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## What Do You Know?

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Are you ready? Do you know how to provide your students with the technology they need for success? Do you have a plan? How are your own skills in using technology? What do you know about assistive technology? About configuring, troubleshooting, and evaluating software and hardware? Can you effectively incorporate technology into your classroom instruction?

This article discusses competencies in technology knowledge and use that special educators need today. Here, we challenge teachers and other related services professionals to take charge of their own training and move toward being competent in assistive technology to better serve their students and meet the mandates of the law (see box, "IDEA and Assistive Technology).

Educators must become proactive in their technology-related professional development because teacher education programs have only recently begun addressing the technology skills of their students. This, in part, is because many teacher educators are not trained in assistive technology either, and in part because training programs are already packed with coursework addressing the many other competencies that special educators must have. Adding assistive technology to the program of studies is truly a dilemma for preservice and inservice teacher preparation programs.

Understanding change in education is a slow process. We must meet the needs of a changing student population and incorporate changing technologies, both instructional and assistive, into the many approaches to instruction available to special educators. Understanding new competencies and requirements is a start.

### THE WORK OF CEC'S PROFESSIONAL STANDARDS AND PRACTICE STANDING COMMITTEE

Over the past few years, the Knowledge and Skills Subcommittee of CEC's Professional Standards and Practice Standing Committee has been developing and validating knowledge and skill statements to serve as competencies in all areas of disabilities (The Council for Exceptional Children, 1998). In addition to competencies for disability categories, the subcommittee has developed sets of knowledge and skill statements for cross-categorical aspects of special education, such as diagnostics, cultural diversity, and transition. Recently, the subcommittee has written knowledge and skill statements for assistive technology and validated these statements for CEC's Technology and Media Division (TAM).

The subcommittee validated these statements through a Delphi methodology (Ono & Wedemeyer, 1994). Fourteen nationally known assistive technology experts formed a Delphi panel for the purpose of reviewing 189 knowledge and skill statements. The Delphi panel discussed each statement through a blind iterative process. Each member had three opportunities to review the statements and rate them as "essential," "useful but not essential," and "not important." They were encouraged to state their rationale for their ratings. These comments were shared with all panelists on subsequent rounds, who used them to reconsider their ratings. The ratings assigned on the third round were final and are the basis for our discussion. The final number of statements was 51.

The definition of assistive technology can be found in the 1997 amendments to IDEA, as well in many other pieces of legislation. The definition is broad in nature (see box, "Assistive Technology Defined") and encompasses a full range of technologies, from low to high sophistication. The panelists rating the competencies discussed here acknowledged the differences between beginning and experienced teachers and that each statement represents a range of knowledge and skills that correlate with the teacher's experience. Special educators should strive to learn more about assistive technology as they advance in their career.

In keeping with CEC's format for knowledge and skills, the competencies for assistive technology are organized into eight categories: (a) philosophical, historical, and legal foundations of special education; (b) characteristics of learners; (c) assessment, diagnosis, and evaluation; (d) instructional content and practice; (e) planning and managing the teaching and learning environment; (f) managing student behavior and social interaction skills; (g) communication and collaborative partnerships; and (h) professionalism and ethical practices. Table 1 lists the eight categories, along with the knowledge and skill statements adopted for each.

### ESSENTIAL KNOWLEDGE AND SKILL COMPETENCIES

### PHILOSOPHICAL, HISTORICAL, AND LEGAL FOUNDATIONS OF SPECIAL EDUCATION

The expert panelists decided that special educators must have an understanding of the legislation and regulations related to technology use in special education (see Table 1, Item 1). The panelists also agreed on the importance of two skill statements. Item 2 addresses the need for teachers to have a personal philosophy on the use of technology to guide them in the implementation of assistive technology. Item 3 speaks to the need to know the terminology related to assistive technology to accurately and efficiently communicate with others about the technology.

## CHARACTERISTICS OF LEARNERS

As Table 1 shows, the panelists found very few knowledge and skill statements related to the characteristics of learners to be essential in the area of assistive technology. Most of the knowledge and skills related to the characteristics of learners are addressed in the statements listed in the CEC (1998) document What Every Special Educator Should Know. The statements here relate to the influence of learner characteristics on technology use and the impact of technology on the learner (for knowledge statements, see Items 4, 5, and 6).

As teachers advance in their careers, they should be noticing and anticipating more relationships of the academic and physical demands that various types of technology place on the students. For example, a child having difficulty with handwriting may try using a word processor. The word processor, however, may require more long-term memory than the child is capable of--for example, remembering the placement of letters on the keyboard--making the word processing task less efficient than the handwriting task.

## ASSESSMENT, DIAGNOSIS, AND EVALUATION

The panelists found a greater number of skills (10) to be essential for special education teachers in this category than in six of the other categories (Table 1). Assessment, diagnosis, and evaluation are critical to the success of any technology intervention and to the satisfaction of the legislative mandate.

The skills noted here revolve around the teacher's role on the assessment team. As a member of the IEP team, the teacher contributes data on the child's instructional performance, helping the team to get a picture of the whole child. With the contribution of other team members, the team can make an informed decision about the need for assistive technology. When there is not enough information or expertise on the IEP team to make a sound decision, the team can solicit the assistance of someone with more expertise in assistive technology, such as an assistive technology specialist. Once the team implements assistive technology, the teacher shares the responsibility with other team members of monitoring the student's success and using that information to make necessary adjustments to the intervention.

## INSTRUCTIONAL CONTENT AND PRACTICE

The largest number of knowledge and skill statements falls in the category of instructional content and practice, which addresses the primary function of teachers. Table 1 lists one knowledge statement and thirteen skill statements in this category.

Essential for all teachers is the knowledge of procedures for determining if a software program or assistive device has potential for a student or a class of students (see Item 18). Often school districts have a particular procedure defined for general software evaluation, but the specific learning needs of students in special education may demand additional or adapted procedures.

The essence behind this set of skills is the assurance that technology will be matched to the student's specific needs, with the goal of keeping the student on target within the curriculum and moving toward meeting the student's IEP objectives. To accomplish this goal, teachers must know how to operate the technology (both hardware and software), integrate it into the curriculum, and be able to teach students to use it.

## PLANNING AND MANAGING THE TEACHING AND LEARNING ENVIRONMENT

Basic to the successful use of technology in any setting is the care and maintenance of the technology. With limited human resources available to assist classroom teachers, teachers will have to take on the responsibility of basic troubleshooting, care, and maintenance of the technologies at their disposal (Table 1, Items 32 and 33). This is not to say that everyone must be a "techie," but that teachers will be able to address simple tasks, such as the printer running out of ink, the augmentative communication device needing a new battery, or setting software preferences to meet a student's needs, without relying on external resources. This basic knowledge ensures better and more consistent use of technology in the classroom.

Managing the classroom environment is a basic skill needed by all teachers. Adding technology to the classroom should not put additional burdens on teachers but should be incorporated into the teaching environment with the same thoughtfulness as other instructional materials and equipment. Proper management enhances the benefit of the technology.

## MANAGING STUDENT BEHAVIOR AND SOCIAL INTERACTION SKILLS

Table 1 shows that only one skill was found essential for both levels of special education teachers. As Item 34 states, using computers as a vehicle for promoting student interaction and collaboration provides unique opportunities in the classroom.

Computers seem to naturally draw students to them, motivating students to participate in learning activities in new and different ways. They provide natural settings for group instruction, allowing students with disabilities to be included into groups in an acceptable manner. One example is using cooperative learning group strategies for conducting research on a science topic using multimedia resources. The student with a disability is assigned a group role, such as "illustrator," and is responsible for locating appropriate illustrations to be used in the research report. Teachers can facilitate the students' ability to realize their potential by developing group-based instructional activities using the computer.

## COMMUNICATION AND COLLABORATIVE PARTNERSHIPS

As with so many aspects of teaching in special education, technology use necessitates communication and collaboration with other professionals, administrators, parents, and community personnel. The panelists found one knowledge and nine skill competencies essential for beginning teachers. Interestingly, one of those skills was not rated as essential for experienced teachers. Item 43 in Table 1 states that teachers should be able to use electronic mail and Web browsers to support research and instruction. Panelists found those skills essential for beginning teachers but not for experienced teachers.

As the panelists emphasized in the diagnosis, assessment, and evaluation category, the implementation of assistive technology is a team decision. The knowledge statement in this section (Item 35) reinforces the need to know the role of each team member. Each of the skill statements addresses some aspect of team collaboration and communication to accomplish an integrated plan for implementing technology. One

statement lists personal communication skills such as listening, speaking, and writing. Another statement identifies a new role beyond the team, that of advising general educators in the use of assistive technology in the inclusive setting.

## PROFESSIONALISM AND ETHICAL PRACTICES

In the final category of knowledge and skill statements, the panelists found two knowledge and five skill statements essential for special education teachers (see Table 1). The knowledge statements reinforce two basic principles of special education: student confidentiality and teacher self-assessment. Three of the skill statements specify activities of self-assessment and professional development in the area of technology.

Items 50 and 51 emphasize basic skills for all educators: equity, ethical, legal, and human issue considerations to the implementation of technology and adherence to the copyright laws related to technology materials.

## INDIVIDUAL TEACHER RESPONSIBILITIES

With a total of 51 items to be responsible for (8 knowledge and 43 skills statements deemed essential for special education teachers), teachers may find meeting the technological needs of students with disabilities challenging. Teachers already in the field need to pursue a self-improvement plan to achieve these goals. Preservice teachers need to demand the training before they enter the field.

Several avenues are available to the special educator: self-education, inservice workshops, and formal coursework. The ambitious, self-directed teacher who desires a flexible learning schedule can design a self-taught program, using these knowledge and skill statements as a guideline. Several books can help in the process (see box, "Selected Books"). Numerous Web sites also include training materials, tutorials, and information about assistive technology applications (see box, "Selected Assistive Technology Web Sites"). It will be critical to have access to some of the technologies to gain hands-on experience.

The second approach to becoming technology competent is by participating in workshops offered by school districts or professional associations. Working with the building principal or special education director, teachers can persuade their district to bring in experts to train special education and related services personnel in the areas outlined by these competency statements. Requests for workshops can be made to professional organizations (e.g., local and state CEC chapters) to conduct workshops in conjunction with regional and state meetings. They are frequently offered in conjunction with national conferences as well. Table 2 lists some prominent technology-related conferences, dates, and Web sites.

The third avenue for obtaining training in special education technology is to take formal courses offered by colleges and universities. At present there are only a few special education training institutions that offer formal courses in special education technology (see box, "Universities"), but many universities have plans to add such courses to their program. Some universities offer these courses using distance-learning technologies, extending their availability to a broader audience. Regardless of the training method, it is imperative that all special educators gain the knowledge and skills in the areas of instructional and assistive technology to meet the assistive technology mandate of the recent amendments of IDEA.

## BETTER CHOICES, BENEFITS FOR STUDENTS

As teachers become more skilled and confident in instructional and assistive technology, they will make better choices regarding the technology, and teams will implement it using better methods. For example, a child with severe language delays will be identified at an early age as needing an augmentative communication device. Everyone interacting with that child will be trained in its operation and will know how to foster the child's development of language. As a consequence, the child can be successfully included in many educational activities, communicating with peers and adults. With the teacher's gain in knowledge and expertise, students with disabilities will stand a better chance of having assistive technology fairly considered as part of their IEP.

ADDED MATERIAL

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Table 2. Selected Conferences with Assistive Technology Training Options

| Organization | Approximate Time of Year | Web Site |
| --- | --- | --- |
| Closing the Gap<br>P.O. Box 68, 526 Main St.<br>Henderson, MN 56044<br>507/248-3294 | October | http://www.closingthegap.com |
| ConnSense<br>Chauncy N. Rucker, Director<br>A. J. Pappanikou Center Technology Lab<br>860/486-0165 or 0172 | July | http://www.ucc.uconn.edu/~wwwpcse/cs97.html |
| The Council for Exceptional Children (CEC)<br>1920 Association Drive<br>Reston, VA 20191-1589<br>703/620-3660 | April | http://www.cec.sped.org |
| CSUN: Technology and Persons with Disabilities<br>CENTER ON DISABILITIES<br>18111 Nordhoff Street<br>Northridge, CA 91330-8340 | March | http://www.csun.edu/cod/center.html |

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(818) 677-2578
RESNA                                                    June            http://www.resna.org
1700 North Moore Street, Suite 1540
Arlington, VA 22209-1903
703/524-6686
Technology and Media Division of CEC                     January         http://www.ucc.uconn.edu/~tam/
1920 Association Drive
Reston, VA 20191-1589
703/620-3660
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The students are using assistive technology to compensate for learning and performance barriers.

## REFERENCES

The Council for Exceptional Children. (1998). What every special educator should know: The international standards for the preparation and certification of special education teachers (3rd ed.). Reston, VA: Author.*

Individuals with Disabilities Education Act. (1997). 20 U.S.C.S. 1400 et seq.*

Ono, R., & Wedemeyer, D. J. (1994). Assessing the validity of the Delphi technique. Futures, 26, 289-304.

* To order books marked by an asterisk (*), please call 24 hrs/365 days: 1-800-BOOKS-NOW (266-5766) or (801) 261-1187; or visit them on the Web at http://www.BooksNow.com/TeachingExceptional.htm. Use VISA, M/C, or AMEX or send check or money order + $4.95 S&H ($2.50 each add'l item) to: BooksNow, Inc., Suite 220, 348 East 6400 South, Salt Lake City, UT 84107.

## IDEA AND ASSISTIVE TECHNOLOGY

With the passage of the 1997 amendments to the Individuals with Disabilities Education Act (IDEA) (IDEA Amendments of 1997, Public Law 105-17), teachers are expected to have an additional set of knowledge and skills. For every student with an individualized education program (IEP), teachers must now consider the appropriateness of assistive technology as a tool or intervention. Teachers with little knowledge of assistive technology will have difficulty fulfilling this new requirement without assistance or additional training. Many special educators currently in the field may need to gain new competencies in an area of special education unfamiliar to them.

## ASSISTIVE TECHNOLOGY DEFINED

Assistive Technology Device: 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.

Assistive Technology Service: Any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device. Such services include the following:

* The evaluation of the needs of such child, including a functional evaluation of the child in the child's customary environment.

* Purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices by such child.

* Selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, or replacing of assistive technology devices.

* Coordinating and using other therapies, interventions, or services with assistive technology devices, such as those associated with existing education and rehabilitation plans and programs.

* Training or technical assistance for such child, or, where appropriate, the family of such child.

* Training or technical assistance for professionals (including individuals providing education and rehabilitation services), employers, or other individuals who provide services to, employ, or are otherwise substantially involved in the major life functions of such child.

Source: Individuals with Disabilities Education Act (IDEA) Amendments of 1997, Section 602.

## TABLE 1. ESSENTIAL KNOWLEDGE AND SKILL COMPETENCIES

### PHILOSOPHICAL, HISTORICAL, AND LEGAL FOUNDATIONS OF SPECIAL EDUCATION
Knowledge
1. Legislation and regulations related to technology and their implications for special education.
Skills
2. Articulate a philosophy and goals for using technology in special education.
3. Use technology-related terminology appropriately in written and oral communications.

### CHARACTERISTICS OF LEARNERS
Knowledge
4. Characteristics of exceptional learners that influence the use of technology.
5. Impact of technology on exceptional learners.
6. Impact of technology on exceptional learners with moderate disabilities.
Skills
7. Identify the academic and physical demands placed on the student by computer software and related technology materials.

### ASSESSMENT, DIAGNOSIS, AND EVALUATION
Skills
8. Analyze, summarize, and report student performance data to aid instructional decision-making regarding technology.
9. Identify functional needs, screen for functional limitations, and identify if the need for a comprehensive assistive technology evaluation exists.
10. Refer for additional evaluation regarding technology if adequate data are not available for plan development.
11. Recognize the need for further evaluation regarding technology, and refer to other professionals when appropriate.

12. Recognize poor outcomes regarding technology needs, and reevaluate and reinitiate the process as needed.

13. Work with assistive technology team members to identify assistive technologies, both hardware and software, that can help individuals meet the demands placed upon them in their environments.

14. Define measurable objectives to monitor progress toward achieving stated goals regarding technology.

15. Observe and measure consumer's performance with the assistive technology after a period of initial use.

16. Compare actual performance with anticipated performance and the goals stated in the intervention plan.

17. Interview the consumer, the family, and caregivers to determine if the technology solution meets their present and future needs.

## INSTRUCTIONAL CONTENT AND PRACTICE
Knowledge

18. Procedures for evaluating computer software and other technology materials for their potential application in special education programs.
Skills

19. Identify elements of the special education curriculum for which technology applications are appropriate and ways they can be implemented.

20. Design, deliver, and assess student learning activities that integrate computers/technology for a variety of student populations.

21. Design student learning activities that foster equitable, ethical, and legal use of technology by students.

22. Identify and operate software that meets educational objectives for students in multiple educational environments.

23. Use computers to support various stages of the learning process and to facilitate student reporting of educational achievements.

24. Use technology to compensate for learning and performance barriers.

25. Identify and use assistive technologies that can provide access to educational materials that are otherwise inaccessible to some individuals.

26. Use computer-based productivity tools to develop classroom materials.

27. Teach special education students to use productivity software programs to perform tasks such as word processing, database management, graphics production and telecommunications.

28. Teach special education students to operate equipment and run associated educational programs.

29. Use productivity tools for word processing, database management, and spreadsheet applications.

30. Solicit accurate feedback from end-users and others having experience with technology.

31. Understand proper mechanical and electrical safety practices, or direct their use in the assembly and integration of the technology at a defensible level of competence.

## PLANNING AND MANAGING THE TEACHING AND LEARNING ENVIRONMENT
Skills

32. Demonstrate the proper care of technology systems and related software; use simple diagnostics to determine problems that arise, and perform routine maintenance.

33. Arrange and manage the classroom environment to facilitate the use of technology.

## MANAGING STUDENT BEHAVIOR AND SOCIAL INTERACTION SKILLS
Skills

34. Organize computer activities to promote positive social interaction.

## COMMUNICATION AND COLLABORATIVE PARTNERSHIPS
Knowledge

35. Roles that related services personnel assume in providing technology services to special education students.
Skills

36. Recognize the need (how, when, where) to refer a consumer to another professional regarding technology.

37. Identify assistive technology team members and their roles.

38. Design and implement integrated technology classroom activities that involve teaming and/or small group collaboration.

39. Collaborate with consumer and other team members in planning and implementing the use of assistive and adaptive devices.

40. Participate in collaborative projects and activities involving technology.

41. Demonstrate effective group process skills.

42. Communicate effectively including listening, speaking, and writing on technology issues.

43. Use electronic mail and Web browser applications for communication and for research to support instruction.

44. Advise general education teachers about the use of technology systems with special education students who are mainstreamed into their classes.

## PROFESSIONALISM AND ETHICAL PRACTICES
Knowledge

45. Confidentiality of information

46. Limits of expertise--recognize and seek outside expertise.
Skills

47. Recognize own skills and knowledge regarding technology and limit individual practice accordingly.

48. Maintain a professional development program to ensure the acquisition of knowledge and skills about new developments in technology as they become available.

49. Identify activities and resources to support professional growth related to technology.

50. Demonstrate knowledge of equity, ethical, legal, and human issues related to technology use in special education.

51. Adhere to copyright laws about duplication and distribution of software and other copyrighted technology materials.

**SELECTED BOOKS**

**SPECIAL EDUCATION TECHNOLOGY**

Church, G., & Glennen, S. (1992). The handbook of assistive technology. San Diego, CA: Singular Publishing Group.*

Cook, A. M., & Hussey, S. M. (1995). Assistive technologies: Principles and practice. St. Louis: Mosby.*

Flippo, K. F., & Inge, K. J. (1997). Assistive technology: A resource for school, work, and community. Baltimore: Paul H. Brookes.*

Galvin, J. C., & Scherer, M. J. (1996). Evaluating, selecting, and using appropriate assistive technology. Gaithers-burg, MD: Aspen.

Lewis, R. B. (1992). Special education technology: Classroom applications. Pacific Grove, CA: Brooks/Cole.*

Male, M. (1997). Technology for inclusion (3rd ed.). Boston: Allyn & Bacon.*

**PRODUCTIVITY TOOLS**

Caughlin, J. (1996). ClarisWorkshop for teachers. Eugene, OR: Visions Technology in Education.*

Fleck, T., Isbister, S.C., Carey, C., Brundige, A., and Westerfield, M. (1997). HyperStudio for terrified teachers. Huntington Beach, CA: Teacher Created Materials, Inc.

Jonassen, D.H. (1996). Computers in the classroom: Mindtools for critical thinking. Englewood Cliffs, NJ: Prentice Hall.

**SELECTED ASSISTIVE TECHNOLOGY WEB SITES**

Applied Science and Engineering Laboratories

http://www.asel.udel.edu/at-online/assistive.html

Assistive Technology On-Line is a World Wide Web (WWW) database on Assistive Technology (AT). This effort is being organized by the Applied Science and Engineering Laboratories through its four major programs.

Equal Access to Software and Information (EASI)

http://www.rit.edu/˜easi/index.html

People with disabilities must have the same access to information and resources as everyone else. EASI's mission is to promote this access through (a) on-site and on-line workshops; (b) publications and videos; (c) e-mail discussion lists; (d) Web site; (e) electronic journal; and (f) participation in regional and national conferences.

Jim Lubin

http://www.eskimo.com/˜jlubin/disabled.html

The pages provided here are meant to serve as a WWW resource to provide useful information. They were created and are maintained solely by Jim Lubin, who is a C2 quadriplegic, completely paralyzed from the neck down and dependent on a ventilator to breathe.

National Center to Improve Practice

http://www.edc.org/FSC/NCIP/

The National Center to Improve Practice (NCIP) site links community members through a series of facilitated discussion forums known as NCIPnet, which provide opportunities to exchange information and build knowledge through collaborative dialogue.

Trace Research and Development Center

http://trace.wisc.edu/tcel/

Co-Net is a cooperative effort that brings together information of several types in several formats. The formats include databases, Web sites, and full-text documents; the information provided through these formats includes material on assistive devices, services, funding, legislation, and universal design.

**UNIVERSITIES OFFERING COURSES IN SPECIAL EDUCATION TECHNOLOGY**

California State University, Dominguez Hills, CA
California State University, Northridge, CA
California State University, Sacramento, CA
Columbia University, Teacher's College, New York, NY
Dowling College, Oakdale, NY
Florida State University, Tallahassee, FL
George Mason University, Fairfax, VA
Johns Hopkins University, Baltimore, MD
Peabody College at Vanderbilt University, Nashville, TN
Purdue University, West Lafayette, IN
Regent University, Virginia Beach, VA
Simmons College, Boston, MA
Tufts University, Medford, MA
University of Buffalo, Buffalo, NY
University of Colorado, Denver, CO
University of Kansas, Lawrence, KS
University of Kentucky, Lexington, KY
University of Massachusetts, Boston, MA
University of New Mexico, Albuquerque, NM
University of South Carolina, Columbus, SC
University of Virginia, Charlottesville, VA
University of Wisconsin, Milwaukee, WI
Western Michigan University, Kalamazoo, MI

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