (2007). Assistive technology as a self-management tool for prompting students with intellectual disabilities to initiate and complete daily tasks: A literature review. *Education and Training in Developmental Disabilities, 42*, 252-269.

Mitchem, K., Kight, J., Fitzgerald, G., Koury, K., & Boonseng, T. (2007). Electronic performance support systems: An assistive technology tool for secondary students with mild disabilities. *Journal of Special Education Technology, 22*(2), 1-14. doi: 10.1177/016264340702200201

Mull, C. A., & Sitlington, P. L. (2003). The role of technology in the transition to postsecondary education of students with learning disabilities: A review of the literature. *The Journal of Special Education, 37*(1), 26-32. doi: 10.1177/00224669030370010301

Murray, C. (2002). Supportive teacher-student relationships: Promoting the social and emotional health of early adolescents with high incidence disabilities. *Childhood Education, 78*, 285-290. doi: 10.1080/00094056.2002.10522743

Murray, C., & Pianta, R. C. (2007). The importance of teacher-student relationships for adolescents with high incidence disabilities. *Theory into Practice, 46*, 105-112. doi: 10.1080/00405840701232943

Naik, M., Yorkman, M., & Casserly, M. (2010). Investing wisely and quickly: Use of ARRA funds in America's great city schools [PDF file]. Retrieved from https://www.cgcs.org/cms/lib/DC00001581/Centricity/Domain/293/ARRA%20Report.pdf

Newman, L. A. & Madaus, J. W. (2015). An analysis of factors related to receipt of accommodations and services by postsecondary students with disabilities. *Remedial and Special Education, 36*, 208-

219. doi: 10.1177 /0741932515572912

Ofiesh, N. S., Rice, C. J., Long, E. M., Merchant, D. C., & Gajar, A. H. (2002). Service delivery for postsecondary students with disabilities: A survey of assistive technology use across disabilities. *College Student Journal, 36*, 94-108.

O'Neill, L. N. P., Markward, M. J., & French, J. P. (2012). Predictors of graduation among college students with disabilities. *Journal of Postsecondary Education and Disability, 25*, 21-36. Retrieved from http://files.eric.ed.gov/fulltext/EJ970017.pdf

Parette, P., & Scherer, M. (2004). Assistive technology use and stigma. *Education and Training in Developmental Disabilities, 39*, 217-226.

Perelmutter, B., McGregor, K. K., & Gordon, K. R. (2017). Assistive technology interventions for adolescents and adults with learning disabilities: An evidence-based systematic review and meta-analysis. *Computers & Education, 114*, 139-163. doi: 10.1016/j.compedu.2017.06.005

Phillips, B., & Zhao, H. (1993). Predictors of assistive technology abandonment. *Assistive Technology, 5*, 36-45. doi:10.1080/10400435.1993.10132205

Poudel, B. (2014). Acceptance and use of assistive technology: Perspectives of high school and college students with high incidence disabilities (Doctoral dissertation). Retrieved from http://udspace.udel.edu/bitstream/handle/19716/16818/2014_PoudelBishwa_PhD.pdf

Qualtrics Survey Tool (2019). Georgia Tech Qualtrics Research Suite: https://pwp.gatech.edu/qualtrics/

Rashid, T., & Asghar, H. M. (2016). Technology use, self-directed learning, student engagement and academic performance: Examining the interrelations. *Computers in Human Behavior, 63*, 604-612. doi: 10.1016/j.chb.2016.05.084

Raskind, M. H., & Higgins, E. L. (1995). Effects of speech synthesis on the proofreading efficiency of postsecondary students with learning disabilities. *Learning Disability Quarterly, 18*, 141-158. doi: 10.2307/1511201

Raskind, M. H., & Higgins, E. L. (1998). Assistive technology for postsecondary students with learning disabilities: An overview. *Journal of Learning Disabilities, 31*, 27-40. doi: 10.1177/002221949803100104

Raskind, M. H., & Higgins, E. L. (1999). Speaking to read: The effects of speech recognition technology on the reading and spelling performance of children with learning disabilities. *Annals of Dyslexia, 49(*1), 251-281. doi: 10.1007/s11881-999-0026-9

Raskind, M. H., Higgins, E. L., Slaff, N. B., & Shaw, T. K. (1998). Assistive technology in the homes of children with learning disabilities: An exploratory study. *Learning Disabilities: A Multidisciplinary Journal, 9*(2), 47-56.

Riffel, L. A., Wehmeyer, M. L., Turnbull, A. P., Lattimore, J., Davies, D., Stock, S., & Fisher, S. (2005). Promoting independent performance of transition-related tasks using a palmtop PC-based self-directed visual and auditory prompting system. *Journal of Special Education Technology, 20*(2), 5-14. doi: 10.1177/016264340502000201

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs, 80*(1), 1-28. doi: 10.1037/h0092976

Sennott, S., & Bowker, A. (2009). Autism, AAC, and Proloquo2Go. *Perspectives on Augmentative and Alternative Communication, 18*, 137-145. doi: 10.1044/aac18.4.137

Sharpe, M., Johnson, D., Izzo, M., & Murray, A. (2005). An analysis of instructional accommodations and assistive technologies used by postsecondary graduates with disabilities. *Journal of Vocational Rehabilitation, 22*(1), 3-11.

Stodden, R. A., Conway, M. A., & Chang, K. B. T. (2003). Findings from the study of transition, technology and postsecondary supports for youth with disabilities: Implications for secondary school educators. *Journal of Special Education Technology, 18*(4), 29-44. doi: 10.1177/016264340301800403

Stodden, R. A., & Roberts, K. D. (2005). The use of voice recognition software as a compensatory strategy for postsecondary education students receiving services under the category of learning disabled. *Journal of Vocational Rehabilitation, 22*(1), 49-64.

Wagner, M., Newman, L., Cameto, R., Levine, P., & SRI International, M. P. C. (2005). Changes over time in the early postschool outcomes of youth with disabilities. A report of findings from the National Longitudinal Transition Study (NLTS) and the National Longitudinal Transition Study-2 (NLTS2). Online Submission. Retrieved from https://nlts2.sri.com/reports/2005_06/nlts2_report_2005_06_complete.pdf

Wehmeyer, M. L., Palmer, S. B., Smith, S. J., Parent, W., Davies, D. K., & Stock, S. (2006). Technology use by people with intellectual and developmental disabilities to support employment activities: A single-subject design meta-analysis. *Journal of Vocational Rehabilitation, 24*, 81-86.

Wolfe, G. L., & Lee, C. (2007). Promising practices for providing alternative media to postsecondary students with print disabilities. *Learning Disabilities Research & Practice, 22*, 256-263. doi: 10.1111/j.1540-5826.2007.00254.x.

Wood, S. G., Moxley, J. H., Tighe, E. L., & Wagner, R. K. (2017). Does text-to-speech and related read-aloud tools improve reading comprehension for students with reading disabilities? A meta-analysis. *Journal of Learning Disabilities, 50*, 1-12.

Woodward, J., & Rieth, H. (1997). A historical review of technology research in special education. *Review of Educational Research, 67*, 503-536. doi:10.2307/1170519

Zabala, J. (1995, March). The SETT framework: Critical areas to consider when making informed assistive technology decisions. Paper presented at the Florida Assistive Technology Impact Conference and Technology and Media Division of Council for Exceptional Children, Orlando, FL.

Appendix

Assistive Technology from High School to College Survey

1. What year did you graduate high school? _____

2. What was your final GPS in high school? _____

3. What is your home/high school zip code? _____

4. How difficult was each of the following for you in high school? Circle one.

Tasks	Easy	Straightforward	I had to work at it	It was hard	It was very hard
Reading	1	2	3	4	5
Writing	1	2	3	4	5
Computation	1	2	3	4	5
Note Taking	1	2	3	4	5
Test Taking	1	2	3	4	5

Subjects	Easy	Straightforward	I had to work at it	It was hard	It was very hard
Language Arts	1	2	3	4	5
Math	1	2	3	4	5
Science	1	2	3	4	5
Social Studies	1	2	3	4	5

5. Did you have a 504 Plan or an IE in high school?
   - ☐ 504
   - ☐ IEP
   - ☐ None of these

6. If so, what was your eligibility?
   - ☐ Attention Deficit/Hyperactivity Disorder
   - ☐ Psychological Disorder
   - ☐ Learning Disability
   - ☐ Systemic Disorder
   - ☐ Mobility Disability
   - ☐ Autism/Asperger's Disorder
   - ☐ Deaf and Hard of Hearing
   - ☐ Vision Impairment
   - ☐ Other

7. What accommodations did you have in high school?
    - ☐ Extra time on assignments and tests
    - ☐ Reader for tests
    - ☐ Notetaker
    - ☐ Quiet room
    - ☐ Take tests over
    - ☐ Electronic text
    - ☐ Other: _____

8. What technology did you use regularly in high school?
    - ☐ PC/Laptop
    - ☐ Tablet (iPad/Android/Surface)
    - ☐ Other: _____

9. How did you feel about using technology (in #8 above) in high school? Circle one.

Very Uncomfortable	Uncomfortable	Neutral	Comfortable	Very Comfortable
1	2	3	4	5

10. Check all of these tools that were available to you in high school.
    - ☐ Screen reader (text-to-speech software)
    - ☐ Speech recognition (speech-to-text software)
    - ☐ Word prediction
    - ☐ Talking word processor
    - ☐ Graphic organizer
    - ☐ Audible textbooks
    - ☐ Spell checker
    - ☐ Electronic dictionary
    - ☐ Audio recorder
    - ☐ Magnification/Enlargement
    - ☐ Other: _____

11. Which of these do you feel you had mastered (very comfortable with) in high school?
    - ☐ Screen reader (text-to-speech software)
    - ☐ Speech recognition (speech-to-text software)
    - ☐ Word prediction
    - ☐ Talking word processor
    - ☐ Graphic organizer
    - ☐ Audible textbooks
    - ☐ Spell checker

- □ Electronic dictionary
- □ Audio recorder
- □ Magnification/Enlargement
- □ Other: _____

12. What year did you enter college/tech school? _____

13. What is your college/tech school zip code? _____
14. What was your GPA at the end of the first year in college/tech school? _____
15. How would you describe your first year of college? Circle one.

Very Easy	Easy	Neutral	Difficult	Very Difficult
1	2	3	4	5

16. How difficult was each of the following for you in college/tech school? Circle one for each task/subject.

Tasks	Easy	Straightforward	I had to work at it	It was hard	It was very hard
Reading	1	2	3	4	5
Writing	1	2	3	4	5
Computation	1	2	3	4	5
Note Taking	1	2	3	4	5
Test Taking	1	2	3	4	5

Subjects	Easy	Straightforward	I had to work at it	It was hard	It was very hard
Language Arts	1	2	3	4	5
Math	1	2	3	4	5
Science	1	2	3	4	5
Social Studies	1	2	3	4	5

17. What accommodations did you have in your first year in college/tech school?
    - □ Use of a laptop/tablet in class
    - □ Extra time on assignments and tests
    - □ Reader for tests
    - □ Notetaker
    - □ Audio recorder
    - □ Priority seating
    - □ Captioning services
    - □ Sign language interpreter
    - □ Handouts in advance
    - □ Quiet room

- ☐ Take tests over
- ☐ Book in digital (electronic) format
- ☐ Personal attendant (parapro)
- ☐ Other: _____

18. What technology did you use regularly in your first year of college/tech school?
    - ☐ Screen reader (text-to-speech software)
    - ☐ Speech recognition (speech-to-text software)
    - ☐ Word prediction
    - ☐ Talking word processor
    - ☐ Graphic organizer
    - ☐ Audible textbooks
    - ☐ Spell checker
    - ☐ Electronic dictionary
    - ☐ Audio recorder
    - ☐ Calculator
    - ☐ Magnification/Enlargement
    - ☐ Other: _____

19. How did you feel about using these technology tools in college/tech school?

Very Uncomfortable	Uncomfortable	Neutral	Comfortable	Very Comfortable
1	2	3	4	5

20. Which of these tools had you mastered/gotten to feel comfortable with by the end of your first year in college/technical school?
    - ☐ Screen reader (text-to-speech software)
    - ☐ Speech recognition (speech-to-text software)
    - ☐ Word prediction
    - ☐ Talking word processor
    - ☐ Graphic organizer
    - ☐ Audible textbooks
    - ☐ Spell checker
    - ☐ Electronic dictionary
    - ☐ Audio recorder
    - ☐ Calculator
    - ☐ Magnification/Enlargement
    - ☐ Other: _____

21. Which tools did you find most valuable or most useful to your academic success?

- ☐ Screen reader (text-to-speech software)
- ☐ Speech recognition (speech-to-text software)
- ☐ Word prediction
- ☐ Talking word processor
- ☐ Graphic organizer
- ☐ Audible textbooks
- ☐ Spell checker
- ☐ Electronic dictionary
- ☐ Audio recorder
- ☐ Magnification/Enlargement
- ☐ Other: _____

22. How did you learn the tool? Select all that apply.
    - ☐ Support from AMAC
    - ☐ Support from Office of Disability Services
    - ☐ Attended training
    - ☐ Self-taught
    - ☐ Viewed tutorials on product website
    - ☐ Friend or peer showed me how to use it
    - ☐ Other: _____

23. Do you think that using AT helped your performance at the post-secondary level?
    - ☐ Yes
    - ☐ No
    - ☐ Unsure

24. Please explain.

25. Gender
    - ☐ Male
    - ☐ Female

26. Race/Ethnicity
    - ☐ Black or African American
    - ☐ Asian or Pacific Islander
    - ☐ Hispanic
    - ☐ Native American
    - ☐ White

27. Age upon enter college: _____