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A PRELIMINARY STUDY: DO ALTERNATIVE CERTIFICATION ROUTE PROGRAMS DEVELOP THE NECESSARY SKILLS AND KNOWLEDGE IN ASSISTIVE TECHNOLOGY?

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A large number of special education teachers in the United States are prepared in alternative certification programs and insufficient empirical information exists regarding their knowledge of assistive technology. The purpose of this study was to conduct a preliminary investigation of alternatively licensed special education teachers' knowledge, experience, and confidence with assistive technology. One-hundred twenty-three special education teachers who were enrolled in an alternative license program were surveyed. The data indicated a significant positive relation between teachers' knowledge/usage and their confidence with assistive technology ($r = .74$; $p < .01$). In addition, the extent to which the teachers' perceived barriers to integrating assistive technology in the classroom were moderated by their level of confidence. The results are presented in the context of building special education teachers' knowledge and skills as well as affective issues regarding assistive technology

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The shortage of special education teachers is a national epidemic and affects all regions of the United States. Ninety-eight percent of school districts nationwide have shortages and the situation will continue as teacher retirement increases (Boyer & Gillespie, 2000). Due to increased retirements coupled with an inadequate supply of college students entering the teaching profession, the teacher shortage is expected to worsen, especially in special education. According to Sach in 1999, of the approximately 300,000 positions, noncertified teachers filled more than ten percent. Moreover, an additional 6,000 positions remained vacant due to lack of personnel availability. More recently, the national teacher shortage of fully certified teachers in special education has increased to over 12% (Boe & Cook, 2006; Rosenberg, Boyer, Sindelar, & Misra, 2007). The shortage of qualified teachers is persistent throughout special education and is not limited to teachers serving students with any particular disability.

As a result of the teacher shortage, the U.S. Department of Education through the No Child Left Behind Act of 2001 (NCLB; P.L. 107-110) encouraged the development of alternative routes to teacher certification. Since passage of NCLB, 43 states and the District of Columbia have authorized alternative route training in special education (Feistritzer, Haar, Hobar, & Losselyong, 2005). At the most basic level, alternative routes to teacher certification programs provide access to teaching credentials through a process that circumvents traditional preservice preparation (Hawley, 1992). Alternative routes expedite the entry of well-educated individuals into public schools by hiring them as teachers straightaway and using experienced teachers to mentor them during their first year or two on the job. However, defining critical features of alternative routes to certification programs is difficult since programs are instituted by states, institutions of higher education, and local education agencies. A range of alternative teacher certification programs exists ranging from abbreviated to longer programs typical of traditional preparation.

The learning and application of special education knowledge and skills is an ongoing process for all educators; one critical component is the use of assistive technology (AT). Since some states and some training programs are abbreviated, it may be particularly difficult for alternatively certified special education teachers to gain competence in the rapidly developing field of AT. The 1997 Amendments to

the Individuals with Disabilities Education Act (IDEA) require Individual Education Plan (IEP) and Individualized Family Service Plan (IFSP) teams to consider AT devices and services for increasing access to learning opportunities within home, school, and community settings (Individuals with Disabilities Education Act, Amendments of 1997, 2004). This *consideration requirement*, determining whether an AT device or service is required, must be made on an individual basis as part of the IEP or IFSP process (Edyburn, 2002; Huefner, 2000). More recently, amendments to IDEA in P.L. 108-446 (Individuals with Disabilities Education Improvement Act [IDEA], 2004) continue the requirement that educational teams consider whether the child needs AT devices and services.

AT 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 functional capabilities of a child with a disability* (IDEA, 2004, p. 118, Section 601). Although proponents have asserted for a number of years that certain technology applications can unlock access to general education curriculum content and help to increase student achievement, the full potential of technology remains unfulfilled within special education. Among the reasons cited include (a) a lack of teacher familiarity with instructional technology and AT, (b) insufficient knowledge about integrating technology within general curriculum content, and (c) limited preservice and inservice professional development (Edyburn, 2000; Lahm, 2003).

A lack of special education teacher preparation programs that address AT competencies perpetuates the state of AT implementation today. This lack of training and support services were reported as major barriers of integrating AT in classroom settings (Behrmann, 1995; Lesar, 1998). Lee and Vega (2005) reported that only 25% of special educators agreed that they had adequate AT training from their teacher preparation programs. Additionally, Bauder (1999) found that 82% of special education teachers surveyed reported AT should be a required area of study. Teacher familiarity, confidence, and skill in choosing AT and integrating technology into the curriculum are dependent upon teacher training and time for self-directed exploration and learning.

Large numbers of special education trainees are being prepared currently in alternative certification routes; however, insufficient empirical information exists on the alternatively prepared special educators' knowledge, usage, and confidence in using AT. A literature search of the ERIC database yielded no research studies addressing AT and alternatively prepared special educators. With that in mind, a series of studies regarding the development of necessary AT skills and knowledge and alternatively certificated teachers is needed. The purpose of this study was to conduct a preliminary investigation by assessing the knowledge, confidence, and experience with AT of preservice special education teachers who are currently enrolled in two university-affiliated alternative certification programs. Specific research questions that guided this study were (a) what are the relations between perceptions of barriers to usage of AT, knowledge and usage of AT, and confidence in use of AT for alternatively licensed special educators? and (b) are there differences in alternatively licensed special educators' perceptions of barriers to usage of AT, knowledge and usage of AT, and confidence in usage of AT based on participating in a college course on AT?

Method

Participants

Participants were 123 students enrolled in alternative licensure programs at two publicly-funded universities located in two states in the southeastern part of the United States. All of the students were alternative licensure teachers or paraprofessionals who were working on initial licensure or endorsement in special education. Of the respondents, 101 were female (82.1%) and 22 (17.9%) were male. Their ages ranged from 24 to 59 years, with a mean of 37.63 years (*SD* = 9.69). On average, respondents had been working in the field of special education for 3.71 years (*SD* = 3.43, range= .5 – 22 years; one of the respondents was a teacher assistant for a considerable number of years prior to seeking an alternative license). On average, participants were employed in their present special education positions for 2.04 years (*SD* = 1.06, range = .5 – 6 years). One-hundred-six students (86%) were seeking certification for mild disabilities, 14 (11.4%) for early childhood special education, and 3 (2.4%) for severe disabilities. Only 20 (16.26%) of the respondents indicated that they had completed a specific university course devoted to AT. However, 71 (57.72%) of the respondents indicated that they were currently using AT devices with their students. The number of respondents located in a rural setting was 40 (33.1%), small town/city was 43 (35.5%), and large town/city was 38 (31.4%).

Procedure
The identification of participants was accomplished by obtaining the names, addresses, and email addresses of 350 students who were enrolled in an alternative special education licensure program provided by the program directors at the two universities. All 350 students were mailed a packet that included a cover letter explaining the purpose of the study; the questionnaire; and a stamped, self-addressed envelope in which to return the questionnaire. Follow-up emails were sent to those not responding after three weeks. Returned surveys were entered into a drawing for three gift certificates of $20 to encourage a timely response. Of the 350 questionnaires that were mailed, 142 were returned, representing a 40.57% conditional response rate. Nineteen of the questionnaires were unusable; that is, they were returned undelivered or the respondent did not work with students with disabilities.

Instrumentation
A 43-item questionnaire focusing on AT preparation, barriers to usage, knowledge and usage, and confidence was designed for data collection. An initial draft of the questionnaire was reviewed by several professionals who are knowledgeable about AT, survey development, and/or special education teacher preparation. The questionnaire was redrafted using their feedback. To verify instrument and survey procedures, the questionnaire was also pilot-tested with 20 special education teachers enrolled in a graduate class. Feedback from pilot-test respondents resulted in minor revisions in organization and format.

The survey consisted of four major sections. In section 1, respondents provided descriptive background and demographic information including age, gender, type of certification sought, completion of a university or college AT course, and other information related to type and location of program. In section 2, respondents were asked to rate a list of ten barriers to AT usage (Alper & Raharinirina, 2006; Edyburn, Higgins, & Boone, 2005; Lesar, 1998; Wehmeyer, 1999). Respondents were asked to rate the extent to which the 10 barriers exist in their current situation on a 4-point Likert scale ranging from 1 (*strongly disagree)* to 4 (*strongly agree*). Internal consistency reliability for the barriers section as determined by coefficient alpha was .84.

In section 3, respondents were asked to rate their knowledge and use of AT on 16 items across a 5-point Likert-type scale ranging from 1 (*no knowledge or experience)* to 5 (*knowledgeable and experienced in using this with students and could help others use it*.) The higher the score indicated greater knowledge and use of AT. The 16 items addressing the participants' knowledge and usage were developed based on the professional technology competencies of the Council of Exceptional Children (CEC, 2003). Internal consistency reliability for the section on knowledge and experience of AT as determined by coefficient alpha was .95.

In section 4, respondents were asked to rate their level of AT confidence on 16-items across a 6-point Likert-type scale ranging from 1 (*strongly disagree)* to 6 (*strongly agree)* with higher scores indicating greater confidence. The 16-item questionnaire was adapted from the Assistive Technology Confidence Scale (Moore & Wilcox, 2006). The original 24-item version consisted of statements designed to measure practitioners' confidence in (a) AT intervention, (b) AT assessment, and (c) accessing AT resources and information. In addition, factor analysis (Moore & Wilcox) of the 24-items yielded 3 subscales, accounting for 70.6% of the variance. Therefore, only the 16-items that focus on AT service delivery was used. This short-form version was used for a matter of convenience and in the interest of time. Mean scores for the entire measure and the three factors were calculated by averaging all the items, with higher scores reflecting a higher degree of confidence in AT service delivery. Internal consistency reliability for the confidence scale items, as determined by coefficient alpha, was .95.

Results
Barriers to AT
Table 1 displays the barriers items and their means and standard deviations. The three most significant barriers to AT were lack of time, lack of knowledge, and funding. Eighty-five percent of respondents reported lack of knowledge to select appropriate AT for students as a barrier. In addition, time to learn how to use AT (80%) and time to teach a student how to use AT (79%) were reported as barriers in AT use. The third highest rated barrier was funds to purchase AT (81%).

Knowledge and Usage of AT
The 16 items from section 3 of the survey assessing the knowledge and usage of AT were clustered under the following CEC professional standard headings: (a) foundation knowledge, which includes

Table 1
Means and Standard Deviations for Items Assessing Barriers To Assistive Technology for Total Participants (n = 123) and for Participants who Had (n = 20) and Had Not (n = 103) Previously Enrolled in a University Assistive Technology (AT) Course

Barriers Scale and Items	Total Participants		Previous AT Course		No Previous AT Course	
	M	*SD*	*M*	*SD*	*M*	*SD*
Barriers Scale Score	*29.42*	*4.76*	*29.53*	*6.35*	*29.40*	*4.49*
1. Funds to purchase assistive technology	3.08	.79	3.05	.89	3.08	.78
2. Infusion of assistive technology in special education coursework	2.79	.71	2.83	.86	2.78	.68
3. Opportunities to use assistive technology during student teaching and field experiences	2.81	.79	2.84	.90	2.81	.76
4. Knowledge of available assistive technology options	3.06	.69	3.11	.74	3.03	.68
5. Knowledge to select appropriate assistive technology for students	3.08	.64	3.00	.73	3.08	.62
6. Time to learn how to use a particular device or system	3.09	.74	3.15	.67	3.10	.75
7. Time to teach a student how to use assistive technology	3.11	.75	3.17	.62	3.09	.79
8. Implementation of assistive technology in the curriculum	2.95	.75	2.84	.83	2.90	.75
9. Limited administrative support	2.67	.78	2.75	.97	2.67	.75
10. Lack of assistive technology technical support	2.77	.76	2.84	.83	2.75	.78

AT awareness, legal mandates, and funding; (b) instructional strategies and learning environment, which includes operation and application of AT devices; (c) assessment, knowing when and how to use AT for assessment; and (d) collaborative partnerships, which includes collaboration activities and

Table 2
Means and Standard Deviations for Items Assessing Knowledge and Usage of Assistive Technology for Total Participants(n = 123) and for Participants who Had(n= 20) and Had Not(n = 103) Previously Enrolled in a University Assistive Technology (AT) Course

Knowledge and Usage Scale and Items	Total Participants		Previous AT Course		No Previous AT Course	
	M	*SD*	*M*	*SD*	*M*	*SD*
Knowledge and Usage Scale Score	*38.48*	*12.98*	*46.00*	*10.72*	*37.11*	*12.93*
I Can:						
1. Describe a variety of assistive technology devices and their potential uses with students with disabilities	2.85	1.07	3.25	.85	2.80	1.09
2. Describe the impact of assistive technology legislation and policy on service delivery.	1.99	.92	2.50	.83	1.93	.92
3. Describe the potential uses and benefits of assistive technology.	2.94	1.00	3.25	.97	2.90	1.01
4. Describe strategies for determining assistive technology funding potential.	1.74	.91	2.16	1.12	1.66	.86
5. Use a variety of assistive technology hardware devices and software applications to support students' individual needs.	2.65	1.08	3.10	.97	2.55	1.11
6. Use assistive technology to increase access to the general education curriculum for all students.	2.62	1.06	2.95	.83	2.56	1.09
7. Identify elements of the curriculum for which technology applications are appropriate and ways they can be implemented.	2.62	1.09	2.70	.92	2.63	1.13
8. Use assistive technology to promote access within school, community and leisure environments.	2.53	1.11	2.90	.91	2.50	1.13
9. Consider assistive technology as part of the IEP process requirements.	3.21	1.09	3.75	.97	3.14	1.07
10. Match characteristics of individuals with disabilities with technology product or software features.	2.59	1.05	3.37	.96	2.50	1.03

11. Monitor outcomes of technology-based interventions and reevaluate and adjust the system as needed.	2.36	1.10	3.15	.99	2.26	1.08
12. Serve as a member of a multidisciplinary team conducting assistive technology assessments.	1.71	.97	2.40	.94	1.60	.94
13. Collaborate with other members of a team to determine assistive technology needs and implement assistive technology supports.	2.35	1.18	3.00	1.00	2.25	1.18
14. Implement assistive technology interventions using a process of assessment, self-reflection, and impact evaluation.	2.21	1.05	2.90	.79	2.11	1.07
15. Serve as a resource for assistive technology information, consultation, and technical assistance to colleagues and families.	1.99	1.13	2.75	.97	1.91	1.11
16. Facilitate the selection of assistive technology solutions based on student/family needs and preferences.	2.13	1.11	2.65	.99	2.07	1.11

technical assistance. Table 2 shows the means and standard deviations of the 16 AT knowledge and usage items. Likert response options ranged from 1 to 5. Means range from 1.71 to 2.94, indicating in general that respondents' knowledge and usage of AT is in the awareness range (a *2* on the Likert scale).

Confidence in AT

In section 4 of the survey (the Assistive Technology Confidence Scale or ATCS), respondents rated themselves as somewhat confident overall in the areas of AT intervention, assessment, and accessing resources and support (ATCS total scale *M* = 3.64, *SD* = 1.08, range = 1.00-5.75). Table 3 displays the AT confidence items means and standard deviations. They were most confident in their ability to conduct or participate in AT assessments (*M* = 3.79, *SD* = 1.18, range = 1.00-5.75), less confident in use and application (*M* = 3.78, *SD* = 1.22, range = 1.00-6.00), and least confident in their ability to obtain and use AT resources and support services (*M* = 3.42, *SD* = 1.13, range = 1.00-5.83).

Table 3
Means and Standard Deviations for Items Assessing Confidence in Using Assistive Technology for Total Participants (n = 123) and for Participants who Had (n = 20) and Had Not (n = 103) Previously Enrolled in a University Assistive Technology (AT) Course

Confidence Scale and Items	Total Participants		Previous AT Course		No Previous AT Course	
	M	*SD*	*M*	*SD*	*M*	*SD*
Confidence Scale Score	*58.16*	*17.20*	*68.84*	*16.90*	*57.07*	*17.13*
I feel confident in my ability to:						
1. Assess a student's need for assistive technology.	3.68	1.45	4.40	1.14	3.53	1.48
2. Participate in an assistive technology assessment.	3.38	1.43	3.90	1.37	3.31	1.43
3. Refer a student to an assistive technology specialist if needed	4.23	1.31	4.45	1.10	4.18	1.35
4. Determine whether an assistive technology device will increase a student's ability access the general education curriculum.	3.89	1.30	4.11	1.24	3.86	1.32
5. Decide whether an assistive technology device/tool is the lease intrusive, yet most effective device available for a student.	3.52	1.33	3.95	1.23	3.47	1.36
6. Utilize assistive technology equipment in the assessment process.	3.34	1.48	3.80	1.15	3.24	1.52
7. Utilize assistive technology as a vehicle for more effectively serving students with disabilities.	3.72	1.39	4.05	.89	3.66	1.47
8. Evaluate the effectiveness of an assistive technology device/tool.	3.58	1.41	3.90	1.21	3.50	1.46

9. Make provisions for assistive technology devices and services on a student's IEP.	4.03	1.38	4.15	1.18	4.05	1.42
10. Collaborate with related professionals about the use ad application of assistive technology for individual students.	4.26	1.36	4.15	1.09	4.30	1.39
11. Utilize state and local assistive technology resources to gather information about assistive technology assessment, intervention, or funding.	3.19	1.35	3.70	1.34	3.10	1.33
12. Locate appropriate assistive technology funding sources to help students acquire assistive technology equipment.	2.72	1.34	3.45	1.43	2.58	1.29
13. Obtain training in assistive technology assessment and intervention.	3.84	1.36	3.95	1.19	3.84	1.39
14. Gather information on maintenance services for repair and replacement of assistive technology devices.	3.24	1.42	3.85	1.31	3.11	1.44
15. Make low tech devices/tools (such as picture symbols, hand grips, position supports).	4.02	1.65	4.55	1.47	3.93	1.69
16. Find the most up-to-date information about the availability and use of high tech assistive technology devices.	3.53	1.39	3.75	1.41	3.46	1.39

Relationships among participants' ratings of barriers, knowledge and usage, and confidence in using AT were examined via correlational analyses. A correlation matrix is presented in Table 4. Correlations range from r = -.32 to .74. Barriers were negatively correlated with Confidence (r = -.32, p < .01) and with Knowledge and Usage (r = -.18), though not significantly (p > .05). Confidence and Knowledge and Usage were positively correlated (r = .74; p < .01).

Table 4

Correlations Between Barriers, Knowledge and Usage, and Confidence in Using Assistive Technology

Variables	Barriers	Knowledge and Usage	Confidence
Barriers	--	-.18	-.32**
Knowledge and Usage		--	.74**
Confidence			--

**p < .01.

To determine if participants' perceptions of barriers, knowledge and usage, and confidence differed based on formal training via a university course devoted to AT, three independent samples *t-tests* were conducted. For the 20 participants who had previously participated in a university AT course, the Barriers scale mean score was 29. 53 (SD = 6.35) compared to a mean of 29.40(SD = 4.49) for those who had no previous AT course (n = 103). For Knowledge and Usage, those who had taken an AT course earned a mean score of 46.00 (SD = 10.72) compared to a mean of 37.11 (SD = 12.93) for those who had not. And, for the Confidence scale, those who had taken an AT course earned a mean of 68.84 (SD = 16.90) compared to a mean of 57.07 (SD = 17.13) for those who had no previous AT course.

For the Barriers scale, t-test results indicated no significant difference based on previous enrollment in a university AT course (t = -.10 (1,104), p > .05). Participants who had previously taken an AT course scored significantly higher on the Knowledge and Usage scale than those who had not (t = -2.67 (1, 108); p < .01). For the Confidence scale, results indicated no significant difference in the means of the two groups (t = -1.58 (1,16); p > .05). For each analysis, the homogeneity of variances was confirmed using Levene's Test for Equality of Variances.

Discussion

The results indicated a strong relation between knowledge and usage of assistive technology in special education settings and confidence in using AT. This finding is not surprising but it underscores the need for initial and ongoing preparation as well as opportunities to apply what has been learned

(Edyburn, 2000; Lahm, 2003). The relation between confidence and perceived barriers to AT usage was moderate and significant while the relationship between knowledge and usage and perceived barriers was small and nonsignificant, though both were in the same direction. That is, the more participants expressed confidence and, to a lesser extent, indicated active knowledge and usage of AT, the lower they rated barriers to AT usage. Again, this finding is not surprising and provides further support for the necessity of professional preparation and application opportunities. The fact that the extent to which barriers were perceived appears to have been mitigated by the amount of confidence expressed underscores the need to address affective issues, as well as knowledge and skills in preparation and professional development efforts.

When participants' responses to the three scales were compared based on previous enrollment in a university AT course, only the Knowledge and Usage scale mean score differed. That is, participants who had previously completed an AT course reported higher knowledge and more usage of AT in their applied settings than did those who had not yet taken an AT course. However, previous enrollment in an AT course did not make a difference in perceived barriers nor in confidence about using AT. This finding again underscores the need to address affective issues in AT preparation efforts. Results suggest that AT college courses may serve as a source of information and learning about technology while applied experience is needed to build confidence to apply what is learned, reinforcing the need for technology-rich field experiences as suggested by Anderson and Petch-Hogan (2001) in their study of preservice teachers' technology expertise.

Almost half of alternative route students (47%) have never participated in any training on AT (Lee & Vega, 2005). As identified in the literature, one possible explanation may be that special education teacher education programs do not have the capacity, resources, and faculty expertise to effectively integrate AT competencies into curriculum and instruction (Edyburn & Gardner, 1999; Lahm & Nickels, 1999; Michaels & McDermott, 2003). To meet the needs of all future special educators, the development of AT competencies should assume a more central role throughout all phases of alternative route programs for certification in special education.

It is important that those in charge of all special educator preparation programs, including alternative route programs, ensure that *programs are of adequate length and employ a variety of learning activities to deliver critical content* (Rosenberg & Sindelar, 2001, p. 20). In addition to resisting the pressure to deliver fast track programs, higher education personnel must work collaboratively and effectively with school-based partners to ensure adequate opportunity for alternative track students to apply and practice AT skills.

Despite the importance of the issues addressed in this study, there are limitations. First, the majority of students who participated in this investigation were volunteers rather than randomly selected students in alternative route special education preparation programs. It is possible that there is a self-selection bias based on respondents' interest in AT and willingness to contribute to this effort, although a variety of other factors also could account for failure to respond. Because the data were obtained anonymously, the impact of non-response bias cannot be ascertained. Second, this questionnaire was used with students who were currently enrolled in alternative special education licensure programs at two universities. Because the data were collected from a limited geographical area and to students already holding teaching positions, results should be generalized to other populations with caution. Third, the number of participants who had participated in an AT course at the time the survey was administered was quite small, limiting the generalizability of findings.

Implications

This study is one of the first to examine the perceived barriers, knowledge and usage, and confidence of assistive technology alternatively prepared preservice special educators. Because of the shortage of special educators, alternative special education preparation programs continue to be on the rise. Consequently, results have implications for other alterative licensure programs. In addition, research should be extended to preservice teachers in both traditional and other alternative route preparation programs.

The study is significant also because it provides evidence of psychometric adequacy of three scales designed to assess different aspects relating to teacher AT usage. High internal consistency values were obtained for all three scales (barriers, knowledge and usage and the 16-item ATCS) used in the study and the pattern of intercorrelations provide preliminary evidence of construct validity. Consequently, these scales hold potential for use in future research.

Though preliminary in nature, results of the present study support a link between alternatively licensed special educators' confidence in and their knowledge and use of AT *and* knowledge and use was reportedly higher for those who had completed a university AT course. Results support the need to include AT coursework in alternative licensure as well as traditional licensure programs for special educators. In order to provide students with disabilities equal access to the general education curriculum, it is necessary for special educators to possess knowledge about AT tools and their use. Over 75% of students with disabilities spend the majority of their school day in general education classrooms (Turnbull, Turnbull, & Wehmeyer, 2007). For many students with disabilities, the effective use of assistive technologies might make the difference between experiencing success or failure in the educational setting.

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