Status of Assistive Technology Instruction in University Personnel Preparation Programs

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Abstract: The reauthorization of IDEA mandates that students with a disability must be considered for assistive technology (AT). However, in order to implement the mandate, teachers and related service personnel must be knowledgeable about many aspects of AT. The purpose of this study was to gauge the extent to which personnel preparation programs believe they prepare their graduates to implement AT in their future roles. Participants from 231 institutions of higher education (IHEs) completed the survey. Results indicate that the majority of the respondents provided some AT instruction but had a *limited number* or *no* AT devices available to them. Participants also indicated the major barriers to including AT in their curriculum; however, of value are the suggestions for promising practices that could benefit other IHEs that are providing or wanting to provide AT coursework. Ideas for practice are categorized and include collaboration strategies, college initiatives, student assignments, and alternate instruction.

Keywords: Assistive technology, Higher education, Promising practices, Assistive technology coursework

Many students with disabilities need AT to receive a free and appropriate public education (FAPE). The Individuals with Disabilities Education Improvement Act (IDEA, 2004) states that an AT device is defined as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability [20 U.S.C.1401§602(1)]. IDEA also states that each Individualized Education Program (IEP) team must consider whether a child needs AT devices or services and that AT devices and services must be documented in a child's IEP as a part of special education, related services, and/or supplementary aids or services [§1414(d)(3)(B)(v)].

As a result of these federal legislation mandates, advancing technologies, and the competencies of the professionals in schools, students have mastered skills that they would have never been able to attain before the availability of AT. Researchers and teachers working in school settings have demonstrated the effectiveness of assistive and instructional technologies in teaching a wide variety of functional and academic core contents skills to students of different ages and ability levels across a wide variety of environments (Dell, Newton, & Petroff, 2011).

To take full advantage of the success that can be achieved by students using AT, it is crucial that professionals working in schools develop the technology competencies to implement the mandates of IDEA and adequately serve their students (Michaels & McDermott, 2003). For example, the Council for Exceptional Children (2009) has developed professional content standards for initial level special educators. Technology knowledge and skills are included in the standards under (a)

Standard 6: Communication (i.e., using assistive and augmentative communication strategies); (b) Standard 7: Instructional planning (i.e., planning and managing for technology, implementing instructional and AT, using technologies for students with exceptional learning needs); and (c) Standard 8: Assessment (i.e., using technology in conducting assessments). More advanced knowledge and skills are defined for advanced level special educators as well as special education technology specialists.

Elementary and secondary schools need to employ teachers who have mastered these technology standards and are trained in the appropriate selection, use, and implementation of AT devices to comply with federal, state, and local policies (Bausch & Hasselbring, 2004). If training is not provided at the preservice level, school districts will be responsible for providing professional development training or offering outreach classes for teachers and other staff. Training will most likely be required for teachers, school psychologists, administrators, occupational therapists (OTs), physical therapists (PTs), and speech/language pathologists (SLPs) because they may be responsible for administrating the policies or implementing the use of AT as described in IEPs. For example, district and school administrators need to know how to establish AT policies or guidelines, supervise the implementation of those policies, and evaluate their respective program. OTs, PTs, and SLPs need to work closely with general education and special education teachers to assure proper implementation of specific AT devices, monitor AT use, and evaluate AT effectiveness.

Training for direct service professionals in these AT competencies falls to undergraduate programs, and, at the advanced level, to graduate programs. The importance and need to integrate technology competencies into teacher preparation curricula has been noted for many years (Edyburn & Gardner, 1999; Lahm & Nickels, 1999; Parette, Peterson-Karlan, Smith, Gray, & Silver-Pacuilla, 2006; Parette, Peterson-Karlan, & Wojcik, 2005); however, teacher candidates graduating with inadequate technology knowledge and skills continues to be an area of concern (Anderson & Petch-Hogan, 2001; Parette et al., 2006; Van Laarhoven & Conderman, 2011). To illustrate, Lee and Vega (2005) surveyed 154 special education personnel from a rural county in California, 91% of whom were teachers. When asked about the adequacy of the AT training they received in their teacher preparation programs, only a fourth of the respondents indicated that their pre-service AT training had been adequate. In addition, Bell, Cihak, and Judge (2010) surveyed 123 special education teachers enrolled in an alternative certification program and found that gaining skills in AT was particularly difficult for this population of students. They indicated there was a positive correlation between the teachers' knowledge and use of AT and their confidence with AT, emphasizing the importance of providing AT experiences and instruction to special educators.

The inadequacy of AT training also has been noted by researchers and IHEs themselves. For example, Judge and Simms (2009) analyzed the documents from special education teacher preparation programs in the U.S. They studied a stratified sample of 162 special education preparation programs from urban, suburban, and rural areas. They found that AT coursework was required in only about 33% of undergraduate special education licensure programs, 28% of initial post baccalaureate licensure programs, and 25% of master's degree programs. They also found that AT coursework was required more frequently in programs for teachers of students with moderate to severe disabilities when compared to other special education

certification programs. Michaels and McDermott (2003) surveyed 143 graduate special education program coordinators about the current state of AT practice in their institutions and what they would consider to be ideal. A statistically significant mismatch was found between the current state of practice and perceived ideal practices in the graduate program. Qualitatively, respondents indicated barriers to achieving ideal practice were a lack of (a) time and funding, (b) faculty knowledge and consistent AT focus, and (c) understanding of the need for AT for students with high incidence disabilities.

Despite reported inadequacies in teacher preparation programs, data indicate that training can make important changes in teachers' knowledge, skills, and dispositions. Lee and Vega (2005) found that the majority (71.9%) of special education personnel who had 40 hours of AT training indicated that AT was an important part of the daily routine of their students, while the majority (73.9%) of the respondents who had not had AT training indicated that AT was not an important part of this daily routine. In addition, Anderson and Petch-Hogan (2001) found that following participation in a technology-rich field placement experience, pre-service teachers reported they had improved skills in their use of AT, their knowledge of computers, their ability to evaluate software, their ability to facilitate instruction using technology, and their ability to develop a technology plan. Finally, Bell et al. (2010) noted that alternative certification teachers who had taken a previous AT course scored significantly higher on a Knowledge and Applied Use Scale than teachers who had not taken a course.

Given that IHEs are in a prime position to influence the AT training of personnel who will work directly to make important changes for students, it is crucial to understand how they are delivering AT instruction. The purpose of this study was to gauge the extent to which pre-service personnel preparation programs and graduate programs believe they prepare their graduates to implement AT in their future roles. The findings will be useful in planning AT offerings in pre-service teacher training programs and providing a rationale for providing training for the teachers and other staff already working in schools who have not been trained to implement the principles of AT.

Research Questions

The following general research questions were formulated to determine the status of AT instruction in pre-service and graduate personnel preparation programs in IHEs. More specific questions were addressed for the various types of personnel who are being prepared at IHEs.

1. To what extent are IHEs providing instruction to develop AT knowledge and skills among students who are preparing for careers in schools?
2. In what specific topic areas are AT instruction being provided in IHE curricula?
3. What are the barriers to implementation of instruction about AT in IHEs?
4. What promising practices are being implemented by personnel at IHEs to prepare school personnel to participate in AT activities in schools?

Method

Background

Survey research was conducted to determine the status of instruction about AT in programs preparing personnel to work in schools as part of the data collection process for the National Assistive Technology Research Institute (NATRI). This Institute was formed through a cooperative agreement

with the Office of Special Education Programs (OSEP) to study the use of AT to improve the provision of a FAPE for children with disabilities. The project was conducted by the University of Kentucky in collaboration with several local, state, and regional education agencies, IHEs, and related national institutes and agencies that address AT topics. There were two main goals of the research institute: to examine factors related to the planning, development, implementation, and evaluation of AT services in schools; and to disseminate the findings of the research in ways that will assist school personnel to develop or improve AT policies and practices for students with disabilities. In order to accomplish the goals, seven research areas were defined for the project. They were to (a) investigate the status of AT use in schools and the role it provides in education; (b) examine the policies & procedures in the development and delivery of AT services; (c) study AT decision-making by IEP teams; (d) examine how AT is integrated in learning environments to facilitate instruction and access the curriculum; (e) investigate the effects of AT use on academic, social, functional performance of students; (f) identify the training and technical support needed by persons implementing AT; and (g) examine the extent to which IHEs are developing AT knowledge and skills (Lahm, Bausch, Hasselbring, & Blackhurst, 2001). The data for this paper were extrapolated from the research on IHEs.

Participants

Surveys were sent to the chairpersons of all special education (SPED), occupational therapy (OT), physical therapy (PT), and speech language pathology (SLP) departments at IHEs in the U.S. The list of names and contact information was purchased from MKTG Services in Wilmington, MA, the same service used by the Council for Exceptional Children. MKTG Services provided a list of SPED and SLP department chairs. A list of department chairs for OT and PT were not available, so two additional lists containing all faculty members in OT and PT at IHEs in the U.S. also were purchased from MKTG. Because a specific individual was not included, a search for the name of each department chair was conducted online by locating the name of the IHE provided on the MKTG Services list and identifying the name of the department chair listed on the official website of each IHE.

A total of 561 IHEs offering courses in special education were identified in the purchased list. However, when 84 duplicates, U.S. territories, and obvious errors (e.g., math department) were eliminated, 477 surveys were mailed to education programs. Those receiving the survey included department chairs from departments titled special education, special populations, and exceptional populations. At the risk of over-identification, departments with the generic title of *Department of Education* were also sent surveys. These departments were not omitted from participation in the study since conceivably all education courses, including special education, could be included in one department. Recipients of the survey were instructed to return the survey unanswered if their department did not offer one of the four targeted programs (i.e., SPED, OT, PT, or SLP).

MKTG Services also provided a list of 279 speech language and related departments (e.g., audiology, communication disorders, speech and hearing). Addresses of 31 institutions were eliminated, again because of noted errors (e.g., agriculture communication). However, Departments of Allied Health were included, once again at the risk of over-identification. A total of 248 surveys were mailed to department chairs of Allied Health and Communication Disorders.

Additionally, 336 department chairs of PT and 281 chairs of OT were identified from the separately purchased lists. The total number of surveys sent was 1,342.

Instrument

The questionnaire used in the national survey contained items designed to obtain descriptive data about the status of AT instruction at the IHE, how it was integrated into the curriculum, barriers that might exist for implementation of AT, and promising practices that may have implications for other IHE personnel. The authors developed a print-based questionnaire comprised of 13 multi-component questions. Survey items related to AT coursework and AT topics were developed based on the Quality Indicators of Assistive Technology (Zabala & Carl, 2005), a validated guide for providing quality AT services to students with disabilities. In addition to the authors, four AT faculty members at other institutes of higher education reviewed the survey for clarity. Following discussions with the reviewers, the authors made edits and revisions to the survey. The questionnaire contained a variety of items, including rating scales, checklists, discrete response objective items, and open-ended responses for both pre-service and graduate programs. Graded response and short answer questions sampled opinions in the following 13 topic areas: demographic information; degrees offered; current status of instruction; demonstration of competencies; availability of AT devices; availability of instructional materials; required and elective courses offered; specialization in AT; delivery formats (e.g., face-to-face, distance learning); delivery methods (e.g., lectures, demonstrations, hands-on); topics addressed; functional areas addressed; possible barriers to delivering instruction; and promising practices.

For the purpose of this paper, information from seven topic areas were examined: (a) current status of instruction, (b) demonstration of competencies, (c) availability of devices, (d) availability of instructional materials (e) specific topic areas addressed in courses, (f) barriers to offering AT instruction at the institution, and (g) promising practices in the program. The complete questionnaire is available from the first author upon request.

Procedures

All of the surveys were mailed to the institutions via the U.S. Postal Service. Each envelope contained one copy of the survey instrument and a self-addressed, postage paid envelope for the return of the questionnaire. Two weeks following the mailing of the surveys, a postcard was mailed to the individual at each institution thanking those who had completed the survey and reminding those who had not completed it to do so (Dillman, 2007). Participants also were given the opportunity to request another copy of the instrument if they had not received the questionnaire or had misplaced the original.

Data Analysis

The data were analyzed using both quantitative and qualitative methods. The quantitative data from the forced choice items were entered into the SPSS statistical software package and analyzed using descriptive statistics (i.e., frequencies, percentages). These data contributed to answering Research Questions 1-3.

The qualitative data contributed to answering Research Question 4 in which respondents wrote in promising practices. Themes were developed that emerged from the data and provided insight into practices being used in IHEs to overcome barriers to providing instruction in AT. These data were important

to gather to provide more detail about what the objective data did not show, to explore additional explanations of the data, and to provide information to others who may want to replicate the practices described by the respondents (Glesne, 2006).

The qualitative analysis was an iterative process that occurred over time (Glesne, 2006). First, the first author read through all open responses in which the respondents wrote in a promising practice they thought was unique in their program. The author used open coding, categorized like responses, and developed themes (Dey, 2004; Strauss & Corbin, 1998). After the initial coding session, the author identified 16 categories. The author read the responses again and collapsed the 16 categories into more broad categories using a constant comparative method (Lincoln & Guba, 1985). This resulted in a reorganization of the codes that resulted in four broad themes. The second author then used these broad themes and independently read all the open-responses determining if the identified themes adequately captured all of the responses (Miles & Huberman, 1994). The first and second authors met to reach a consensus on any disagreements of the final themes and agreed the four themes adequately captured the reported data. They included (a) collaboration, (b) college initiatives, (c) student assignments, and (d) alternate instruction.

Results

Surveys were returned from 15 institutions as undeliverable and 26 were returned as not having one of the four programs (i.e., SPED, OT, PT, or SLP). A total of 231 surveys out of the 1301 valid surveys were returned for a return rate of 17.5%. Of the returned surveys, 30% (n = 69) were from SPED departments, 23% (n = 53) were from SLP departments, 23% (n = 52) from OT departments, 18% (n = 42) from PT departments, and 6% (n = 15) identified their department as *other* including generic classifications such as *allied health* and *education*.

Of those returning the survey, 70% (n = 161) were from public institutions, 29% (n = 67) from private colleges or universities, and 1% (n = 3) did not respond to the question. Additionally, 10% (n = 23) offered an associate's degrees, 52% (n = 121) offered a bachelor's degree, 70% (n = 161) offered a master's degree, 10% (n = 24) a specialist's degree, and 30% (n = 69) offered a doctoral degree in their field. The size of the institutions varied from fewer than 2,000 students to greater than 30,000 students (see Table 1).

Table 1
Enrollment Size of Institutions of Higher Education (n = 231)

Students	Institutions	
N	*n*	%
Less than 2,000	16	6.9
2,001 - 5,000	42	18.2
5,001 - 10,000	38	16.5
10,000 – 20,000	52	22.5
20,001 - 30,000	38	16.5
Greater than 30,000	15	6.5
No Response	30	13.0

Table 2
Graduate (*n* = 188) and Undergraduate (*n* = 136) AT Offerings at Institutions of Higher Education

Status of AT Instruction	Undergraduate		Graduate	
	n	%	*n*	%
No need to provide	2	1	2	1
Not providing with no plans to provide	10	7	1	1
Not providing but plans to provide	1	1	1	1
Not providing/ provided in other departments	6	4	3	2
Some instruction	89	65	104	55
Strong AT provisions	28	21	77	41

Current Status of Instruction in AT

In order to answer the first research question, "To what extent are IHEs providing instruction to develop AT knowledge and skills among students who are preparing for careers in schools?" data from four of the survey questions were analyzed including current program status, demonstration of competencies, availability of devices, and availability of instructional materials. One hundred thirty six responses were received at the undergraduate level and 188 responses were received for graduate programs. The majority of the respondents, 65% (*n* = 89) at the undergraduate level and 55% (*n* = 104) at the graduate level, indicated that they were providing *some* instruction in AT while 21% (*n* = 28) at the undergraduate level and 41% (*n* = 77) at the graduate level reported *strong* offerings in AT (see Table 2). When asked whether students had to demonstrate competencies, 142 responses were recorded for undergraduate programs and 192 were received for graduate programs. Of those responses, 47% (*n* = 66) of undergraduate programs and 25% (*n* = 47) of the graduate programs reported that students were not required to demonstrate competencies or were required to demonstrate a *few* competencies in AT. The undergraduate programs reported that students demonstrated AT competencies *some* of the time 42% (*n* = 59) while the graduate programs reported 54% (*n* = 104). Only 12% (*n* = 17) of undergraduate programs and 21% (*n* = 41) of graduate programs reported that students were required to demonstrate AT competencies to *a great extent*.

When asked about the availability of AT devices, 137 undergraduate programs and 191 graduate programs provided information. Over half (58%; *n* = 80) of undergraduate programs and about half (49%; *n* = 93) of graduate programs have access to *no* or a *limited number* of AT devices during their program while only 9% (*n* = 13) of programs at the undergraduate level and 12% (*n* = 22) at the graduate level have access to an *optimum* number of AT devices. Undergraduate and graduate programs reported an *adequate* number of devices 32% (*n* = 44) and 40% (*n* = 76) respectively.

Similarly, when asked about the availability of instructional materials related to AT, 140 graduate programs and 189 graduate programs responded. Of the programs, 52% (n = 72) of undergraduate and 40% (n = 75) of graduate reported *no* or *limited access* to instructional materials related to AT while only 7% (n = 10) of the undergraduate programs and 11% (n = 20) of the graduate programs indicated an optimum number of instructional materials. An *adequate* number of AT materials were reported 41% (n = 58) by undergraduate programs and 50% (n = 94) by graduate programs.

Topic Areas of Instruction at IHEs

When asked, "In what specific topic areas are you providing AT instruction?" respondents were asked to identify whether or not 20 different topics were addressed in their programs. The five most frequently topics addressed by all of the programs (including at the undergraduate level only, at the graduate level only, or at both the undergraduate and graduate levels) at an IHE were general awareness of AT devices (94%; n = 217), selecting AT devices (79%; n = 180), including AT in the IEP (76%; n = 175), teaching students how to use AT devices (76%; n = 175), and locating information about AT (72%; n = 167; see Table 3).

The most frequently addressed topics at the undergraduate level (including programs that reported the topic addressed at either the undergraduate level only or both the undergraduate and graduate levels) were general awareness of AT devices (52%; n = 121), including AT in the IEP (34%; n = 79), locating information about AT (34%; n = 78), teaching how to use AT devices (32%; n = 74), selecting AT devices (30%; n = 70), and making low tech devices (30%; n = 70).

The most frequently addressed topics at the graduate level (including programs that reported the topic addressed at either the graduate level only or both the undergraduate and graduate levels) were similar to the undergraduate most frequently addressed topics: general awareness of AT (75%; n = 173), selecting AT devices (67%; n = 155), AT in the IEP (65%; n = 149), and teaching how to use AT devices (62%; n = 142). Additionally, approximately 27% (n = 63; undergraduate) and 49% (n = 113; graduate) are instructing students in applying universal design for learning (UDL) principles to instruction; 25% (n = 59; undergraduate) and 55% (n = 128; graduate) of IHEs are training students in understanding AT legislation; and 22% (n = 50; undergraduate) and 49% (n = 114; graduate) are training students in selecting and using AT software.

Of note are the AT topics that were least often reported as being addressed in either the undergraduate or graduate programs at the IHEs. Nine of the topics were reported as not addressed by 50% or more of the respondents. The topics most frequently reported as not addressed by the responding IHEs were, evaluating district of school implementation of AT (81%; n = 187), coordinating AT services (66%; n = 152), using AT to provide appropriate accommodations, (61%; n = 141), evaluating AT service delivery (60%; n = 139), training service providers and parents to use AT devices (57%; n = 131), selecting and using instructional software (57%; n = 131), monitoring student performance (55%; n = 126), integrating AT into the curriculum (53%; n = 123), and funding AT (53%; n = 122).

Barriers to Offering AT Instruction

Study participants were asked, "What are the barriers to implementation of instruction about AT in IHEs?" and were asked to choose from nine possible choices and report other barriers they faced at their institution.

Table 3
Topic Areas Reported by Institutions of Higher Education (*n* = 231)

Topic Area	Not Addressed		Undergraduate Only		Graduate Only		Both U and G	
	n	%	*n*	%	*n*	%	*n*	%
General awareness of AT devices	14	6	44	19	96	42	77	33
Understanding AT legislation	86	37	17	7	86	37	42	18
Conducting AT assessments	86	37	17	7	98	42	30	13
Including AT in the IEP	56	24	26	11	96	42	53	23
Applying UDL principles to instruction	97	42	21	9	71	31	42	18
Selecting AT devices	51	21	25	11	110	48	45	19
Teaching how to use AT devices	56	24	33	14	101	44	41	18
Making low tech AT devices	86	37	28	12	75	32	42	18
Selecting and using tools/software to aid instruction	93	40	18	8	77	33	43	19
Training service providers/parents to use AT devices	131	57	8	3	79	34	13	6
Evaluating AT service delivery	139	60	7	3	68	29	17	7
Coordinating AT services	152	66	5	2	62	26	12	5
Locating information about AT	64	28	28	12	89	38	50	22
Using AT to provide accommodations	141	61	8	3	59	25	23	10
Integrating AT into the curriculum	123	53	12	5	58	25	38	16
Funding AT	122	53	9	4	78	33	22	10
Evaluating district or school implementation programs	187	81	1	0.4	37	16	6	3
Monitoring student performance	126	55	9	4	61	26	35	15
Selecting and using AT software	104	45	13	6	77	33	37	16
Selecting and using instructional software	131	57	7	3	58	25	35	15

Almost half (47%; *n* = 107) of respondents reported that lack of fiscal resources to purchase AT devices was a *significant* or *irresolvable* barrier (see Table 4). Similarly, lack of support staff (34%; *n* = 79), lack of lab and storage facilities (33%; *n* = 75), lack of faculty time to learn software and devices (31%; *n* = 72), and fear of the need to constantly update software and hardware (28%; *n* = 64) were reported as *significant* or *irresolvable* barriers.

Promising Practices

When asked, "What promising practices are being implemented by personnel at IHEs to prepare school personnel to participate in AT activities in schools?" approximately 44% (n = 101) of the respondents volunteered 114 promising practices used in their programs that they believed to be unique and useful for others to replicate. The authors categorized the responses into 4 categories: (a) collaboration, (b) college initiatives, (c) student assignments, and (d) alternate instruction using a constant comparative method (Lincoln & Guba, 1985).

Collaboration. The most often cited practice was that of collaboration. Collaboration activities took place with many partners including State Education Agencies, public schools, other departments within the university that offered coursework in a specific area of AT (e.g., seating in the physical therapy program, augmentative communication in the communication disorders program), other IHEs with a nearby campus, not-for-profit AT centers, local agencies providing services for individuals with disabilities, and transdisciplinary programs with related service (OT, PT, SLP) programs. The collaborators typically shared AT equipment and AT lab space.

College initiatives. Participants included examples of college-wide initiatives that increased opportunities for students to learn about AT. One university reported a college AT loan library run by faculty and students, another had the local AT center based on campus, another developed a model classroom showcasing technology for all learners, and one respondent reported having a traveling exhibit with presentations and equipment for use by faculty for demonstrations and use at professional meetings.

Student assignments. Respondents reported a variety of student assignments that allowed students to gain experiences in AT. Suggestions included fieldwork in schools and local agencies; AT assessment opportunities in school, home, and community environments; student-run AT fairs and expos; service learning projects with local AT centers or AT libraries; and exploration and evaluation of free AT software on the internet.

Alternate instruction. Respondents overwhelming reported ways to provide instruction about AT outside of their university setting. Field visits, distance-learning opportunities, courses at other IHEs, home visits, and off campus courses at local technology centers were some of the practices listed.

Discussion

AT coursework was being offered in all four disciplines surveyed (SPED, OT, PT, and SLP), at both public and private IHEs, and at both the undergraduate and graduate levels. IHEs apparently saw the need to offer coursework in AT as 86% (n = 117) of the undergraduate programs and 96% (n = 181) of the graduate programs included coursework about AT. However, even though institutions reported offering the AT courses, relatively few required students to demonstrate more than *some* AT competencies (12% undergraduate, n = 17; and 21% graduate programs, n = 41). Additionally, both undergraduate and graduate programs reported *no* or a *limited number* of AT devices for instructional purposes, 58% (n = 80) and 49% (n = 93) respectively, severely limiting the ability to provide comprehensive AT instruction and adequate hands-on instruction for their students.

These findings conflict with those reported by Judge and Simms (2009) in their document analysis of required AT coursework of special

education preparation programs, in which it was reported that only 25-33% of undergraduate and graduate special education programs in their sample required AT coursework. The data in this study indicate much higher percentages of AT coursework being offered in programs. The discrepancy may be attributable to several factors. First, this study was a self-reporting survey while the Judge and Simms study was a document analysis. Second, this study surveyed OT, PT, SLP, and SPED programs while the Judge and Simms study only analyzed special education preparation programs. And third, this study asked respondents to report AT coursework *offered* in their programs, while the Judge and Simms study analyzed required AT coursework. However, the data from these studies are similar in that both indicate that teachers are leaving special education preparation programs without adequate preparation in AT.

More instruction occurred in graduate programs than in undergraduate programs, but overall there were relatively low percentages of inclusion of many of the topics in both the undergraduate and graduate programs. While 52% (n = 121) of undergraduate programs and 75% (n = 173) of graduate programs were offering information about general awareness of AT, few included information about integrating AT into the curriculum, monitoring and evaluating student performance, service delivery, or evaluating school AT implementation programs. Proficiency in each of these topics is vital for school personnel to implement high quality assistive technology services, and AT instruction at the higher education level must go beyond general awareness. Other studies (Abner & Lahm, 1998; Bausch, Ault, Evmenova, & Behrmann, 2007; Hutinger & Johanson, 2000) have reported similar findings in that service providers were not prepared to address these same topics.

It is concerning that only 65% (n = 89) of undergraduate programs had some AT instruction and only 21% (n = 28) had strong provisions. This could indicate that many people who are hired upon graduation are entering schools without the skills and knowledge to produce positive outcomes for students using technology. AT training must include a full range of instruction in AT competencies to prepare school personnel to provide high quality AT services from the consideration process through implementation (Bausch, Ault, & Hasselbring, 2006).

A number of barriers were reported that affected IHEs delivery of AT content including faculty and administrator attitudes; a fear of need for continuous upgrade of technology; and a lack of faculty knowledge, room in the curriculum, fiscal resources, facilities, time to learn new technology, and tech support. These findings support those in the Michaels and McDermott (2003) survey that also found that graduate special education program coordinators reported lack of time, funding, and faculty knowledge as barriers to ideal AT practice.

Limitations

There were several limitations to the study. First, a relatively low return rate was obtained. It may have been that distributing paper versions to be returned by mail contributed to this, whereas availability of an online version may have increased the response rate. Second, there was an over identification of IHEs offering the programs. Although a decision was made to attempt to garner information from all of the programs with generic departments, it is suspected that many did not offer the programs and the survey may have been ignored. This could have been another factor leading to the low return rate. Third, as with any self-report study, the accuracy of the information cannot be verified without

follow-up with each program. Due to the lack of resources and time, this was not done for this study. Fourth, although all programs surveyed for this study prepared professionals that could potentially be providing services in school systems, OT, PT, and SLP programs have a wider focus and different purpose than SPED programs in that they also prepare individuals to work in medical professions and communities. Because individuals being prepared as OTs, PTs, and SLPs have different training needs, the requirements for demonstrations of competencies for some of these programs may be expected to be different from those of a SPED program, and could have impacted the findings. Future research should evaluate the different AT competencies required based on the specific disciplines and the environments in which they are being prepared to work.

Outcomes and Benefits

Current laws mandate that school districts provide AT devices and services for students with disabilities. Since it is the responsibility of local education agencies to implement state and federal laws and to follow state and local AT policies, districts must have personnel who are knowledgeable about AT. When students receive training in AT at the undergraduate and graduate levels, universities will produce special educators and related service providers who are knowledgeable about AT and can serve as qualified members of the IEP team. When comprehensive training occurs, the ultimate benefit will be for students with disabilities who need AT in order to receive a FAPE.

Current data suggest that many university special education programs are not meeting the need for training in AT. Respondents at training programs indicated they face barriers to including AT instruction in the curriculum such as a lack of fiscal resources, trained personnel, facilities, time, and equipment. However, there were IHEs that were providing extensive training in AT and many have established creative ways to deliver this instruction. A major outcome of this study is the list of some of the ways used by the participants to overcome these barriers. Colleges and universities can benefit from the ideas of others when planning or revising coursework in AT at their institutions. The following section presents benefits for both the IHEs and the students enrolled in their personnel preparation programs.

AT center and university collaborations. Whether on or off campus, this type of collaboration provides opportunities for students to participate in providing services for individuals of all ages and disability areas, opportunities for external grant funding, and integration of AT in the practitioners' professional curriculum.

College and P-12 school partnerships. Such collaborations can offer field placements for students. They also offer realistic and meaningful classroom experiences for students.

Transdisciplinary programs. Resources at IHEs are often limited. By having a transdisciplinary program that may include OT, PT, SLP programs, and the medical campus, faculty can combine resources and provide students with a team approach to providing AT to students with disabilities.

Hands-on experience. A key factor in training personnel in becoming knowledgeable about and skilled in using AT is to have ample opportunities for hands-on experiences. When resources are limited, faculty can incorporate fieldwork into the curriculum to assist students in obtaining these experiences.

Technology. When hands-on experiences are not possible for every situation, technology applications can augment hands-on

experiences and provide advantages to both instructors (e.g., distance learning delivery formats, web-based instruction, student observations, and online resources,) and students (e.g., distance classroom observations, video recording students to monitor progress toward objectives, free AT applications).

Qualified personnel. Respondents overwhelmingly reported the importance of having qualified personnel. IHEs can take advantage of regional experts, vendors, school district employees, AT users, and parents of individuals who use AT for guest lectures, interviews, and part-time instructors. In this way, university faculty can expand the scope and depth of their knowledge about AT.

Systematic program planning. The inclusion of AT coursework into the higher education curriculum requires systematic planning. AT coursework needs to go beyond general awareness so that future teachers are knowledgeable and skilled in selecting, using, and implementing AT devices across environments in order for students to meet IEP goals.

Integration of AT into courses. If there is no room in students' academic programs for stand-alone AT courses, AT can be embedded into existing courses in the curriculum. However, an integration model requires the collaboration and commitment of the entire faculty to implement AT topics as planned.

Training for general education teachers. Students often need AT in general education classrooms. Thus, AT instruction should be extended beyond special education and related services to include all teachers.

Conclusion

A commitment by IHEs to increase and improve AT instruction for the school personnel they prepare, can only improve the outcomes for students in schools with whom their graduates interact. The results of this investigation and suggestions of promising practices may help IHEs identify areas of need in their programs and work toward providing quality AT instruction.

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