
Including Assistive Technology in Teacher Preparation: Exploring One Approach

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Assistive Technology (AT) is specifically addressed in the most recent reauthorization of IDEA, the Individuals with Disabilities Education Improvement Act (2004). The law insures that assistive devices and services are available for students with disabilities to help them access their environment at home, school, and in the work place. Therefore, it is important that teacher preparation programs in higher education establish required components for including AT in their programs of study. To explore one approach to meeting this need, an AT module was developed and implemented with pre-service teachers at a southwestern university during their student teaching semester. The goals of the study were to determine (a) prior knowledge of pre-service teachers in the area of assistive technology, (b) the effectiveness of an AT Module presented during one student teaching seminar session, and (c) the impact of the AT module on classroom practice after the seminar. Based on survey responses and in-class discussions, the impact of the information provided in the module was found to be positive. Pre-service teachers felt that they were better prepared and more confident as a result of knowledge gained about AT concepts, resources, and applications.

Assistive technology (AT) is a provision of the Individuals with Disabilities Education Improvement Act (IDEA) (2004). The law requires that assistive devices and services are available for students with disabilities to help them access their environment at home, school, and in preparation for post-secondary education and work environments. Current data indicate that 13.1% of the total student population between the ages of 6 and 21 are served under IDEA-B (NCES, 2012), while more than 12.7% of adults with disabilities who are eligible for work remain unemployed (USDL, 2012). Access to AT and its applications during early interventions activities, as well as in elementary, middle, and secondary schools, may be one way to help individuals with disabilities acquire the learning and performance skills they need to become successful at school and work. *As technology becomes even more important to mainstream society, people who do not have ready access to a computer or the Internet will be at an increasing disadvantage until the Internet and devices become more accessible to users with disabilities* (Green, 2012, p. 6).

Assistive Technology

According to IDEA (2004), AT devices include equipment that is purchased, modified, or customized and used to help children with disabilities access their environment. However, *the term does not include a medical device that is surgically implanted, or the replacement of such device* (Title I, A, 602, 1). AT services also directly assist students with disabilities, including those with learning disabilities, in the selection, acquisition, and application of any AT device (IDEA).

Bodine (2003) summarizes assistive technology as a tool used by someone with a disability to perform everyday tasks such as getting dressed, moving around or controlling their environment, learning, working or engaging in recreational activities (p. 33). AT tools and services make it easier for individuals with disabilities to actively engage in classroom and social activities, as well as functional living and work responsibilities, independently or with minimal assistance. For example, AT can allow individuals to access computer equipment and participate in activities that they could not otherwise participate in without AT. Individuals with disabilities use AT devices and services to (a) assist them in learning, (b) make their environment more accessible, (c) enhance their independence, (d) enable them to compete in the workplace, and (e) improve their quality of life. Because AT is mandated by law, both general and special education teacher preparation programs in higher education need to establish a mechanism for including AT in their programs of study in order to align with the law, professional standards, and classroom practice. In order to do this, educators need to know what AT is, what AT is available, and understand the laws that mandate AT in classrooms and other educational settings. (Beard, Carpenter, & Johnston, 2011).

The Role of Professional Standards

Organizations such as the Council for Exceptional Children (CEC) and the National Council for Accreditation of Teacher Education (NCATE) both establish standards and competencies designed to guide to the special education profession. The standards are aligned in order to provide a set of content

expectations to assure the public that practicing professionals have mastered the specialized skills for safe and effective practice (CEC, 2012, p. 6). For example, standards related to evidence-based practices support K-12 student successes with the appropriate accommodations [*including assistive technologies*] to ensure maximum participation of students with special education needs (CEC:PCCS, 2010, p. 1). Because implementation of professional standards better ensure best practices in the profession and are an integral part of teacher preparation programs, NCATE expects teacher preparation programs to prepare teachers who are able to use educational technology to help all students learn (NCATE, 2012).

The Role of Legislation and Inclusive Practices

Issues of equity and accessibility for children with disabilities in K-12 classrooms are outlined in the No Child Left Behind (NCLB) Act (2011) and the Individuals with Disabilities Education Improvement Act (IDEA)(2004). With this came specific, new expectations for the education of students with disabilities and continuing licensure requirements (e.g., NCATE, CEC) for pre-service and in-service teachers. In addition, the introduction of program supports (e.g., Universal Design for Learning; Differentiated Instruction; Response to Intervention) focused on guidelines for professional practice. As the program of choice for school-age children remains inclusion of students with disabilities in the general education classroom, students with disabilities, with few exceptions, are expected to meet the same high academic standards as students without disabilities in a general education setting (Poel, 2007).

Individuals with Disabilities Education Act (IDEA) of 2004

IDEA is the law that protects students with disabilities through the age of 21 who are receiving early childhood services or enrolled in K-12 schools. IDEA requires that appropriate AT be considered in the development of each student's Individual Education Plan (IEP) and remains a critical element in ensuring that students become competitive with their peers at school, at home, and in the work place. Each student who receives special education services is required to have an IEP. One responsibility of each student's IEP team is to identify reasonable accommodations, which may require the use of assistive devices and services in order for the IEP to be effective, support the student, and align with the intent of the law. Both general and special educators are integral members of the IEP team and assume responsibility for implementing the program.

Universal Design for Learning

More recently the introduction of Universal Design for Learning (UDL) recognized that all students need to have an equal opportunity to learn. With the increasing number of students with disabilities and those from diverse ethnic backgrounds in the general education classrooms, meeting the needs of individual students is becoming more challenging. UDL provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone—not a single, one-size-fits-all solution but rather flexible approaches that can be customized and adjusted for individual needs (CAST, 2011). Products that are universally designed are both accessible and usable for a broad audience and, therefore, minimize the need for accommodations (Burgstahler & Cory, 2008, p. 9). UDL may serve as the umbrella to better ensure the academic success of all students.

Differentiated Instruction

Differentiated instruction is established through the use of a variety of pedagogical strategies that encourage critical thinking, problem solving, and making choices. Assignments are structured to address student learning styles and higher-level thinking. Students are encouraged to explore topics that they show interest in and present knowledge gained through a variety of assessments and activities (Allan & Goddard, 2010). Tomlison (1999) suggests that teachers who support the concept of differentiated instruction begin with recognizing their students and creating classroom cultures that engage students and encourage them to excel as individuals. By implementing a variety of instructional strategies, teachers are better equipped to outreach to the diverse students in the class and ensure their academic success.

Response to Intervention

Each state has developed a Response to Intervention (RtI) program designed to identify students who are not achieving academic success in the classroom. A tiered program provides for assessments and interventions at each level that examine the progress and needs of each student and emphasizes the importance of both general and roles of special education teachers in that process. Early intervention and a systematic approach to addressing student needs have the potential to improve retention rates and reduce school dropout, unemployment, and incarceration (Fuchs, Fuchs, & Compton, 2012).

The Growing Need for Teacher Competence in Assistive Technology

Historically, AT has been considered expensive, and only prescribed through evaluations conducted by certified specialists (e.g., occupational therapists, physical therapists, speech/

language pathologists). Some have implied that K-12 teachers believe that AT is *complicated and difficult to use* (Dissinger, 2003, p. 44). Because special educators spend a significant amount of time with their students, there is a great need to include AT as a part of the student teaching experience. It is difficult for special educators to recommend or discuss AT professionally, when they do not know what is available and/or how to use the devices and services mandated by IDEA (2004).

Now however, it is vital that special educators and general educators understand the value of AT, what is available, and how specific, carefully chosen devices, suited to individual needs, can positively impact their students. It also is increasingly important that they possess the knowledge and skills needed to participate actively in the selection, training, implementing, and use of AT to assist learning for students with disabilities. Because *the appropriate application of AT can promote fuller participation within school, home, and community environments and improve the overall quality of life of individuals with disabilities* (Bryant, Erin, Lock, Allan, & Resta, 1998), both special educators and general educators need AT information in order to improve instruction, discuss AT options with parents and other professionals, and recommend AT devices/services during IEP meetings.

Researchers in the area of AT report that new teachers are entering the classroom unprepared to help students with disabilities access their environment through the use of assistive technology (Bausch & Hasselbring, 2004; Milken as cited in Smith, 2001). In a national survey conducted by the National Assistive Technology Research Institute (NATRI)(2006), it was reported that only 30% of the 231 colleges/universities who responded addressed AT in their teacher preparation program. Over 50% of the undergraduate students had no access or limited access to AT in their studies, and approximately 47% stated that funding was a significant issue in purchasing and maintaining AT for instruction in their department (Bausch, 2006).

Assistive Technology and the Individual Education Plan

Determining the appropriate AT to be used begins with choosing the device(s) that meet identified student needs. Three decades ago there were fewer than 100 devices available. Today, there are over 29,000 assistive devices available for individuals with disabilities and aging adults (Bausch & Hasselbring, 2004; Bodine, 2003; Dove, 2012). Thus, having an awareness of the large variety of available devices and services is an important first step toward helping teachers to make more informed decisions that provide student access to their environment and greater success in school activities.

However, meeting these needs remains quite a challenge because trained and qualified AT teachers, who are available to teach AT courses, are scarce (Babbitt, 2003). In addition,

the option of requiring one more course to the extensive education program for university students is highly unlikely. To address these issues and explore the level of AT exposure in teacher preparation programs, the researchers designed an AT module (90 minutes) for pre-service teachers that was presented during one student teaching seminar (150 minutes). A research component examined the effects of the module with respect to prior knowledge and impact on the pre-service teachers and their classroom practice.

The Student Teaching Semester and an Assistive Technology Module

Student teaching is a critical time in the teacher preparation process, (Little & Robinson, 1997). At the university where this module was developed, weekly student teaching seminars were conducted that included elementary, special education K-12, and bilingual education pre-service teachers. The seminars were designed to help pre-service teachers majoring in each area to strengthen their emerging skills; and reflect on their personal teaching styles while they transitioned from teacher candidate to lead professional in the classroom (Prushiek, McCarty, & McIntyre, 2001). Therefore, infusing an AT module during one of the seminars seemed appropriate.

The goals of the module were to: (a) engage teacher candidates in discussion and help them develop an awareness of Assistive Technology--what it is and what is available; (b) identify the seven National Assistive Technology Research Institute (NATRI, 2006) categories (Existence; Communication; Body Support, Protection and Positioning; Travel and Mobility; Environmental Interaction; Education and Transition; Sports, Fitness, and Recreation) as an organization platform and list sample devices appropriate for each; and (c) explore and examine a variety of AT devices that may be appropriate for the children with whom they work.

Seminar

As students entered the seminar, they were given a guided outline in the form of a Cloze exercise and an empty film canister. The guided outline was aligned with the AT PowerPoint presentation and not a copy of the PowerPoint slides. House-keeping activities were addressed and the seminar agenda was reviewed prior to the start of the module. To begin the seminar instructor (SI) asked pre-service teachers to define AT. The instructor called on several students and their responses included expensive computers and software. The AT discussion continued and the SI encouraged preservice teachers to reflect on the students in their classrooms and prompted for additional responses which expanded to talking devices, wheelchairs, and recorders. During the discussion, students who shared were given unassembled PVC pencil grips or talk-back telephones as a reward for their participation. Sharing of the PVC AT was conducted at the end of the seminar.

The SI delivered an engaging PowerPoint presentation that included: Module purpose, personal experiences, history of AT, AT laws, and NATRI categories. During the AT PowerPoint students were reminded to complete their Cloze outline and allotted time to explore various AT devices provided by the SI some of which were displayed in the PowerPoint. They were asked to apply Least Restrictive Environment (LRE), Free Appropriate Public Education (FAPE), and other principles of the Individuals with Disabilities Education Act (IDEA)(2004) as they pertained to their program

practice and the students in their classrooms. Specific laws (e.g., Section 504; Technology-Related Assistance Act for Individuals; Telecommunications Act; Workforce Investment Act; and IDEA) were highlighted and students were given an opportunity to identify and explain the laws prior to the PowerPoint display.

The PowerPoint presentation continued with the introduction of the NATRI categories. Several devices were presented in each category, and pre-service teachers had the opportunity to identify these devices, predict how they might be

Table 1

NATRI Categories and AT Devices

Category	Low Tech	Medium Tech	High Tech
Existence	<ul style="list-style-type: none"> Sock helper Button hooker Long-handled hair brush 	<ul style="list-style-type: none"> Weighted eating utensils Plates/bowls with lips 	<ul style="list-style-type: none"> Hoyer Lift
Communication	<ul style="list-style-type: none"> Color plastic cup Bell 	<ul style="list-style-type: none"> Braille Labeler Single-message switch Multiple message watch Switches Dana Alpha-Smart Dana Neo 	<ul style="list-style-type: none"> Chat-PC Kurzweil 1000/3000
Body Support, and Protection Positioning	<ul style="list-style-type: none"> Tush Cush Contour Cushion 	<ul style="list-style-type: none"> Wheel-chair supports Book Supports 	<ul style="list-style-type: none"> Sit-to-stand chairs
Travel and Mobility	<ul style="list-style-type: none"> Folding Cane 	<ul style="list-style-type: none"> PVC Walker 	<ul style="list-style-type: none"> Beach Wheelchair Climbing Wheelchair GPS
Environmental Interaction	<ul style="list-style-type: none"> Box-top opener Grabber 	<ul style="list-style-type: none"> Color Identifier Fit ‘n Sit Ball Chair Braille Watch Bar Code Scanner Vibrating Alarm Clock Key Locator 	<ul style="list-style-type: none"> Ergonomic Mouse Foot Mouse Ergonomic Keyboards One-handed keyboard Perkins Braille Writer Mountbatton
Education	<ul style="list-style-type: none"> Writing Template Slant Boards Large dice Spin ‘n Say 	<ul style="list-style-type: none"> Talking Calculators Intellikeys Keyboards Talking Dictionary Reading Pen Talking Globe Typoscope 	<ul style="list-style-type: none"> Inspiration/Kidspiration Jaws Via Voice Dragon Naturally Speaking
Sports, Fitness, and Recreation	<ul style="list-style-type: none"> Balls with Bells Card Holder 	<ul style="list-style-type: none"> Beeping balls Beeping hoops 	<ul style="list-style-type: none"> Basketball Wheelchair Modified Water Skis Modified Bicycle

used, and suggest who may benefit by their use. At the end of the presentation, additional devices were demonstrated, and students were able to work with them.

After discussing components of the PowerPoint, fielding questions about AT, and sharing student scenarios, the SI asked the pre-service teachers to define AT. Their responses were much more specific. They were able to state the purpose of AT, recall and name a variety of AT devices, and identify the laws. Students who contributed to the discussion continued to receive the PVC talk-back telephones and pencil grips. Time was allotted for them to construct the devices and share uses with their peers. They seemed to want classroom sets of the talk-backs. Discussion continued with the film canisters. The SI asked, *How can the empty film canister be used as an AT device?* Responses included: containers, noise makers, and clay cutters. The SI had to remind them to readjust their thinking to the topic of AT and prompted them to think about how common items can be repurposed. Ultimately, the SI shared the options of using the canisters as a holder for a pencil, a toothbrush, or an eating utensil.

Methodology

An AT module was developed and a research study was conducted with pre-service teachers at a southwestern university. The goals of the study were to determine (a) prior knowledge of pre-service teachers in the area of assistive technology, (b) the effectiveness of the Assistive Technology Module (90 minutes) that was presented during one 2.5 hour student seminar and (c) the impact that the AT module had on classroom practice.

The module was designed to emphasize the role and responsibility of the teacher and AT. A PowerPoint was organized according to the seven categories established by the NATRI. Numerous devices were presented in each category and discussed (see Table 1).

Possibly, the greatest benefit of this AT module was to provide information, resources, and hands-on experiences with the technologies for individuals who made decisions about AT for students with disabilities (Dissinger, 2003, p. 38). Since the purpose of the module was to increase awareness and knowledge of AT for pre-service teachers, their input about the effectiveness of the module was most important.

Participants

A convenience sample of pre-service teachers (graduate and undergraduate students) attending a southwestern university - main campus and three branch campuses around the state was used. The majority of the teacher candidates were female ($n = 68$; 88%) and caucasian ($n = 37$; 48%). Age range of all participants fell between 21 and 56 ($M = 29$, $SD = 7.2$). The pre-service teachers were enrolled in several Teacher Education licensure program as indicated in Table 2.

Table 2

NATRI Categories and AT Devices

Teacher Education Licensure Programs

Program	n	%
Bilingual Education	3	4
Elementary Education	41	53
Elementary/Bilingual	3	4
Bilingual/Special Education/Elementary	1	1
Special Education	4	5
Special Education/Elementary	19	25
No Response	6	8
Total	77	100

Procedures

A total of 121 surveys (pre-surveys) were distributed prior to the AT module presentation that was conducted during one student teaching seminar at each of the four campuses; 89 post-surveys were returned at the end of the semester giving a return rate of 73.5%. The post-test sample was collected at the end of the semester by each seminar instructor. Surveys completed at a distance were packaged and mailed to the researcher on main campus. A total of 77 pre-post surveys (86.5% of the total number of surveys returned) were matched using identification codes provided by the pre-service teachers.

Data Analysis

A 10-question pre/post survey (see Table 3) was developed and distributed to all pre-service teachers. The survey included six multiple choice questions focused on AT background and experiences and four short response questions focused on identifying specific AT devices.

The data from the survey were analyzed using a *t* test to determine significance ($p = 0.05$) between the means of the pre-test/post-test responses except for Questions 6 and 8. A z-test of two proportions was conducted for Questions 6 and 8 to analysis of the proportion of correct responses in pre versus the proportion of correct responses in post. More detailed analysis was conducted on 5 of the 10 survey questions. These questions were chosen because of their specific alignment with the module.

Two of the questions focused on AT definitions and personal experiences with AT. Question 1: (*open ended*) What is your definition of Assistive Technology? Question 2: (*multiple-choice*) Most of my experience(s) with assistive technology has/have been... (a) through university coursework, (b) through family use, (c) through friends use, (d) through personal use, (e) I have not yet learned about assistive technol-

Table 3

Pre/Post Survey Questions

No.	Questions
1	What is your definition of Assistive Technology
2	Most of my experience(s) with assistive technology has/have been <ol style="list-style-type: none"> Through university coursework Through family use Through friends use Through personal use I have not yet learned about assistive technology
3	There are many different types of assistive technology devices. Name one (1) low assistive technology device
4	There are many different types of assistive technology devices. Name one (1) high assistive technology device
5	Name one additional assistive technology device that is not listed in the above two questions.
6	Who is responsible for purchasing/providing assistive technology to students who may need it?
7	I have discussed assistive technology at one or more IEP meetings. Yes No
8	Under what law is assistive technology covered for children in K-12 classrooms? <ol style="list-style-type: none"> NCLB IDEA ADA CEC
9	I have used assistive technology <ol style="list-style-type: none"> During the past year (identify the AT) During the past 3 years (identify the AT) It's been over 3 years (identify the AT) I have never used assistive technology
10	What questions do you have concerning assistive technology?

Age:

Ethnicity: White, Hispanic, African American, Native American

Gender: Male Female

ogy. The results for Question 2 indicated no significant difference between the means of the pretests and posttests.

However, the three questions that focused on identifying low tech devices, high tech devices, and opportunities to discuss AT at IEP meetings indicated an increase in gained knowledge. Question 3: There are many different types of assistive technology devices. Name one (1) low assistive technology device. Question 4: There are many different types of assistive technology devices. Name one (1) high assistive technology device. Question 7: I have discussed assistive technology at one or more IEP meetings... Yes No. (Students were not asked how many IEPs they attended). Students were better able to identify low tech devices $t(77) = -2.05, p = 0.02$ (one-tailed) and high tech devices $t(77) = -2.59, p = .005$ (one-tailed). In addition, student opportunities to discuss AT at IEP meetings $t(77) = -1.92, p = 0.02$ (one-tailed) increased. Based on analysis of the proportion of correct responses in pre versus the proportion of correct responses in post analysis for question 6, there was no significant difference in the proportion of correct responses from pre to post ($p = 0.1108$). For questions 8,

there was no significant difference in the proportion of correct responses from pre to post ($p = 0.2777$).

Discussion

Students with disabilities are increasingly challenged to perform at school and to meet the academic standards of their peers. Often the resulting struggles lead to frustration and a poor sense of self-esteem. AT may be one way to help these students achieve academic success in the classroom by providing them with tools to both access their daily curriculum and demonstrate the expected level of content mastery.

New teachers in special education and general education are required to address AT in IEP meetings they attend during their student teaching semester. In order to make informed decisions and advocate for their students, they need to be aware that AT includes a wide variety of devices and services and is required by law. The majority of the project participants indicated on the survey that they have students with disabilities in their classrooms. In addition, they felt a lack of AT knowledge

Table 3**Student Responses**

Student	Responses
1	More information in order to obtain a deeper/clearer understanding
2	When will more of it be taught earlier?
3	Why don't the parents get more literature to assist children?
4	How can we get more? The \$ is so limited and the devices are very expensive
5	Where can you find a list of all the assistive technologies?
6	Where can I get more information on it?
7	I would like to know a little more about what's out there
8	I want to know what innovations are being made and how often does old tech still win out?

of available devices, how to work with AT professionals, and the specifics of the IDEA (2004). This aligns with the literature stating that teacher education programs are not adequately preparing pre-service teachers to work with students with disabilities in the area of AT (Bausch & Hasselbring, 2004). All education majors are required to take at least 6 credits of special education courses. SPED law is infused into their programs; therefore, the majority are familiar with IDEA, mandates, and procedures.

The goals of this study were to determine (a) prior knowledge of pre-service teachers in the area of assistive technology, (b) effectiveness of the Assistive Technology Module that was presented during the student seminar, and (c) the impact that the AT module had on classroom practice.

The impact of the information provided in the module proved to be positive. The post-survey responses indicated that the AT Module was effective in providing an overview of AT and establishing interest. Several student comments included:

Overall, participants demonstrated an increase in AT knowledge on the post-survey and revealed during discussion and subsequent seminars that they are using AT even though they did not know that what they were using was identified as AT. Participants felt that they were better prepared and more confident about AT, resources, applications, and the law (IDEA-2004).

To address the impact of the module on classroom practice, one student reported that there were twin girls on her team. They rocked in their chairs often falling backward. The teachers were concerned that they may injure themselves. After the AT seminar, the student teacher discussed the module content and devices with her cooperating teacher. They decided to order a ball chair and try it with one of the twins. After introducing the device to the class and instructing the student how to use it, the student was able to maintain focus on the lesson and move around on the ball without concern for injury. They ordered a second ball for the sister.

A second student reported that her 10-year-old son (who attended the seminar because of lack of after-school babysitting) gave his Talk Back to his friend. He felt that

his friend needed it and the device could help him with improving his speech.

Limitations

A convenience sample of student participants at the main campus and three branch campuses was selected to complete a pre-/post- survey that focused on AT. A random sample of student participants at the campuses would have been preferable; however, our convenience sample still provides insight into our objectives. One researcher traveled to each campus to personally deliver the AT module presentation. Completion of the pre-survey was required at the AT Module seminar prior to the presentation and was collected by the researcher. The post-survey was completed at the end of the semester at each of the three branch campuses. However, not all surveys from the branch campuses were completed or returned. Completion of the post-surveys and mailing them to the author was the responsibility of the seminar instructor at each site. Even though several telephone calls were made and email requests were delivered, not all post-surveys were returned. Several of those that were returned did not include identification numbers that could be matched to the pre-surveys.

The student population at each of the branch campuses was unique to the area; therefore, that may have made a difference in survey responses. It may be that the difference in pre/post responses was due to expected outcomes and not necessarily a result of the module itself. A control group was not assigned; therefore, a comparative study could not be conducted.

Conclusions and Future Research

As technology continues to become more powerful, less expensive, and more portable, it becomes increasingly more acceptable and helpful in improving speech, language, new learning, reasoning, memory, and better accessibility. By creating opportunities as well as removing performance barriers, technology can help us explore new frontiers (Green, 2012, p. 5).

Certainly, setting aside one weekly seminar that focuses on AT was not enough time to investigate the large array of

AT devices, explore a variety of evaluation tools, and discuss in depth AT services. It was; however, enough time to help pre-service teachers (both general and special education) gain awareness and explore a variety of devices.

Results of the survey indicated that the participants demonstrated an increase in AT knowledge on the post-survey and revealed during discussion and subsequent seminars that they were using AT. However, it became apparent through these discussions that pre-service teachers did not know that what they were using (e.g., pencil grips, slant boards, cushions) was considered AT. During the discussion, PVC Talk Back Telephones and PVC pencil grips were distributed as rewards for those students who responded to questions and engaged in the discussion.

Currently, there is little research data to guide the amount, content, or type of infusion of AT instruction into special education programs, even though there are several AT on-line university programs (e.g., CSUN, RESNA). There is an obvious need to investigate and research further. Using focus groups and recording student stories as they related to classroom experiences using AT would help validate specifics as to how university students interacted and experienced AT with the students in their classrooms and professionals in their schools. Increasing the number of questions from six multiple choices and four open-ended would provide more in depth knowledge of student knowledge and experiences. A variety of focus groups and/or continued periodic surveys throughout the semester may help to document AT knowledge and skills in pre-service candidates. Requiring Action Research projects in the area of AT for all teacher candidates along with case study presentations during graduate orals (at the end of their program) will provide a clearer picture of the knowledge gained by the teacher candidates. In addition, the survey conducted by Bausch and Hasselbring (2004) may need to be replicated in order to more clearly identify the current state of AT training in higher education.

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