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ABSTRACT

This paper discusses the development of an assistive technology (AT) toolkit for special education teachers to use in integrating assistive technology with general curriculum standards for students with high incidence (mild) disabilities. Participants were 31 K-8 special education teacher-volunteers recruited from schools representing urban, rural, and suburban school settings in two states. Teachers participated in four weeks of asynchronous on-line training and discussion on assistive technology and general curriculum standards and attended a 25-hour workshop on the following assistive technology applications: word prediction, voice input, speech output, concept mapping, multimedia, and alternative keyboards. Teachers received an AT toolkit for classroom use and developed lesson plans that integrated language arts and math general curriculum standards with technology. Evaluation indicated: (1) improvement in teacher knowledge, confidence, and willingness to use assistive technology in lesson plans addressing state curriculum standards; (2) the need for hands-on training and support in implementing assistive technology; and (3) the necessity of ready access to necessary software and equipment for instructional purposes. (Contains 13 references.) (DB)

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Integrating Assistive Technology with Curriculum Standards

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Abstract

Assistive technology (AT) benefits students with high incidence disabilities in achieving higher academic standards and must be considered in developing the Individualized Educational Program. Factors impeding appropriate implementation of AT include teachers' lack of knowledge of possible AT applications, insufficient training in the selection and use of AT, and access to AT equipment and software in classrooms. Moreover, the current system for acquiring assistive technology requires a lengthy process of referral and assessment based on a model more appropriate for students with physical and sensory disabilities. Students with high incidence, or mild disabilities resulting in academic and cognitive difficulties, need more readily available access to AT tools that provide instructional support and further inform the established assessment and referral processes.

This paper discusses the development of an assistive technology toolkit for special education teachers use in integrating assistive technology with general curriculum standards for students with high incidence (mild) disabilities. Participants were thirty-one K-8 special education teacher-volunteers recruited from schools representing urban, rural, and suburban school settings in two states. Teachers participated in four weeks of asynchronous on-line training and discussion on AT and general curriculum standards, and attended a 25-hour workshop on the following AT applications: word prediction, voice input, speech output, concept mapping, multimedia, and alternative keyboards. The teachers received an AT toolkit for classroom use and developed lesson plans that integrated language arts and math general curriculum standards with technology.

Results include (1) improvement in teacher knowledge, confidence, and willingness to use assistive technology in lesson plans addressing state curriculum standards, (2) the need for hands-on training and support in implementing assistive technology, and (3) the necessity of ready access to necessary software and equipment for instructional purposes.

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The 1997 reauthorization of Individuals with Disabilities Education Act (IDEA) (Public Law 105-17) charts a clear change of direction for special education teachers in two areas: access to and achievement in general education curriculum standards, and the consideration of assistive technology when planning the individualized education program (IEP) of all students with disabilities. These legislative changes mandate shifts in the training of special educators. Whereas the special education program once looked at the needs of the individual child in isolation, it now must look at these needs as they relate to involvement in the general curriculum. Practicing special education teachers are more likely to have been trained using models that attend to individual needs but exclude the instructional standards of general education classrooms. In the second area of concern, regulations requiring that individuals be considered for assistive technology as part of the IEP process state no exceptions or prerequisites, and the determination of whether an assistive technology device or service is required must be made on an individual basis. Numerous barriers impede the effective consideration and implementation of assistive technology. Many special education teachers do not possess sufficient knowledge to select technology devices or services, do not have sufficient knowledge of possible tools, do not have the necessary resources, or do not have sufficient knowledge to develop evaluation criteria for the selection and use of assistive technology. Special education teachers need to know the capability of a particular technology, how to match it appropriately to the general education needs of the learner and must be able to instruct the learner to use it to the best of his/her ability.

IDEA regulations can work together to provide a policy context within which assistive technology has an important role to play in helping special education students achieve general education outcomes. When students with disabilities have access to technology that incorporates principles of universal design (multiple means of representation, expression, and engagement),

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academic performance is improved (O'Neil, 2000, Rose & Meyer, 2000). For example, reading a textbook passage, (a difficult task for many students with mild disabilities) could be supported by digitizing the text and using a screen reader for auditory feedback (a form of altering the representation). Much of the assistive technology that should be considered by IEP teams is readily met by available classroom technologies, many of which are relatively easy to use and are adaptable to general education curriculum content.

While assistive technology (AT) benefits students with disabilities in achieving higher academic standards and must be considered in developing the Individualized Educational Program, the current system for acquiring AT requires a lengthy process of referral and assessment based on a model more appropriate for students with physical and sensory disabilities (Edyburn, 2002). Students with high incidence, or mild disabilities resulting in academic and cognitive difficulties need more readily available access to AT tools that provide instructional support and further inform the established assessment and referral processes. The current system of individual referral for in-depth evaluation does not appear to be capable of meeting the technology needs of the large number of students with mild cognitive disabilities. We can, however, use existing evaluation frameworks (such as the SETT, Zabala, 2000), to promote the use of technology as a commonly available and readily accessible tool for student use in the classroom (environment) for the task of enhance academic performance. A proactive strategy, proposed by Edyburn (2000), involves ready access to Assistive Technology toolkits that would serve to "quickly deploy tools of obvious value into the hands of teachers and students" and provide opportunities for exploratory use.

This paper describes the development, initial dissemination and implementation of the Project ACCESS (Accessing Curriculum Content for Special Education Students) toolkit for K-8 students with mild disabilities. We patterned the toolkits around a collection of three recommended concepts: teacher productivity, core assistive technology, and learner productivity. A grant provided by the Tennessee Higher Education Commission Title II Eisenhower program provided initial funding to purchase the necessary materials and to field test this idea with special education teachers.

The Project ACCESS toolkit included software, equipment, and strategies that would support student achievement in general education standards in math and language arts. Applications and strategies chosen were essentially content or curriculum neutral, i.e. were useable and adaptable as tools for supporting curriculum standards without the use of pre-authored or drill and practice activities, and would span the gap between instructional and assistive technology. (Edyburn, 2000). Portions of the toolkit were the introduction of simple and generally available productivity strategies, i.e., general accessibility features of Windows and Mac operating systems, incorporating digital images and sound into programs, and integrating technology use with general curriculum standards. Instructional and assistive technology software and equipment included text to speech word processors, word prediction, voice input word processors, scan and read software, concept mapping, multimedia, computer-based calculators, and alternative keyboards. The following lists the instructional/assistive technology software and vendors selected for the ACCESS toolkit.

Text to speech word processors:	Intellitalk II, (Intellitools), Write: Outloud (Don Johnston).
Word Prediction:	Co:Writer (Don Johnston), Word Prediction features of Kurzweil 3000
Multimedia:	Intellipics, Intellimathics (Intellitools)
Scan and read programs:	Kurzweil 3000 (Kurzweil Educational Systems)
Concept Mapping:	Kidspiration (Inspiration Inc.)

Support for arithmetic calculations:	Math Pad and Math Pad plus (Intellitools, Inc.)
Alternate keyboards:	Intellikeys, (Intellitools) and Alpha Smart
Adapting alternate keyboards:	Overlay Maker (Intellitools)
Voice input word processors:	Naturally Speaking (Scan Soft, Inc.)
Accessibility features	Windows (Microsoft) and Mac (Apple Computer, Inc.)

This toolkit was used to integrate general curriculum standards for K-8 students with mild disabilities. Training in the use of these tools and their integration with curriculum standards was provided in the form of a workshop.

Participants were thirty-one K-8 special education teachers recruited from thirteen schools in five school districts in two southeastern states. The majority of the teachers (50%) had from 6 to 15 years teaching experience, with 25% reporting from 1-5 years, and 25 % over 16 years. The teachers were from schools that met one or more of the following criteria: (a) an established working relationships between university and K-12 faculty as partners in a Professional Development School (b) served underrepresented populations (students from inner city, impoverished situations or underserved rural Appalachian areas), or (c) are participants in other curriculum and technology training initiatives and had faculty and leadership interested in extending these training opportunities to the special education staff. The workshop training took place in two different sites. The first site consisted of fifteen special education teachers from the same rural Appalachian district. These teachers had shown an interest in technology and were asked by the district to assist in purchasing decisions for a special education grant the district had received. They were provided three days of release time from teaching duties during the workshop. The second site consisted of sixteen special education teachers from four different school districts who volunteered to participate in a Tennessee Higher Education Commission

Title II Eisenhower Grant. This workshop activity was conducted during one week of the summer vacation and provided incentives for attendance: one copy of each of the assistive technology applications to the teachers for classroom use, mileage, meals, and a modest stipend of $25.00 per day. The teachers in this second group developed lesson plans that integrated language arts and math general curriculum standards with technology as a requirement of the project. A follow-up survey conducted mid-way during the following school semester looked at implementation and usefulness of the software for this group of teachers.

Teachers in each site participated in a four week asynchronous on-line training and discussion phase prior to the workshop event. During this phase, the teachers were directed to a project website that included links to concepts of universal design, disability simulations, assistive and instructional technology vendors, and state curriculum standards. They were asked to review specific sites and participate in an on-line discussion board. Participation requirements for this phase were altered to study the process of on-line learning, and were reported elsewhere.

Each workshop site featured 25 hours of direct instruction and used the same curriculum. Workshop sessions were conducted in computer labs equipped with hardware and software for each teacher to participate in hands-on training and practice. The teachers also had access to general classroom textbooks and standards during the workshop, and were given time during each day to develop activities using the software and curriculum materials. Project training had three main objectives: (1) to develop special education teachers' technical skills in the use of technology that supports general curriculum content standards, (2) to further develop their skills in aligning general curriculum standards with IEP goals, and (3) to apply the technical skills in assistive technology to general curriculum standards.

Evaluation

Evaluation activities were conducted at each phase of the project. Quantitative and qualitative measures provided both numerical data and descriptive reports from participants. Pre and post surveys were administered to all participants (n=31) prior to and after the on-line phase, at the end of direct instruction in the workshop, and follow-up at the mid point of the next school semester. These surveys measured knowledge, use and confidence in using assistive technology to address state curriculum standards. Survey items asked participants to report current knowledge of eight types of assistive and instructional technology applications (i.e. text to speech word processors, scan and read programs, etc.) These items used a 4-part Likert scale indicating defined levels of knowledge: none, aware, practicing, and proficient. Participants were also asked to report their level of use of twelve types of instructional and assistive technology applications (word processing, drill and practice, and assistive technology applications) using a 4-part Likert scale defined as never, rarely, sometimes, and frequently. Participants were asked to report their knowledge and experience with state and local grade level standards in Language Arts and Math and to rate their level of confidence in their ability to help Special Education students reach standards based accomplishments using technology. Open-ended questions embedded in the surveys addressed the teachers' perception of the effectiveness of the on-line and workshop formats.

Surveys were completed on-line before the start of the on-line training, immediately after the on-line training, and at the end of the workshop. The follow-up survey, administered by mail to the 16 teachers who received the software as part of the initial training, reported on actual use mid-way through the following semester. The Likert data were gathered into spread sheet files and analyzed using Statistical Package for the Social Sciences (SPSS, 1998). For this study,

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because of the small N (31) and volunteer nature of the participants, simple frequencies of responses were reported. Comparisons that were the result of differences in requirements between the two groups on-line participation were analyzed and reported as part of a separate study. Qualitative responses from the open-ended survey questions were coded and then sorted according to themes (Lincoln & Guba, 1985).

Results

Participants increased their knowledge and potential use of assistive technology and reported greater confidence in using assistive technology to address state curriculum standards for special education students. Post-conference comments centered around the need for hands-on training and support in implementing assistive technology, the necessity of ready access to software and equipment for instructional purposes, and the value of collaboration with colleagues. Follow-up reports indicate continued use of software and equipment with special education students.

An increase in knowledge and potential use of assistive technology was the aim of the workshop, and these data show that project efforts were successful in this area. Of particular concern, however, were the extremely low levels of knowledge and use of assistive technology reported prior to the project activities. Questions displayed in Table 1 asked the teachers to report their level of familiarity and knowledge of eight types of AT applications. Pre-project data show that the majority of these teachers report no knowledge or minimal awareness of these applications in seven of the eight categories. While 70.9% (22 of the 31) reported practicing or proficient use of spell and grammar check to support the writing process for students, the results for the other categories were of concern. When the categories "none" and "aware" are combined, over 90% of the teachers reported limited knowledge of voice activated word

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processors, text reading programs, and programs to support transcription and sentence generation such as word prediction and alternate keyboards. Over 80% of the teachers reported limited knowledge of technology applications for writing planning and idea generation (such as outlining programs) and text to speech word processors. Over half the teachers reported no or minimal awareness of student use of multimedia programs to support math and language arts skills. After participating in the project, these numbers improved. By combining practicing and proficient categories, teachers reported they could use voice-activated word processors (22%), text reading programs (54.8%), and programs to support transcription and sentence generation such as word prediction and alternate keyboards (70.9%). The teachers reported practicing or proficient knowledge for writing planning and idea generation (71%), text to speech word processors, (64.5%) and student use of multimedia programs to support math and language arts skills (83.8%). General accessibility option available in Windows and Mac, programs that are freely provided with both operating systems, showed a reversal of figures. Pre-conference reports 77.4% had no or little awareness of these features while post conference reports show that 77.4% reported practicing or proficient knowledge of these features.

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Table I: Knowledge of Assistive Technology

Question: Please rate your level of familiarity and knowledge pertaining to the following assistive technology applications. Use the following scale.

None: No knowledge, have not heard of this; **Aware:** Have heard of this, but have not used it, do not know enough about it to initiate its use with students; **Practicing**: Have used (or could use) this with students; **Proficient** : Feel confident in using this with students and could help others use it.

Application:		None	Aware	Practicing	Proficient
• 1a. Text to speech word processors (examples: Intellitalk, Write Outloud, Text Help, etc.)	Pre	25.8% (8)	61.3% (19)	12.9% (4)	0
	Post	0	35.5% (11)	51.6% (16)	12.9%(4)
• 1b. Voice activated word processors (examples: Naturally Speaking, Dragon Dictate)	Pre	41.9% (13)	54.8% (17)	3.2% (1)	0
	Post	0	77.4% (24)	22.6% (7)	0
• 1c. Computer technology to support reading; text reading programs (examples: Kurzweil 3000, Text Help, WYNN)	Pre	54.8% (17)	41.9% (13)	3.2% (1)	0
	Post	0	45.2% (14)	41.9% (13)	12.9%(4)
• 1d. Student generated multimedia (pictures and sound) to support language arts and math (examples: HyperStudio, PowerPoint, Intellipics Studio)	Pre	16.1% (5)	38.7% (12)	29% (9)	16.1% (5)
	Post	0	16.1% (5)	41.9% (13)	41.9% (13)
• 1e. General accessibility options available in Windows and Mac (examples: screen magnification, latch keys, variable keyboard response rates, etc.)	Pre	35.5% (11)	41.9% (13)	19.4% (6)	3.2% (1)
	Post	0	22.6% (7)	51.6% (16)	25.8% (8)
• 1f. Technology to support student writing process in planning and idea generation (outlining and semantic mapping software, multimedia applications, prompting programs):	Pre	41.9% (13)	45.2% (14)	9.7% (3)	3.2% (1)
	Post	0	29% (9)	38.7% (12)	32.3% (10)
• 1g. Technology to support the writing process in transcription and sentence generation (word prediction, alternate keyboard formats)	Pre	61.3% (19)	29% (9)	6.5% (2)	3.2% (1)
	Post	0	29% (9)	54.8% (17)	16.1% (5)
• 1h. Technology to support the mechanics of the writing process (spell and grammar checkers):	Pre	9.7% (3)	12.9% (4)	54.8% (17)	22.6 % (7)
	Post	3.2% 1)	9.7% (3)	32.3% (10)	54.8% (17)

Questions displayed in Table 2 asked for reports of pre-project use of technology and post project potential for use. Teachers were asked to rate use or potential for use of twelve assistive and instructional technology applications along a continuum of never, rarely, sometimes, and frequently. These questions were patterned along the lines of level of knowledge listed in Table 1, with the addition of three questions describing commercial programs and one describing use of multimedia for student production. Prior to the start of the project, well over 80% of the teachers reported they never or rarely used text to speech word processors, voice activated word processors, text reading programs, general accessibility options, outlining programs, and word prediction. Over half of the teachers never or rarely used multi-media programs either for student production or to support language arts or math. Areas in which teachers reported higher rates of "sometimes" or "frequent" use were word processing (64.6%), and the drill and practice type commercial programs for Language Arts (74.2%), Math (67.3%), and multimedia programs (61.3%).

After participating in the project, reports of potential use of instructional and assistive technology improved. Over 80% reported anticipating "sometimes" or "frequent" use of word processing, text to speech word processors, multimedia, outlining, and word prediction applications. Over 70% of the teachers anticipated they would "sometimes" or "frequently" use text reading programs and general accessibility features available in Windows and Mac. One area showing little improvement in potential use was voice activated word processing. Eighty-four percent of the teachers reported that they anticipated never or rarely using this technology after the training, commenting that difficulty in implementation would make its use less likely.

Anticipated use of drill and practice type commercial programs improved only slightly after project participation.

Table 2: Use of technology with special education students

Pre workshop question: Approximately how often do you use the following types of technology with your special education students?
Post workshop question: Based on your training experiences this week, approximately how often do you anticipate you will use the following types of technology with your special education students in the upcoming year?

Application		Never	Rarely	Sometimes	Frequently
2a. Word Processing (examples: Microsoft Word, Appleworks)	Pre	32.3% (10)	3.2% (1)	45.2% (14)	19.4% (6)
	Post	0	6.5% (2)	35.5% (11)	58.1% (18)
2b. Text to speech word processors (examples: Intellitalk, Write Outloud, Text Help, etc.)	Pre	74.2% (23)	9.7% (3)	16.1% (5)	0
	Post	0	19.4% (6)	38.7% (12)	41.9% (13)
2c. Voice activated word processors (examples: Naturally Speaking, Dragon Dictate)	Pre	87.1% (27)	9.7% (3)	3.2% (1)	0
	Post	12.9% (4)	71.0% (22)	9.7% (3)	6.5% (2)
2d. Multimedia Programs for student production (examples: KidPix, PowerPoint)	Pre	41.9% (13)	12.9% (4)	32.3% (10)	12.9% (4)
	Post	0	6.5% (2)	35.5% (11)	58.1% (18)
2e. Computer technology to support reading; text reading programs (examples: Kurzweil 3000, Text Help, WYNN)	Pre	77.4% (24)	12.9% (4)	9.7% (3)	0
	Post	0	22.6% (7)	45.2% (14)	32.3% (10)
2f. Student-generated multimedia (pictures and sound) to support language arts and math (examples: HyperStudio, PowerPoint, Intellipics Studio)	Pre	48.4% (15)	19.4% (6)	22.6% (7)	9.7% (3)
	Post	0	6.5% (2)	35.5% (11)	58.1% (18)
2g. General accessibility options available in Windows and Mac (examples: screen magnification, latch keys, variable keyboard response rates, etc.)	Pre	80.6% (25)	9.7% (3)	9.7% (3)	0
	Post	6.5% (2)	19.4% (6)	45.2% (14)	29% (9)
2h. Technology to support student writing process in planning and idea [illegible]	Pre	80.6% (25)	12.9% (4)	3.2% (1)	3.2% (1)

generation (outlining and semantic mapping software, multimedia applications, prompting programs)	Post	0	19.4% (6)	29% (9)	51.6% (16)
• 2i. Technology to support the writing process in transcription and sentence generation (word prediction, alternate keyboard formats)	Pre	58% (18)	29% (9)	12.9% (4)	0
	Post	0	19.4% (6)	48.4% (15)	32.3% (10)
• 2j. Commercial Programs for Reading/Language Arts (examples: Grammar Blaster, Accelerated Reader, Reader Rabbit)	Pre	6.5% (2)	19.4% (6)	29% (9)	45.2% (14)
	Post	3.2% (1)	12.9% (4)	29% (9)	54.8% (17)
• 2k. Commercial Programs for Math examples: Sticky Bear, Math Blaster)	Pre	19.4% (6)	12.9% (4)	32.3% (10)	35.5% (11)
	Post	3.2% (1)	22.6% (7)	25.8% (8)	48.4% (15)
• 2l. Commercial Multimedia Programs (examples: Living Books, Explorers – games, simulations, read-along formats)	Pre	29% (9)	9.7% (3)	25.8% (8)	35.5% (11)
	Post	3.2% (1)	19.4% (6)	32.3% (10)	45.5% (14)

An essential purpose of the assistive and instructional technology used in this project was its integration with general curriculum standards for special education students. Teachers in this project had access to age and grade appropriate curriculum standards and materials while they were learning to use the technology, with the aim of purposeful use towards learning accomplishments. Table 3 shows the results of questions intended to measure familiarity and use of standards and the teachers' confidence in their ability to help students achieve these standards. Over 60% of the teachers reported pre-project knowledge of state and district curriculum standards and supporting classroom materials in the practicing and proficient ranges, and over 50% consulted these standards "sometimes" or "frequently" when developing the IEP. Their confidence in their ability to help special education students reach standards-based accomplishments was moderate to high (54%), but their confidence in using technology to achieve these accomplishments was none or low (over 75%). After the training, their report of confidence in their ability to use technology to help student reach standards-based accomplishments increased to "moderate" and "high" (74.2% for Language Arts and 77.4% for Math).

Table 3: Knowledge and Experience with State and/or Local Grade Level Standards

Pre-workshop question: Please rate your current knowledge and experience in the following areas. Post workshop question: Based on your training experiences this week, please rate your knowledge and your anticipation of use in the following areas.

Topic: Language Arts.		None	Aware	Practicing	Proficient
• 3a. In Language Arts, my knowledge of state and/or district content standards for the grade level(s) of my special education students is	Pre	12.9% (4)	22.6% (7)	48.4% (15)	16.1% (5)
	Post	3.3% (1)	16.1% (5)	35.5% (11)	45.2% (14)
• 3b. In Language Arts, my familiarity with general curriculum and general classroom supporting materials and texts for the grade level(s) of my special education students is	Pre	9.7% (3)	29% (9)	48.4% (15)	12.9% (4)
	Post	6.5% (2)	19.4% (6)	32.3% (10)	41.9% (13)
• I consult and use state and/or district content standards in Language Arts		Never	Rarely	Sometimes	Frequently
• 3c. when describing levels of performance of special education students in the IEP	Pre	19.4% (6)	29% (9)	35.5% (11)	16.1% (5)
	Post	9.7% (3)	12.9% (4)	29% (9)	48.4% (15)
• 3d. when developing IEP goals and benchmarks for special education students	Pre	19.4% (6)	29% (9)	35.5% (11)	16.1% (5)
	Post	12.9% (4)	9.7% (3)	29% (9)	48.4% (15)
• 3e. My confidence in my ability to help my special education students reach standards-based accomplishment levels in Language Arts		None	Low	Moderate	High
	Pre	9.7% (3)	35.5% (11)	45.2% (14	9.7% 3)
	Post	6.5% (2)	16.1% (5)	41.9% (13)	35.5% (11)
• 3f. My confidence in my ability to use technology to help my special education students reach standards-based accomplishment levels in Language Arts	Pre	29% (9)	58.1% (18)	6.5% (2)	6.5% (2)
	Post	0	25.8% (8)	48.4% (15)	25.8% (8)
Topic: Math		None	Aware	Practicing	Proficient
• 4a. In Math, my knowledge of state and/or district content standards for the	Pre	12.9% (4)	16.1%(5)	45.2% (14)	25.8% (8)

and/or district content standards for the grade level(s) of my special education students is	Post	6.5% (2)	9.7% (3)	45.2% (14)	38.7% (12)
• 4b. In Math, my familiarity with general curriculum and general classroom supporting materials and texts for the grade level(s) of my special education students is	Pre	12.9% (4)	19.4% (6)	48.4% (15)	19.4% (6)
	Post	6.5% (2)	16.1% (5)	38.7% (12)	38.7% (12)
• I consult and use state and/or district content standards in Math		Never	Rarely	Sometimes	Frequently
• 4c. when describing levels of performance of special education students in the IEP	Pre	16.1% (5)	19.4% (6)	48.4% (15)	16.1% (5)
	Post	9.7% (3)	12.9% (4)	32.3% (10)	45.2% (14)
• 4d. when developing IEP goals and benchmarks for special education students	Pre	16.1% (5)	19.4% (6)	48.4% (15)	16.1% (5)
	Post	9.7% (3)	12.9% (4)	29% (9)	48.4% (15)
• 4e. My confidence in my ability to help my special education students reach standards-based accomplishment levels in Math		None	Low	Moderate	High
	Pre	16.1% (5)	29% (9)	51.6% (16)	3.2% (1)
	Post	12.9% (4)	19.4% (6)	32.3% (10)	35.5% (11)
• 4f. My confidence in my ability to **use technology** to help my special education students reach standards-based accomplishment levels in Math	Pre	25.8% (8)	48.4% (15)	22.6% (7)	3.2% (1)
	Post	6.5% (2)	16.1% (5)	51.6% (16)	25.8% (8)

Analysis of open-ended questions designed to evaluate the training revealed three major areas of effectiveness: the hands on training, access to software, and the ability to collaborate with others, both on-line and during the training. The hands-on format of the training garnered the most comment from the teachers. One teacher indicated,

> The multitude of programs demonstrated was most effective given the time frame to present. The commitment to have the software on hand to use was an integral part of the effectiveness of this training.

Other teachers indicated that while they gained knowledge from lectures and demonstrations, it was the actual time spent trying out the programs that were most effective.

Access to the software was another largely reported theme of program effectiveness. For the first group of teachers, the district was committed to it purchasing software recommended by the teachers after the training, and in the second group, the teachers received the software as a condition of attending the training. Teachers in the first group saw the lack of immediate access to the software as a negative factor of the training. Teachers in the second group noted that immediate access was a positive element. One teacher wrote the "acquisition of the tools and software with which to immediately review skills, develop lessons, and implement the technology essential for student success" made the project successful for her. Another teacher who participated in the second group stated,

> It is hard to believe that we are actually walking away with not only all this knowledge, but also equipment to make it a reality!

The teachers found the activities that encouraged collaboration to be effective elements of the training. Teachers collaborated in electronic "jigsaw" activities and on-line discussions prior to training, and were encouraged to work together to develop lessons and activities during the training. One teacher noted,

> Collaboration with my fellow cohorts was essential in bouncing off ideas. The mixture of computer knowledge was not as intimidating as once thought. Everyone was so helpful.

Other teachers commented that the online resources with which participants could interact and share information were effective.

When asked to speculate on ways (if any) their use of assistive technology might be different as a result of the training, the teachers responded around themes of change in practice and the feeling of being better informed. For example, one teacher wrote,

> I think that my students can use these programs daily to improve, especially reading and math. I will be more aware of my choices for instruction.

Another quote echoed feelings of being better informed regarding the use of assistive technology:

> I am much more aware of the programs available to assist students and have greater confidence in my ability to use them.

Finally, teacher awareness of alternates to drill and practice programs was exemplified with the following statement:

> I'm already (mentally) rearranging the physical layout of my classroom to accommodate the computers and assure that the kids will have focused time in my room to use the computer (not just for games or Accelerated Reader tests) but truly for instruction.

The follow-up surveys mailed to the second group of participants (n=16) indicated, with a few exceptions, that most of the software received in the project was being used on a regular basis. The exceptions were Kurzweil 3000 and Naturally Speaking. Due to budget constraints, the teachers were given read-only copies of Kurzweil 3000 software. Although teachers liked the possibilities offered by this program, they were unable to make it work due to the unavailability of the scan and read version for text input. One teacher reported working with the principal, PTA, and the parent of a student with Asperger's syndrome regarding funding for this program, following suggestions given them in training. Many teachers planned to use Naturally Speaking

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at some time in the school year, but had yet made it work at the time the survey was conducted. Their delay in using this program echoed earlier concerns expressed during the workshop and in the post survey regarding the complexity of training for this software.

Before their involvement with Project ACCESS, the majority of teachers indicated a perspective limited to using the computer as a remediation activity or as a drill-and-practice application for practicing basic skills. Few of the special education teachers were using the powerful accessibility features of simple technology applications to aid students with disabilities in their mastery of general curriculum standards. After participation, the teachers reported a greater potential for use in activities that integrated general curriculum activities with technology. Follow up responses reported use in classrooms, and comments from this phase reflected emerging attempts in curriculum integration, as exemplified by the following quotes:

> We use Kidspiration almost daily. It really helps me with the new reading series. I use it for almost every class. I have also shared it with the inclusion teacher for English assignments.
>
> I share "my" Alpha Smart with students. If it is a take- I've gotten more from Assistive Tech office. I've also begged their old 2000's for my students.

Discussion

The Project ACCESS toolkit was an effective way to get assistive and instructional technology into the hands of special educators, and to facilitate its initial use. The content of the ACCESS toolkit was identified from collective recommendations (Edyburn, 2000). It received positive evaluations from the teachers involved in this study, and can inform the field in advancing a common vision of the toolkit process. Follow-up studies could include validation of its contents for enhancing performance of teachers and effectiveness with students. Additional follow-up studies could document the extent of integration with curriculum standards and identify further support needed.

This project gave teachers ready access to assistive and instructional technology tools to a small group of special educator using modest funding support. The total project, however, also acknowledges the technical and conceptual support from the principals of Project IMPACT (Implementing Partnerships Across the Curriculum with Technology), a PT3 implementation grant funded by the U.S. Department of Education. Most notably, collaboration with IMPACT provided guidance in developing the structure of project funding and activities using the Essential Conditions for Technology Integration (International Society for Technology in Education (ITSE), 2002, Vannata & O'Bannon, 2002). Although Project ACCESS was time limited and reached a relatively small group of participants on a small scale, the following conditions were considered when developing the training component: (1) a shared vision through proactive leadership and an assortment of technologies, (2) access to current technology, (3) building a base for skilled educators, (4) professional development, (5) technical assistance, (6) content standards and curriculum, (7) student-centered teaching, (8) assessment, (9) community support, and (10) support policies and incentives. In addition to the ITSE essential conditions, the work of others who monitor changes in teacher behavior when using technology were useful in forming the basis for Project ACCESS training (Handler, 1992; Wetzel, 1993; Sprague, Kopfman, & Dorsey, 1998, Roblyer, 2003).

Finally, the need to develop specific methods that meet general curriculum standards for Special Education students cannot be overstated. We need to restructure special education professional training opportunities and experiences to include methods that promote access to the general curriculum through the support possible by classroom uses of technology. This technology training must be curriculum specific, integrated across subject areas, and actively engage learners. The data supplied by ACCESS participants prior to training reinforces this need. In this study, the special education teachers' information and use of assistive technology was limited. If these reports are reflective of conditions typical among teachers of students with mild disabilities, it is of potentially great concern to the fields of special education, assistive technology, and technology integration.

One possible explanation for special education teachers' limited knowledge and use of assistive technology could come from school policies developed to meet the AT consideration requirements of IDEA. The first step in developing an assistive technology plan is usually to refer the student for an individual evaluation by a team of technology specialists. Districts are understandably reluctant to try new technology on an exploratory basis for fear the parents will demand its purchase and exclusive use for that individual student (Schweder,2002). Perhaps a better alternative would be to identify essential technology tools based on principles of universal design (Rose, 2000), usefulness for the task (Zabala, 2000), and teacher and learner productivity guidelines (Edyburn, 2000, Cavanaugh, 2002). This technology, rather than following the individual student, would be available for use with the instructional task, essentially becoming a resource available within the classroom. The ACCESS toolkit developed in this project could be the start of a validation process for just such an alternative.

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