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ABSTRACT

This document contains the following papers on special needs from the SITE (Society for Information Technology & Teacher Education) 2002 conference: (1) "Selected Technology-Infused Thematic Activities for Elementary and Special Education Teacher Education Programs" (Cindy L. Anderson and Kevin M. Anderson); (2) "Educational IT: How Students and Employees with Disabilities Can Access IT" (Sheryl Burgstahler and Lyla Crawford); (3) "Assistive Technology Basics in Education" (Terence Cavanaugh); (4) "Enhancing Special Technology Instruction: Improving Methods for Teachers in General Education" (Valerie Larsen and Terri L. Demmon); (5) "Using Robolab Software and Lego Hardware To Teach Computing Concepts to Deaf and Hard-of-Hearing High School Students" (James R. Mallory and Ronald R. Kelly); (6) "Technology Integration into Special Education Coursework: Instructor-Focused and Learner-Focused Integration" (Sylvia S. Martin and Caroline M. Crawford); (7) "TIPS: Technology Integration Projects across Special Education Teacher Preparation Programs" (Trinka Messenheimer, Tara Jeffs, Alicia Bevill, Wm Morrison); (8) "GIDL-PC: A Global Infrastructure for Distance Learning for the Physically Challenged" (Warren Moseley); (9) "The Numerical and Literary Six-Year Old, 125 IQ Dyslexic Explores IT and Opens Up New Avenues of Thought and Areas of Practical Experience for In-Service Education in a Bi-Lingual Environment" (Daithi O Murchu); (10) "Enhancing Parent Teacher Partnerships through Technology" (Jane B. Pemberton, Joyce Rademacher, Tandra Tyler-Wood, Maria Victoria Perez Cereijo); (11) "Using Microsoft Word's Tracking Changes To Improve the Writing of Students with Special Needs"; (12) "Providing an Online Instructional Medium for the Deaf" (John Thompson); (13) "Challenging Decisions: Software Selection and the IEP Process" (Roberta K. Weber and Jim Forgan); and (14) "Effectiveness of QuickTime VR as an Instructional Environment for Students with Special Needs" (William R. Wiencke). Brief summaries of several conference presentations are also included. Most papers contain references. (MES)

Special Needs (SITE 2002 Section)

SPECIAL NEEDS

Selected Technology-Infused Thematic Activities for Elementary and Special Education Teacher Education Programs

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Abstract: This paper is a description of various techniques for integrating technology skills into thematic units for use by pre-service teachers in teacher education programs involving elementary and special education preparation classes. Numerous software titles are highlighted as appropriate for use by primary and upper elementary/middle level students in integrated lessons. Also provided are ideas for using literature and writing skills in activities involving math, science, and social studies. Activities for using spreadsheets, databases, and graphing software are also described for use in collaborative and cooperative instructional settings.

Introduction

Reform efforts in schools have included the development of standards that school districts use to develop curriculum and instructional methodologies (Anderson and Anderson, 2000). Organizations that developed these standards began by making them disciplinary specific (Daniels and Bizar, 1998). Increasingly, schools that focus on authentic activities are finding this classification inadequate for effective use with students (Daniels and Bizar, 1998). School districts today that are attempting to utilize authentic instruction that integrates technology in the classroom are adapting their instructional methods to accommodate both technology and thematic approaches for their lessons (Pastorek and Craig, 2000). The technology becomes a tool to enhance the multidisciplinary environment (ISTE, 2000). In an effort to begin exposing pre-service teachers to more authentic instruction that includes the integration of technology, several sample activities have been successfully developed and used by the authors in teacher training programs, including elementary education methods courses and special education methods courses. These activities have been used in teacher education classes as a demonstration of how teachers can develop technology-integrated lessons emphasizing authentic learning. Beginning with the selected content gleaned from national academic standards in content areas, the lessons integrate technology in a seamless fashion and result in teaching products that can be used by the pre-service teachers in their own classrooms. These lessons also provide pre-service teachers with an opportunity to demonstrate the ability to use instruction reflecting the ability to teach to academic standards, mastery of pre-service teacher technology standards, and mastery of pre-service beginning teacher standards. These lessons also serve as a satisfactory element for pre-service teacher portfolios demonstrating mastery of content and technology standards. For each of these lessons, the teacher educators would involve the pre-service teachers as sample elementary or secondary school students and walk them through the lessons, discussing a variety of ways the lessons could be used with their own classroom students during practicum experiences or student teaching.

Integrated Lessons Using Technology

English/Language Arts

Two activities in the area of reading and language arts are described here, one for primary students and the other for older students. The lesson for younger students focuses on integrating science into the language arts, while the lesson for the older students integrates several subject areas to accommodate the model of different teachers for different classrooms. For the younger student, the instructor begins by reading a science-based picture book to the students that illustrates how animals look and move. A discussion with the children about how different animals in the story look and move follows the reading of the story. Next the teacher collects vocabulary words for animal colors, words that describe how different animals move, words that describe different animal body coverings, and finally, words that describe the size of different animals. The children then choose an animal of their own of which they will write a description, so that the other students can guess their animal. To do this story, they create a word web with *Kidspiration* (Inspiration Software) using the correct words from the earlier word bank for color, movement, covering, and size. This web is used to develop the story that describes their animal. Finally, they use *KidPix Studio* (Broderbund) to draw a picture of their animal. If desired, the children can also write their story in *KidPix Studio* using the typewriter function.

For the older children, the teacher could use a work of literature such as *The Adventures of Huckleberry Finn* by Mark Twain. This book is available in software format from Don Johnston Inc. for use on the computer by students needing a simplified version. Students may investigate the social relationships of people from different ethnic backgrounds during Mark Twain's lifetime as an integrated social studies/language arts activity. Using word processing software, the students would be able to write a newspaper column or an editorial expressing the local views of race relations appropriate to the time period. For mathematics integration, students would be able to use a spreadsheet such as *The Cruncher* (Davidson) or *Excel* (Microsoft) to chart and graph distances and times traveled by Huck Finn on the river. Both of these programs allow the development of graphs that may be used to support a newspaper article about travels on the Mississippi River. As a science integration, students may use a database program such as *Filemaker Pro* (Filemaker) or *Access* (Microsoft) to keep track of different kinds of wood that might have been used for building rafts. Students could experiment with various woods in the lab to test for floating ability, the volume of water that was absorbed, and how much weight wood of varying degrees of wetness could support. This database information could then be used in writing an article on how to build the best rafts for use on the river.

Science, Math, and Social Studies

These lessons integrate math, science and social studies into lessons that can be done in collaborative or cooperative groups for student of all ages and abilities. As is the case for most integrated lessons, reading and writing skills are fundamental for the successful completion of the project and provide the framework for the description of results generated. For example, one lesson may begin with the CD-ROM of the fable *The Tortoise and the Hare* (Broderbund). After reading the story and exploring the CD-ROM, the students can discuss the elements found in a fable and make a flowchart of the elements using either *Kidspiration* or *Inspiration*. *Amazing Writing Machine* (Broderbund) may be used to write fables based on group discussions. *Timeliner* (Tom Snyder Productions) may be utilized to make a visual representation of the order of events in the fable. Programs such as *Geography Search* (Tom Snyder) and *Mapmaker's Toolkit* (Tom Snyder) are useful for exploring and designing pictures of the geographical regions in the fables. For a more localized map for younger children, *Neighborhood Map Machine* (Tom Snyder) or *KidPix Studio* may be used to draw maps based on the areas in which students live.

Science and math explorations based on *The Tortoise and the Hare* can investigate speed and friction. Knowing that the tortoise and the hare traveled at different speeds and rates, students can devise practical analogies for classroom experimentation. For example, students can use two 2-liter soda bottles to correspond to the tortoise and the hare. One bottle should be empty and the other one half full. Students should predict which bottle will travel the farthest and which will have the greatest speed at a preset distance from the bottom of a ramp. They should also predict which bottle will behave more like the tortoise or the hare. These predictions may then be recorded in *The Cruncher* or in a graphing program such as *The Graph Club* or *Graph Master* (both from Tom

Snyder). The bottles are then rolled down an inclined ramp, with the students measuring both total distance covered and the time taken. They may also calculate the speed of each bottle at certain distances using their measurements. Using multiple measurements, students can graph and discuss the reasons for the results, noting that the friction of the sloshing water in one of the bottles probably impacted the results. Finally, students may write up a final lab report describing their observations and measurements.

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E-learning as a facilitator in special education frameworks

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Students in teachers colleges take courses for better use of computer skills. Yet in practice, it transpires that the work models applied at schools are outdated for the most part:

- Use of computers is limited to a rigid time frame according to the class setup.
- A great deal of use is made of rigid educational software for drills, especially in kindergartens.
- Teaching of computer skills is not carried out in a comprehensive manner
- Many subjects are learned without computer work to begin with.
- Little a ttention is given to the social and therapeutic computer-assisted interaction

A new initiative was taken at the Levinsky College of Education, in the Special Education Department: The methodology course is planned for distance learning.

The site and its activities were open and accessible to all Special Education Department students. Several class meetings are held for active experimentation, discussion of syllabus and enlightening reflective and social thinking. In addition, we met for close on-the-job training. Computer skills are being taught while exposing the students to an interactive learning environment and tutoring them in their practical work.

The students experience the difficulties of acquiring skills concurrently, while learning new subjects. Such an experience is common in the learning process of young children, and in special education. Students are encouraged to share their feelings, thoughts, empathy and comprehension during class meetings, as well as in chat and discussion group.

Our assumption is that inculcating computer use as part of the teaching process would help students, by way of modeling, to plan similar work formats with their pupils. This knowledge is particularly important to special education teachers: computer-related teaching of children with learning disabilities and emotional and social difficulties, assists in interactive learning, organizing information and building up learning skills, thought processes and known environment.

Examining the students' practical work techniques in the wake of this course we found that there was a greater use of computers in instruction, use of the computers in an interactive manner and integrating them as an additional teaching method in the lessons. Improvement in social interaction was observed by the stuff in the classes and kindergartens. Few younger children with different communication deficiencies revealed new patterns of interaction.

A content analysis attributes the success to a number of factors:

- The basic concept of combining teaching and alternatively learning: relevant subjects through computer-related activities. The students learn it all -- communication skills, self-awareness, empathy, how to collect and process information and how to execute tasks -- while learning topics relevant to their or practical work.
- Modeling as a basis for planning the students' both learning and teaching activity.
- On-the-job training and supervision follow up the process of learning the relevant subjects and computer skills.
- The creations of professional discussions in various learners' communities to which the students have complete access. The students regarded themselves as part of a professional group.
- Placing the responsibility of learning and communication in the student's hand.
- The change of teacher-student interaction towards mentoring and collegial relations.
- Sharing of feelings in a supporting group
- Better options for allocating students' learning span according to learning styles and time limits.

A "ripple effect": Computer uses spread among additional college lecturers and new work models were adopted in the practical work frameworks. The impact on the mentors and college lecturers had not been foreseen but is a welcome outcome, with a positive influence on the educational system.

Educational IT: How Students and Employees with Disabilities can AccessIT

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Abstract The National Center on Accessible Information Technology in Education (AccessIT) at the University of Washington serves to increase the access of individuals with disabilities to electronic and information technology in educational institutions at all academic levels nationwide. It is funded by the National Institute on Disability and Rehabilitation Research (NIDRR) of the U.S. Department of Education and is located at the University of Washington in Seattle. This paper promotes the use of accessible technology, provides examples of accessible electronic and information technology, and lists useful resources.

The National Center on Accessible Information Technology in Education (AccessIT) at the University of Washington serves to increase the access of individuals with disabilities to electronic and information technology in educational institutions at all academic levels nationwide. It is funded by the National Institute on Disability and Rehabilitation Research (NIDRR) of the U.S. Department of Education and is located at the University of Washington in Seattle.

Access to electronic and information technology, from telephones to computer software, is essential for people with disabilities to fully participate in today's high tech world. The increasing use of technology presents remarkable opportunities for people with disabilities. However, it presents new accessibility challenges to those who have sensory, mobility, learning, and other disabilities. If we do not address these challenges and assure that electronic and information technology can be used by everyone, the potential for technology as a great equalizer will go unrealized. The new Center develops and disseminates materials, training, and technical assistance that facilitate adoption of policies and practices leading to the increased use of accessible electronic and information technology in educational settings.

Examples of Accessible Electronic and Information Technology

Following are examples of accessible electronic and information technology in education.

- Accessible web pages allow students with disabilities, including those who have sensory impairments, to access information; share their work; communicate with peers, teachers, and mentors; and take advantage of distance learning options.

- Accessible instructional software (on disks, CDs or other media) and documentation allow students with disabilities to participate side-by-side with their peers in computer labs and classrooms as they complete assignments; collaborate with peers; create and view presentations, documents, spreadsheets; and actively participate in simulations and all other academic activities.

- Accessible telecommunications and office equipment makes communication and educational administrative functions accessible to everyone, including those with mobility, visual and hearing impairments.

Goals and Activities

AccessIT helps educational institutions make electronic and information technology accessible to all students and employees. In so doing individuals with disabilities can benefit from all technology-based educational and school-related activities. AccessIT facilitates the implementation of policies, procedures, and practices that promote the procurement and use by educational entities of accessible electronic and information technology that applies universal design principles and meets recognized standards.

AccessIT works nationwide with NIDRR-funded Disability Business and Technical Assistance Centers (DBTACs). By providing training, support, dissemination materials, and technical assistance to the DBTACs, AccessIT utilizes and builds on this existing infrastructure for information dissemination and technical support. AccessIT also provides information and training to educational institutions through its web site and presentations at educational events.

- AccessIT's web site is growing to become a resource for educational entities and their constituents for information on accessible electronic and information technology. The web site will include accessibility checklists, case studies, best practices, frequently asked questions, and links to resources, and case studies, all tailored to applications of electronic and information technology in education.

- AccessIT conducts training sessions and presentations at major educational, disability, and technology conferences to inform target audiences about how to make informational technology in education accessible to individuals with disabilities and of the availability of resources from AccessIT and of technical assistance from the DBTACs.

These types of activities benefit:

- Policy makers, including school principals, district directors, technology directors, and others who develop policies, guidelines, and procedures regarding planning for and procuring electronic and information technology;

- Implementers, including educators (both in general education and special education, precollege and postsecondary), computer lab personnel, library staff, and others who implement electronic and information technology and support its use by students, teachers, and other employees; and

- Students and employees with disabilities, as well as their families and advocates, who use or should be able to use electronic and information technology.

Conclusion

Electronic and Information Technology open doors to education and employment for those who have access. Assuring that individuals with disabilities can benefit from these opportunities, electronic and information technology at all academic levels must be accessible to students and employees with disabilities.

Resources

To learn about accessible electronic and information technology, consult the following resources:

The Adaptive Technology Resource Center - http://www.utoronto.ca/atrc/
Training, consultation, and information to help both educators and users with adaptive technology.

Center for Applied Special Technology (CAST) Universal Design for Learning http://www.cast.org/udl/
Resources, research and examples to assist in the design of learning materials and activities for all learners.

Closing the Gap - http://www.closingthegap.com
Information on computer technology in special education and rehabilitation.

DO-IT - http://www.washington.edu/doit
Resources on AT and IT for post secondary education, one of the AccessIT partners.

Equal Access to Software and Information (EASI) - http://www.isc.rit.edu/~easi/
Resources on AT and IT including technical assistance and training, one of the AccessIT partners.

Information Technology Technical Assistance and Training Center (ITTATC) -
http://www.ittatc.org/index.cfm
The ITTATC promotes the development of accessible electronic and information technology by providing technical assistance, training and information.

The National Center on Accessible Information Technology in Education -
http://www.washington.edu/accessit
Resources, knowledge base, case studies, promising practices and events regarding accessible electronic and information technology.

National Center for Accessible Media (NCAM) - http://ncam.wgbh.org/
Research and development facility dedicated to making media accessible to people with disabilities.

Section 508: The Road to Accessibility - http://www.section508.gov/
Resources for understanding and implementing the requirements of Section 508.

Trace Research and Development Center - http://www.trace.wisc.edu/world/
Works on ways to make standard information technologies and telecommunications systems more accessible and usable by people with disabilities.

UW Center for Technology and Disability Studies - http://uwctds.washington.edu/
Resources on AT and IT including technical assistance and training, one of the AccessIT partners.

Web Accessibility Initiative (WAI) - http://www.w3.org/WAI/
Promotes accessibility of the Web through guidelines, tools, education and outreach, and research and development.

Assistive Technology Basics in Education

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Abstract: Currently in the USA about 150 million people are impacted by cognitive or physical disabilities in some form. And, according to some researchers, approximately half of the entire planet's population, which is an estimated three billion people, are affected by disabilities. Because of the large and growing number of individuals in schools who have special needs and the number of laws and rules that apply to assistive technologies, assistive educational technology is growing in importance. Assistive Educational Technology is the theory and practice of design, development, utilization, management, and evaluation of processes and resources that are used to increase, maintain, or improve functional capabilities of individuals, with or without disabilities, for learning. As more regular education teachers teach mainstreamed students, they need understanding of how assistive technologies can support student learning.

Assistive Educational Technology

Disabilities rights leaders have said that the application of technology will be the equalizer ofthe 21st century (Flippo, Inge and Barcus, 1995). Through the use of assistive technology (AT) devices, many students can decrease their isolation and become an important part of a regular classroom. AT is a basic tool in the educational process for any individual who may be experiencing a disability. Screen readers that read aloud the text on the screen or web page can overcome barriers to accessing electronic information encountered by students who have vision disabilities. Captions can overcome barriers for students who have hearing disabilities. Some access solutions that use principles of universal design are built right into the hardware or software of most computers and programs (RESNA, 2001).

Assistive Educational Technology (AET) is the theory and practice of design, development, utilization, management, and evaluation of processes and resources that are used to increase, maintain, or improve functional capabilities of individuals, with or without disabilities, for learning (Cavanaugh, 2000). The distinction between assistive and educational technologies is becoming less clear as the concept of universal design is incorporated into conventional technology. As educational technology develops toward universal design it will go beyond just providing various forms of access to existing methods and materials; and will incorporate AT approaches and accommodations in the application of teaching for all individuals. This will have the impact of changing the learning goals, the teaching methods, and the means of assessment for all students.

What is Assistive Technology?

The Technology-Related Assistance for Individual with Disabilities Act of 1998 (PL 100-407) gave us the first legal definition of assistive technology devices and services. An AT device was 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 individuals with disabilities. AT then is a wide-ranging educational tool that is growing in its use and importance, and is required for consideration for all students classified with any form of disability and must be included on that student's individual education plan (IEP).

AT may be classified as high, middle or low tech. A high technology device usually requires electronics or microchips to perform some function, while bw technologies usually do not require a power source. An example of the application of AT could range from having a computer read a book (high tech) to printing out the material in a larger font or the student using a magnifying glass (low tech) to read the required material.

Assistive Technology Categories

Along with levels of the technology, there are levels of how the necessary AT item will be applied in the school situation which are: personally, developmentally, or instructionally necessary (Judd-Wall, 1999). Personally necessary items are AT devices that are used by an individual that enable a learner to more effectively interact with his/her environment. While developmentally necessary devices help with an educational need based on some developmental delay, ideally would be improved or overcome, eliminating the need for the assistive technology item in an individual's future. Lastly, instructionally necessary devices are ones that modify the instructional process at a course or grade level, and do not need to be moved with the user as her or she progresses to the next level. Progressing from individually to instructional necessary, the materials used are much more likely to be shared among various students. This application of AT to all students becomes a basic component of universal design in education, by allowing any student better access or access in a more appropriate alternative format to the information being taught.

AT has the ability to increase student independence while at the same time advancing academic standing, as it can also allow increased participation in classroom activities by students with special needs, letting them have equal access to their school environment. Rehabilitation Engineering and Assistive Technology Society of North America (RESNA, 2000) has identified twelve different areas where AT can be used. Of the twelve, four are areas that would have a major impact in any school situation, include: Work Site Modifications, Instructional Material Aids, Seating and Positioning Aids, and Sensory Aids. The other AT application areas are Aids for Daily Living, Communication and Augmentative Communication Tools, Environmental Control Systems, Leisure Time or Recreational Adaptations, Mobility Aids, Prosthetics and Orthotics, and Vehicle Modifications, and also apply in some way to the school setting.

Making a Difference

According to David Rose and Anne Meyer (CAST, 2000) AT tools can make a significant difference for students with disabilities. AT tools can allow access to information and activities that otherwise are inaccessible. The other side of AT application is that the tools can also make information and resources more available to those who don't have a disability or have not yet been identified as having a disability. The exceptional education teachers are not the only ones who need awareness of AT applications. All teachers are likely to have mainstreamed students, and the purpose for AT is to allow and support the student in the general student population. Professional organizations including the International Society for Technology in Education (ISTE, 2001) and National Council for Accreditation of Teacher Education (NCATE, 2001) have standards for all teachers and administrators regarding AT that require teachers and administrators to use technology to support learner-centered strategies that address the diverse needs of students and apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.

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Using technology to facilitate the academic achievement of learning disabled students in general education classrooms

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Abstract This presentation will describe and demonstrate a sampling of the many ways that technology can assist in meeting the needs of students with learning disabilities. Ideas for how to use one computer in the classroom will be discussed as well as to demonstrate CD-Rom software (Tom Snyder), graphic organizers (Inspiration), and Text-Help programs. This presentation will provide previews of programs mentioned, along with an annotated bibliography of software and Internet resources.

Introduction

In the day of inclusion, most students with learning disabilities spend much of their school day in the general education classroom. By definition, students with learning disabilities have normal intelligence or above, but often are frustrated in content area subjects due to problems in reading and written language (Bos, C. & Vaughn, S., 2002). Students may be very interested in science or history, but if the text is the only avenue of gaining information, could fail the course.

This presentation will describe and demonstrate a sampling of the many ways that technology can provide a means of accessing information and of providing means to assess the knowledge that a student may have but not be able to demonstrate through traditional means. Technology offers many avenues of providing an interactive way for a student to get the needed academic information without having the read the entire text.

CD-ROMs as a source of information

As long as a classroom has access to one computer, the CD-Rom becomes a tool that can provide access to current subject specific information in an interactive way. For instance, Dorling Kindersley markets numerous programs in the area of science and mathematics that offer the option of text being read and short video clips to illustrate a topic. By using a program such as this, a student is able to gain adequate information in an age appropriate way to allow him/her to be successful in the class.

Tom Snyder Productions offer many programs that integrate cooperative learning into the use of the software and supplementary materials. An example is The Great Ocean Rescue. Each team member has a role to play. Problem solving and higher order thinking is involved, but through the team and the information provided a student with reading problems could contribute and be successful.

Word processors with audio assist

Each year more and more user-friendly word processors that include speech capabilities are available. If the student early on accesses such programs as Read, Write, and Type, the written response becomes accessible. Also programs such as Text Help offers audio feedback options when just a few letters of a word are written. Now Text Help offers programs that are available so that multiple users can utilize the same disk, whereas earlier due to the software learning the style of the writer, each student needed a disk.

The use of the portfolio, the digital camera, along with such programs as PowerPoint, allow students with problems in reading or written expression to find success in a way that was not available before our "digital" age (SEDL, TAP into Learning, 2000).

Graphic organizers

One of the challenges that teachers face in the age of high-stakes testing and diverse-ability classrooms is how to cover the entire curriculum. Students learn lots of facts, but often they are not able to visualize how these isolated facts relate to each other. Connecting facts and seeing the big picture or concepts can be challenging for even experienced teachers. (Ellis, 2001). Graphic organizers and frameworks are effective research based strategies developed by the University of

Kansas Center on Research for Learning. Inspiration software has a variety of graphic organizers that can help teachers to frame information so that students see the relational understanding of the instruction. Graphic organizers also provide a means for elaboration and understanding how ideas hang together. This portion of the session will focus on graphic organizers as well as some tips on integrating technology and websites into the graphic organizers.

Internet

The Internet provides a tool that allows the student with learning difficulties an avenue to transcend traditional classroom tools that have previously brought failure. Through the web a student can link to many virtual trips and opportunities and access information about whatever venue "peeks" his/her interest. A list of Internet resources for teachers will also be provided. Evaluation of Internet websites is also important and tips for how to evaluate websites will be reviewed.

Infusing Instructional Media into Preservice and Inservice classes

Those of us who thrive on the wealth of opportunities provided by instructional media need to remember that many in preservice and inservice classes may not have access to technology in their classrooms. Also in certain areas the use of the computer as an instructional tool is just gaining attention. In poorer school districts, a current computer in the classroom is only beginning to happen. Also among teachers, varying levels of expertise as well as desire exist. As preservice and inservice educators, opportunities for them to experience and complete projects involving instructional technology helps them realize the potential for the use of technology in their classrooms. They can also become advocates for accessing different forms of technology for their campuses and classrooms (enc focus, 2000).

This presentation will provide previews of programs mentioned, along with an annotated bibliography of software and sources.

Bridging the Divide for Special Needs

By

Maribeth Montgomery Kasik, Ph.D.

Abstract

Educational Applications of Microcomputers for Teachers of Students With Special Needs are a critical factor in addressing the Digital Divide. Educators often have access to computers, but allow them to sit idle for fear of what to do with them. Access to quality education is about who has and who does not. This gap is often wider for those dealing in special education settings than regular education. The presenter teaches a graduate level computer application class for teachers of students with disabilities. The presentation will highlight the success of the course as well as present samples of student technology projects.

Dr. Kasik will present the curriculum of the course: Educational Applications of Microcomputers In Special Education as well as utilize the techniques she uses for teaching the class to graduate students at Governors State University in Illinois.

She will provide participants with resourceful Internet sites as well as demonstrate student power point presentations and created websites.

ENHANCING SPECIAL TECHNOLOGY INSTRUCTION: IMPROVING METHODS for TEACHERS in GENERAL EDUCATION

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Abstract: *Indiana University South Bend's School of Education endeavors to develop motivated and committed educators to meet the needs of regional elementary, middle and secondary schools. In keeping with its continuous improvement goals, faculty initiated an effort to enhance and further integrate the role of technology in its year-round teacher training. We provide a brief overview of the content, nature, and concerns with our approaches toward introducing preservice teachers to adaptive technology. We next describe the role of adaptive technology in the current program with special emphasis on exploring instructional strategies, techniques and methods that can enhance the learning for all students. The Special Education program is reevaluating its curriculum to align with new state standards. At the same time, the general education curriculum has expanded its venue to address inclusion of special needs, exceptional, and at-risk children. Additional program analysis is in process via surveys, focus groups and interdepartmental discussions.*

Introduction

Indiana University South Bend's School of Education endeavors to develop motivated and committed educators to meet the needs of regional elementary, middle and secondary schools. In keeping with its continuous improvement goals, faculty at the IUSB School of Education initiated an effort to enhance and further integrate the role of technology in its year-round teacher training. As we redesign our programs to align with new state standards, we are expanding our focus to enhance special technology instruction for special needs and other diverse populations. In this paper, we provide a brief overview of the content, nature, and concerns with our approaches toward introducing preservice teachers to adaptive technology and the various contexts in which those introductions occur.

Review of relevant literature

Over time, the lines between regular and "special" students have become less distinct to parents and educators as more students are identified in the hazy middle ground of these descriptions (Roblyer 2000). The capacity of technology to empower students with special needs, especially physically disabled students, has been well documented (Male 1994). The practical means for converting theory into practice introduced into the classroom include mainstreaming, inclusion, and collaborative teaching or co-teaching (Ainscow 1999; Wallacorsa, Bettencourt, & Zigmond 2000).

Teachers in general education settings are more likely to adopt technology tools that can benefit the spectrum of students in a classroom than they are to focus on special needs children alone. Technology tools available in many of these classrooms are flexible and can be adapted to the needs of individual students. (Wallacorsa, Bettencourt, & Zigmond 2000; Roblyer 2000). The importance of finding tools that general education teachers can employ for all the students in the classroom has been explored for concept-mapping and organizational tools (Lenz & Schumaker, 999). Janney& Snell (2000) describe other pragmatic approaches to the what, how, where, when, and with whom lessons are taught - curricular instructional, and ecological adaptations.

Laws, standards and recommended practices pertaining to educational accountability at state and federal levels are widely available. Modifications in adaptive technology within the instructional technology and special education curricula are driven by these regulations and guidelines (Overton 2000). Converting equal access legal theory into actual classroom practice includes strategies like mainstreaming, inclusion, and collaborative teaching or co-teaching. Both special and general educators need to be well aware of the range of special needs that can exist in a classroom. Teamwork skills and collaboration efforts between special and general educators are key to developing the instructional strategies that incorporate appropriate use of technology for special needs students(Ainscow 1999; Wallacorsa, Bettencourt, & Zigmond 2000; Vitello & Mithaug 1998; Vaughn., Bos & Schumm 2000).

Courses for preservice teachers

IUSB requires that all preservice teachers take an introductory course (W200) in instructional technology. Starting in the fall of 2001, incoming education majors are required to complete a three credit hour course on technology for teachers. Formerly a one-credit course for elementary majors, the course has been redesigned and particular methodologies are introduced that help address special needs students within a general education setting. Through discussion and reading, students explore the social, moral, and technological issues of educational computing, addressing such topics as adaptive technology (including special education in a general education setting), the gender gap, the "Digital Divide", and multicultural sensitivity. The course sections are oriented to either elementary or middle/secondary school audiences to better address the varying instructional strategies, techniques and methodologies appropriate to the school populations IUSB teachers will eventually serve. Throughout the course, the instructors emphasize the flexibility of many of the software applications by modeling ways to construct, modify, or develop lesson activities that can optimize instruction for various learners.

Major topics include introduction to operating systems on both Apple and IBM-compatible personal computers, integration of the microcomputer into the school curriculum, and evaluation of computer assisted educational packages. Students acquire an introduction to integrated software packages including word processing, spreadsheet, database and presentation applications, They are introduced to simple web design using Netscape Composer, electronic grade books, concept mapping (Inspiration), a multimedia authoring tool (HyperStudio), and evaluation of various software and utility packages and hardware commonly employed in P-12 education. As part of web authoring instruction, we illustrate the importance of using headers instead of font sizes to provide necessary information for the visually impaired population that uses text readers. With instruction in concept mapping tools, we explain the importance of visual information to learners at all levels as well as the flexibility of letting learners select images or outlined text as an organizational tool. Preservice teachers are trained to apply advanced Internet search techniques on various search engines to locate and evaluate lesson plans, instructional sites and WebQuests on the World Wide Web. The ASSURE Model (Heinich, Molenda, Russell, & Smalldino 2002) employed for evaluation of lesson plans is among the first of various models the students encounter during their years at IUSB. The students routinely access Oncourse, a proprietary, online course management application developed by Indiana University. Analogous to commercial products such as WebCT and Blackboard, Oncourse (Indiana University 2000) contains chat functions, mail, conferencing/discussion groups, and the ability to integrate online testing, Web authoring, and multimedia resources and other tools for Web-based instruction and/or instructional support.

Following analysis of the fall 2001 classes, we plan to further modify the course by including a competency requiring students to illustrate how a project would be adapted for special education students in categories such as physically disabled, learning disabled, etc. They will also be required to demonstrate how their projects address other diverse populations.

In another example of modifying courses to address special needs and diverse learners, a segment on adaptive technology is now included in the capstone course for preservice teachers on track to obtain the state Computer Endorsement for teaching. This course change resulted from the initial research and needs analysis completed in 2000 (and presented at the 2000 SITE conference) directly responding to weaknesses identified through discussions with advisory groups and stakeholders from area schools.

Content and focus of specific courses in adaptive technology

Since 1992, the IUSB School of Education has offered a technology course for Special Education majors (K400 for undergraduates, K501 for graduates). This course has a pre-requisite of Using Computers in Education (W200 discussed above), the common technology course for all Education majors. The K400 and K501 courses taught many of the same skill sets at a more advanced level. In the spring of 2001, the chair of the Special Education program offered a second section of the K501 course with a new approach. The course was re-designed to reflect more of the same topics that are covered in a capstone course within the Computer Endorsement program. The primary skill sets in word processing, spreadsheets and databases were incorporated into the course, but not as a lesson on each topic, instead, word processing is assessed through papers requiring complex layouts, spreadsheets were assessed through case studies on planning field trips or grant money, databases skills were assessed through the development of IEPs within the database structure.

In the K400/K501 course taught for several years, students were exposed to various peripheral devices for special needs through teacher demonstrations. In the prototype course, students were responsible to demonstrate in class the use of various technologies designed for special needs students. These technologies were gathered from a variety of sources, some students had access to K-12 schools' equipment because they worked as aids and were given permission to bring the equipment to class one day; other students had special needs children and so were using such equipment in their homes for support in the child's education; another source came from the University, which provides equipment for special needs students on campus and, where feasible, instructional demonstration purposes. Two additional components were added to the course, software evaluation and staff development issues. The Software Evaluation component consists of activities starting with students contacting local schools to obtain copies of current software evaluation instruments used in schools, and then turning to literature to obtain additional examples of software evaluation instruments. After class discussions on issues to consider when selecting software for the classroom, students are divided into teams. With the materials collected in hand, each team works to design the best software evaluation tool to meet their needs. Once the instruments are completed, they are usability tested among the classmates. Each classmate writes a review of the software evaluation tool they used (not the one they developed), the reviews of each team's software evaluation tool is collected and shared with the respective teams. With the additional information to consider, the team revises their instrument and submits a final copy for grade. The staff development component consists of activities where students are required to complete library searches for articles on staff development, share the information with the class and submit summaries and reflections on the information gathered. The students are then divided into teams based on interests and skill levels on technology topics. Each team presents a one hour Staff Development Workshop for the class. The topics range from the American Disabilities Act and its impact on technology to Inspiration, Hyper studio, Educational Games, etc. These workshops provide an opportunity for students to learn the fundamentals or expand their experiences with a variety of software packages available in many schools, enabling them to focus on real world strategies for special needs students.

Special needs equipment and software at IUSB

Cost and compatibility of special needs hardware and software form a source of ongoing concerns. The relatively limited market for assistive software and hardware is sufficient by itself to keep prices high. The rate of change for operating systems and underlying personal computers or other large-scale digital software often results in compatibility issues. Several items purchased in spring, 2000 are incompatible with the Macintosh G4s installed in the education lab. Similar difficulties are anticipated with the spring upgrade to multimedia PCs in the same lab. The rapid changes in technology can also adversely affect resident equipment and software. Like other universities in Indiana, IUSB is facing severe budgetary constraints and the prospect of more draconian measures in the near future. One consequence will likely be careful attention to cost/benefit analysis where expensive purchases might benefit one or a few students or faculty.

The Office of Information Technology and the School of Education worked jointly to provide a variety of equipment that would be available for special needs students but also available for educational and instructional purposes. A partial inventory of the equipment includes Touch Screens by Edmark, IntelliTools, IntelliKeys, right and left hand keyboards, a trackball mouse, Window Eyes, ZoomText, a TeleSensory closed circuit television for text magnification, various types of switches, a Slim Armstrong mount, Discover Kenex, etc. We were also able to install copies of word prediction software (Co-Writer and Write Out loud). In addition to many of the items listed above, the Schurz Library also provides special needs students with access to voice recognition software (Dragon Naturally Speaking), a Kurzweil 3000 reader, and Open Book Unbound. Male (1994)

Limitations:

Many of the classrooms used by the School of Education faculty lack Internet connections. Installation of newer technologies was delayed for many years by university plans to move the School of Education. Now, severe funding cuts have left the faculty in classrooms with insufficient technology support. The IUSB Office of Information Technology (OIT) updated the infrastructure to the primary education building in summer, 2001 and is evaluating cost of Internet wiring and investigating some prototypes for wireless technology in some classrooms and the student lounge. Without scheduling classes periodically into the already-overbooked campus technology labs, it is difficult to model the technology integration. Several faculty members develop Web sites or employ Oncourse for web-based instructional support when the Internet is not available in a classroom.

Budgetary concerns, discussed previously, and faculty recruitment are also issues. Given the tight employment market for some years, there is ongoing concern about attracting sufficiently qualified personnel in the Special Education program and to a lesser degree, in the Instructional Technology program. In both programs, IUSB has been fortunate in acquiring a talented, dedicated pool of adjunct faculty.

Future Directions

In preparation for an upcoming NCATE accreditation, an education task force is conducting a needs-analysis of all stakeholders including area schools through the use of surveys, focus groups and inter-departmental discussions, including special education. Surveys were developed and mailed. An assessment grant has been obtained for analysis of the survey returns.

Faculty in the School of Education are gradually infusing newer technologies into their classroom activities. One of the critical roles of faculty is, of course, to model the use of technology in the classroom. We are attempting to model attentiveness to the needs of all learners throughout our courses by discussing diversity in the classroom, promoting visual and written literacy, and optimizing techniques, strategies and methods to reach a broad spectrum of students.

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Using Robolab Software and Lego Hardware to Teach Computing Concepts to Deaf and Hard-of-Hearing High School Students

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Abstract: Each summer, the National Technical Institute for the Deaf (NTID) offers a one-week workshop for approximately 200 deaf and hard-of-hearing high school students, called Explore Your Future (EYF). These EYF students sample a variety of activities that are designed to educate them on different career possibilities. The Holland model is used to help students understand the various career areas and skill requirements.

One of the author's of this paper was responsible for the "Investigative" Holland category and was charged to set up a technology activity. It is not difficult to set up an enjoyable activity that uses technology, but the authors' wanted to have an outcome assessment in place to see if the students gained both an understanding of what the Investigative type of career was and to see what technical concepts were learned during a 45 minute activity. The technical activity and its outcomes are described in this paper.

Introduction

Technical educators of the deaf often wonder if and how quickly deaf and hard-of-hearing students can learn concepts pertaining to computer hardware, computer software/programming, and interfacing the hardware to the software. For the summer 2001 EYF activity, one of the authors developed a 45-minute activity for deaf and hard of hearing high school students enrolled in the Explore Your Future (EYF) program. This activity was developed around Robolab™ software programs in conjunction with Lego™ toys equipped with motors, lights, touch and infrared sensor peripherals interfaced to the Lego RCX controller. The authors also developed a 10-question assessment that tested the students' knowledge before and after the 45-minute activity.

Although students enjoyed these types of activities in years past, nobody really knew if and how much information they learned about the career area and about the specific content being taught. This activity needed an assessment in place to measure the outcomes that showed how much the students actually learned. The current study was an attempt to implement an evaluation process for this EYF technology activity.

The Study

A total of one hour was allotted to this technology activity. This included the assessment and explanation that took about 10 minutes before and five minutes after the activity. The learning activity itself was 45 minutes, with only five minutes of explanation and 40 minutes of hands-on activities.

During the 45 minute activity, students had to: set up and connect the hardware input and output devices, including touch and light sensors; set up and connect output devices, such as lights and motors; interface the input and output devices to the RCX controller; select a correct Robolab software program to run their hardware configuration; download the correct Robolab program to the RCX; run the hardware using the software program which they downloaded to the RCX.

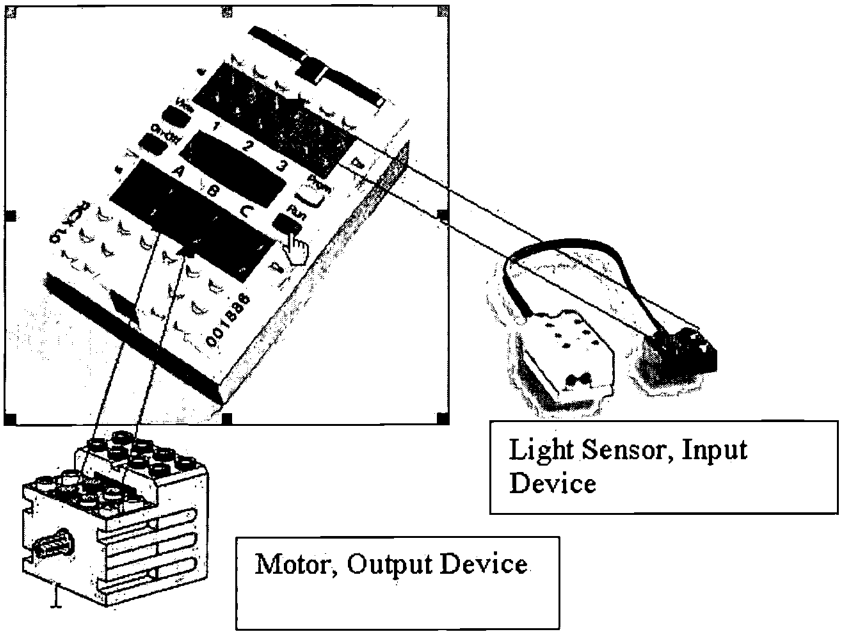


Figure 1: Example of RCX Controller, Lego Hardware and RoboLab Interfacing

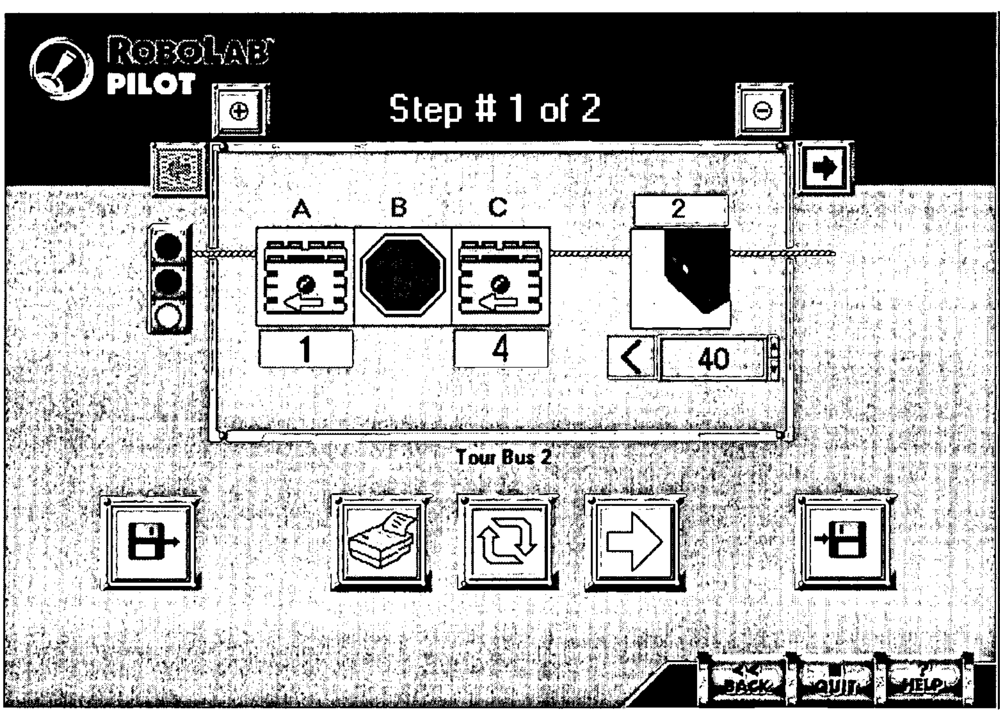
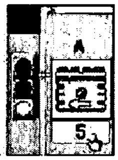


Figure 2: Partial Robolab Software Program for EYF Activity

Two questionnaires were developed, one pre and one post activity that consisted of 10 questions on the actual programming activity plus 4 other questions to find out about student demographics. The questionnaire had to be very brief due to the limited time available for students to fill it out. The 10 activity questions dealt with specific technical details, two about input and output hardware, four about the software and two questions about the interfacing aspects of the activity. The questions had various degrees of difficulty, some fairly obvious and some were quite difficult. Approximately 200 students were asked to fill out the pre and post activity questionnaire.

7.  What do these 2 software commands do?

? I don't know.
? Start the program, turn the motor connected at Port A on so that it rotates in this direction shown at a speed of 5.
? Start the program, turn 5 motors on until the program tells it to stop at point A.
? Go when the motor 5 starts to turn.
? Turn port A item on 5 times

Figure 3: Sample of One EYF Software Question on the Questionnaire.

Findings

There were 215 deaf and hard of hearing students (93 females and 122 males) who participated in the "Explore Your Future" program. The average age for females (17.3) and males (17.5) was statistically similar.

With respect to previous experience with programming, there was a statistically significant gender difference, $\chi^2 = 8.56$, $df = 1$, $p = .0034$. Only 4% of the females had programming experience prior to EYF compared to 17% of the males. Interestingly, there were also gender differences with respect to students' interests in pursuing an investigative programming career. A 2(male vs. female) $\times$ 2(pre vs. post EYF interest) repeated measures analysis of variance showed that males expressed a higher interest in an investigative field, $F(1, 199) = 13.2$, $p = .0004$. Furthermore, there was a significant interaction between gender and interest, $F(1, 199) = 8.1$, $p = .0050$, resulting from the fact that males actually increased their interest in investigative programming from pre to post EYF experience ($M = 3.0$ to 3.5 respectively). In contrast, females showed no change in interest from pre to post EYF ($M = 2.7$ to 2.76).

Regarding students' understanding as to what an investigative type of career was, there was also a significant increase in understanding from pre EYF to post EYF responses, $\chi^2 = 75.7$, $df = 16$, $p = .0001$. Prior to EYF, 44% of the students indicated they "did not know" compared to only 9% at the end of EYF. Similarly, only 34%indicated they understood that computer programming was an investigative type of career while 75% indicated this after their EYF learning experiences.

In terms of learning and knowledge growth relative to hardware and software, there were no gender differences for pre and post EYF responses on the hardware questions ($F(1, 217) = 1.6$, $p = .21$) and the software questions ($F(1, 191) = 3.6$, $p = .06$) and no significant interactions. As a result, overall student learning and knowledge growth were examined regardless of gender. There was a significant difference between the students pre-EYF survey responses for the hardware questions and their post-EYF responses, correlated $t = -12.88$, $df = 222$, $p = .0001$. Similar significant results also occurred for the students pre and post EYF responses to the software questions, correlated $t = -25.82$, $df = 193$, $p = .0001$. Table 1 shows the students' pre and post EYF mean responses and standard deviations for hardware and software knowledge.

	Pre-EYF Survey	Post-EYF Survey
Hardware knowledge		
M	.37	1.6
SD	(.7)	(1.3)
Software knowledge		
M	.35	2.8
SD	(.7)	(1.2)

Table 1: Pre and Post EYF Student Responses on Software and Hardware Questions

Another area of learning was relative to interface connections for input and output devices. For input devices, on the pre EYF survey, student responses indicated that 83% "did not know" with only 8% getting it correct. In contrast, the students post EYF responses showed that only 5% of the students "did not know" with 59% showing a correct response. No gender differences occurred. Similar growth patterns occurred for the question on connections for the output devices. The students pre EYF responses showed that 83% "did not know" and only 8.5% got it correct. At the end of EYF 58% got it correct and only 7.5% "did not know."

Conclusions

The students' pre and post EYF responses showed that a 45-minute activity using a Lego RCX controller and the related input and output hardware along with Robolab software can be an effective way to introduce computer software, hardware and interfacing concepts to deaf and hard-of-hearing high school students. Such an activity can also help clarify deaf students' understanding of an "investigative type of career," in addition to giving them a deeper informational basis for career decision-making when planning their college studies.

There was a statistically significant increase in pre and post activity results relating to the understanding of the investigative career category, regardless of gender. Prior to the EYF activity, 44% of the students stated that they "did not know" what an investigative type of career was compared to only 9% after the activity. Similarly, 35% knew that computer programming was an investigative type of career prior to participating in EYF, while 75% correctly indicated this after the activity.

The findings also showed a statistically significant increase in pre and post activity understanding of hardware, software and interfacing computer concepts, regardless of gender. For hardware input devices, for example, 83% of the students indicated that "they did not know" what an input device was, with only 8% getting the answer correct, whereas after the activity 5% of the students "did not know" with 59% showing a correct response.

This study uncovered some interesting gender differences among deaf and hard-of-hearing high school students. Prior to the EYF activity, only 4% of the females had programming experience compared to 17% of the males. There were also gender differences with respect to students' interests in pursuing an investigative type of career. Males increased their interest in investigative programming from pre to post EYF. In contrast, females showed no change in interest from pre to post EYF activity. These findings reinforce the need to have female role models helping lead these types of activities to further encourage more female participation in technology -related careers.

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Technology Integration into Special Education Coursework: Instructor-Focused and Learner-Focused Integration

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Abstract: Instructional technology within the area of special education expands the teacher candidate's opportunities to communicate with learners and their families. The support that can be available through the use of technology that aids instruction is an important element of the special education methods coursework; however, special education is an area that offers numerous assistive and adaptive activities and tools. Teacher candidates must have instructional technology integrated into the special education methods courses so as to further develop their instructional tools from which to choose, at both the instructor-focused as well as learner-focused integration levels within the learning environment.

Introduction

The integration of technology within a special education learning environment, especially significant within a methods course for teacher candidates, emphasizes the significance of technological tools associated with instruction as well as their appropriate and successful uses. The modeling of both instructor-focused and learner-focused uses of technology is of primary importance for teacher candidates. However, special education university faculty who facilitate special education methods courses may have not had the opportunity to research the integration aspects of technology at any significant length.

Special Education Areas of Coursework

Special education is a specialized area of instruction that maintains a stronghold within numerous areas of expertise. For example, special education not only focuses upon early childhood through secondary education, but the areas of focus also encompass the following specialized areas of influence: child development and learning; curriculum development and implementation; family and community relationships; assessment and evaluation; professionalism; and, application of technologies. From these specialized areas, the curricular scope and sequence is developed.

Supportive Learning Environment

As the topics of coursework are designed, numerous aspects within each of the courses must be fully developed. Expertise must be maintained within the areas of: instructional adaptation; multiple instructional strategies; motivation to learn; classroom management; assessment of learning; professionalism; and, universal design through technology. As may be gauged from the list of areas to be fully developed within the curricular scope, any entity that has the ability to aid in the dispersal of knowledge and aid the learner towards higher order thinking skills, is greatly desired. The instructional elements to be integrated into the learning environment, at both the instructor-centered level as well as the learner-centered level, are the following elements:

- Facilitator-Centered Elements
  - Philosophical Underpinnings: Behaviorist - Cognitivist - Constructivist
  - Clear Objectives
  - Comfortable Implementation
  - Assessment Methods
- Learner-Centered Elements
  - Clearly Articulated Expectations

- Time Allotment
- Conceptual Understanding
- Orientation: Process versus Product

But this is only at the teacher candidate's level of instruction. The teacher candidate is also offered the opportunity to delve into the technological tools available within the special education classroom environment. As a basis towards understanding the teacher candidates explore the instructional technology tools available, an initial review of significant areas of importance. These instructional design considerations are: learning environment enhancement; instructional implementation; ease of use; access, which may be further delineated as learner and the family support; and, monetary constraints. Once these areas are appropriately and successfully reviewed, then the instructional technology tools that are available and appropriate for the special education classroom environment are reviewed:

Hardware	Software	World Wide Web	Multimedia	Learning Styles
Bar Scanners Ergonomic Keyboards Ergonomic Mouse/Joysticks Touch Screen Monitors	Inspiration for Mind Mapping (http://www.inspiration.com/) Screen Reader Voice Recognition Text Resize Capabilities Closed Captioning Web Speech Recognition	Instructor-Generated Learner-Generated	Learning Environments Learner Products	Visual Auditory Spatial Kinesthetic

Teacher Candidate Research and Integration

As presented at nationally recognized teacher education conferences (Crawford & Martin, 2001), teacher candidates are beginning to develop an understanding of the forms and functions pertaining to technology and its appropriate and successful integration into the learning environment. Following are samples of technology that students implemented within the special education methods coursework:

- Loading the Dishwasher: the use of digital camera, gaphs, tables, data collection forms, student-cropped photos to focus on action of loading so students with disabilities can use photos to follow steps accompanying directions in words include a literacy component.
- Going to the movies: movie World Wide Web sites, digital photos, clip art integration, data collection sheets, tables, charts, graphs.
- Going to the movies: Selecting a movie : newspaper ad & theater website; reading reviews on websites; accessing the "Connect" bus schedule at their website; mapping route to theater using Yahoo maps; Used Kodak picture program to crop photos, clip art. E-mailed a friend to join.Each of the steps the teacher candidates completed in order to develop a unit for the special education learning environment offers real-world opportunities for skills development and procedural understanding pertaining to technology integration and skills.

Conclusion

In conclusion, the significance of technological tools at both the instructor level and the learner level, as well as process versus product within the educational environment, are imperative elements that must be emphasized within the special education methods coursework as well as PreK-12 learning environments. However, a strong focus upon instruction must be maintained in order to ensure appropriate instructional design of learning opportunities. The availability of technological resources has overcome the desire to "reinvent the wheel", which has been a major consideration over the previous ten year period, and now the focus must be revised towards the appropriate and successful integration of technology within the special education environment.

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TIPS: Technology Integration Projects Across Special Education Teacher Preparation Programs

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Technology is being integrated into teacher education today, in preparing general educators and special educators, designing and planning program curriculum content, and impacting delivery at both the preservice and in-service levels (Ludlow, 2001). In order to meet today's societal expectations, special education teacher preparation programs are placing more emphasis on providing their graduates with competencies related to the infusion of special education technology (Langone etal, 1998). An impetus to establishing current technology standards and competencies for special education teacher preparation programs include influential entities such as The National Educational Technology Standards (NETS) an initiative of the International Society of Technology in Education (ISTE), The National Council for the Accreditation of Teacher Education (NCATE), Council for Exceptional Children (CEC), and many state licensing agencies (Ludlow, 2001). Federal and state initiatives (i.e. Preparing Tomorrow's Teachers to Use Technology, http://www.pt3.org) provide resources, skill training, and an investment in technological advancement that otherwise would not be possible.

Smith (2000) states "If we expect preservice special education students to be prepared to integrate technology in the K-12 environment they must see the technology (assistive and instructional) modeled by their instructors rather than simply being told about its potential and how it might be effective." (p 60)

One might ask the obvious question, Is modeling the use of technology enough? Recent research suggests the need to go beyond modeling and provide meaningful and real-life opportunities for hands-on integrated technology within the curriculum (Mesenheimer, et.al. 2001).

Preservice and in-service educators need to acquire technological competencies for implementing computer support in the learning process. These competencies can be achieved through meaningful technology integrated projects infused within methodology courses and field experiences (Ludlow 2001). Such projects would allow the preservice/ in-service special educator to design, plan, and implement technological tools and strategies into the instructional process. Jonassesn, Peck and Wilson (1999) states "student thinking is engaged by activity."(p 2). Integrated technology projects could be viewed as learning tools that can be used to help the learner construct their own meaning and assist in guiding the meaning making process within the learner. Where does one begin to integrate technology and authentic student projects within the curriculum? To what extent should the role of technology be emphasized in the curriculum and be required by the preservice /inservice learner?

This presentation highlights specific examples of meaningful technology integrated projects and related research that helps answer the above preliminary questions. Technology projects shared will include both assistive technologies and instructional technologies that can be utilized across computer platforms (Mac & PC) and across the special education teacher preparation curriculum. During this presentation presenters will share their technology integration into an array of disability areas (learning disabilities, behavioral disabilities, deaf education and early childhood special education) and related coursework.

Integrated Technology Examples

Integrated technology projects provided the opportunity for university students to apply fundamental theory with essential teaching strategies taught in special education courses to create an innovative mechanism for learning to take place. Through the implementation of technology, twenty first century preservice and in-service special educators can provide their learners with choices and activities that match their learning styles and specific learning needs. Such examples are briefly described below:

PowerPicture Books and Vocabulary Activities

Student-made PowerPoint Picture Books and interactive lessons created in MS PowerPoint provides interactivity through a customizable electronic learning. Developing a hypertext learning activity, pre-service teacher begin to go beyond understanding and apply technology to develop students' higher order thinking skills, motivation, and creativity.

iMovies and multimedia

Using iMovie students generate literacy projects that essentially come to life. Careful, planning of instructional outcomes and the assessment of these outcomes occurred. Collaborative learning activities provide the guidance and classroom environment to discuss principles of learning outcomes, benchmarks and assessment.

Web quests and Web-based Learning Environments

Experience and exploration are the cognitive backbone to preservice teachers projects involving the understanding and creation of webquests and existing web-based learning environments (i.e. www.literacyaccessonline.com).Student-created detail lesson plans, centered on the integration of innovative web-based learning tools provide new and innovative opportunities for student-centered learning in the special education classroom.

Assistive technologies

Taught in a stand-alone course and integrated within the special education methods classes, preservice special education teachers look closely at meeting the specific needs of the learner through the use of assistive technology. Through integrated assistive technology projects, preservice special educators discover their teaching passion and create a resource ready to be "carried out into the field" and provide to other educators, cooperating teachers, and parents on the "how to" integrate assis tive technology within a particular content area or skill area.

Providing Learner Support through the Teacher Preparation Curriculum

Within the special education teacher preparation program students are taught and encouraged to utilize available technology resources on both on campus and within the community. The College of Education and Human Development Technology Resource Center is the first stop. The Technology & Resource Center is open 80 hours a week serving the 223 faculty, 47 Staff, and 4,905 students of the College of Education and Human Development. Usage rates at the Center averaged 1,570 patrons per week during the Spring Semester 2001, totaling over 25,000 patrons for the entire semester. Twenty-six education classes teach in the 2 computer labs. Students and faculty have a wealth of computer resources (hardware and software) and services to assist in building basic technology skills needed to generate effective technology projects. Computer labs and technology smart classrooms allow special education faculty and students to demonstrate technology and showcase and discuss hands-on technology projects and activities within the learning process.

Guidelines for Successful Integration

This presentation will also share essential guidelines that help assure the usefulness of technology integration into the special education teacher preparation curriculum. Listed below are a few examples of such guidelines:

- required assignments "force" students to practice technology and begin to develop skills
- learned to work and demonstrate across computer platforms, as students are stymied by this process
- created and bridged preK-12 schools and university program through partnerships that allow university students to "kid test" their ideas and refine the development process, thus allowing the preK-12 student with disabilities to clarify the problems.

In this session, participants will:

- Explore through demonstration, common technology projects, and real classroom examples of integrating technology into the special education curriculum.

- Exchange through an open discussion, other technology tips and strategies in using technology in classroom instruction and possible benefits to preservice and inservice special educators and in essence students with disabilities.

Participant Outcomes:

Through the implementation of technology, participants will be able to generate ideas and projects that meet their specific needs of their programs and provide the learners within these programs with choices and activities that will enhance the quality of special education.

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Bridging the Divide for Special Needs

Paper or Workshop to be prepared for Conference

By

Maribeth Montgomery Kasik, Ph.D.

Abstract

Educational Applications of Microcomputers for Teachers of Students With Special Needs are a critical factor in addressing the Digital Divide. Educators often have access to computers, but allow them to sit idle for fear of what to do with them. Access to quality education is about who has and who does not. This gap is often wider for those dealing in special education settings than regular education. The presenter teaches a graduate level computer application class for teachers of students with disabilities. The presentation will highlight the success of the course as well as present samples of student technology projects.

Dr. Kasik will present the curriculum of the course: Educational Applications of Microcomputers In Special Education as well as utilize the techniques she uses for teaching the class to graduate students at Governors State University in Illinois.

She will provide participants with resourceful Internet sites as well as demonstrate student power point presentations and created websites.

GIDL-PC: a Global Infrastructure for Distance Learning for the Physically Challenged

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Abstract

This paper describes the prototype of a global infrastructure called GIDL-PC (Global Infrastructure for Distance Learning for the Physically Challenged). This system supports teaching and research sharing across interrelated disciplines focusing attention to the needs of the physically challenged (PC). Inter-linking of resources provides for a standards-based architecture-centric joint action global infrastructure. The goals of the project include developing new concepts to understand, analyze, invent research processes, and provide tools to help improve and manage knowledge and resource sharing.

Introduction and Background

The Americans with Disabilities Act of 1990(ADA) is a United States federal anti-discrimination statute designed to remove barriers that prevent qualified individuals with disabilities from enjoying the same employment opportunities that are available to persons without disabilities. ADA stipulates that employers must make reasonable accommodations for those with disabilities [1]. In order to accommodate ADA at the pace necessary to keep up with demands of industry, research must be shared through some standards and some common infrastructure.

In his yearly address to the National Academy of Sciences Dr. William Wulf,[2] suggested that progress in science and technology will depend on the participation of a global research community. In addition it will need broad public trust and support. The main goal of this research is to provide an integrated platform for educational research sharing for researchers and teachers working in the area of technological support for the physically challenged. Distance Learning provides a natural way for teachers to share information with each other, and with the participants in their classrooms especially when accessibility is an issue.

Resource sharing up to now has been through publications, conferences, and web pages. This project will extend the classroom past document and data sharing to integrated teaching and research communities that share documents, objects, data, hardware, lectures, power point presentations, multimedia presentations and software through standardized interfaces that simplify system usage.

Expandable repositories of material adapted to the physically challenged will provide a gowth foundation for sharing new plans, new research ideas and educational results. It will allow participation in real-time experimentation with subjects in multiple locations around the globe. Sharing reduces duplication of hardware, software and other costly resources.

Other Research Sharing Efforts

The idea of people sharing their information and ideas is not a new subject to the research community. Areas such as Law Enforcement[3], Education[4] and efforts such as the Center for Coordination Sciences[5] at MIT demonstrate large research-sharing efforts. Somehow the Software Engineer's supporting research for the physically-challenged have kept a local focus. Given a simple standardized robust infrastructure, research, teaching, presentations and resources can now be shared globally. This prototype infrastructure produces a distributed object reference architecture[6] [7] that is standards-based, and architecture-centric.

Moseley described a reference architecture[8] that serves as a context for design environments to create applications that allow the participation of people who are physically challenged (PC). This research is now extended to include the global community doing research for the physically challenged.

Some of tools and techniques used in GIDL-PC are the Unified Modeling Language(UML), web-based documentation (preferably the eXtensible Markup Language - XML[9]), OpenDoc, a CORBA compliant ORB with IDL (Interface Definition Language) as the preferred interface specification, and the World-Wide Web. IDL facilitates a multi-platform and multi-language. object interface.

Figure 1 shows a cooperative project between Western Illinois University in Macomb Illinois, St. Andrews Presbyterian College in Laurinburg, North Carolina, Abbot Laboratories in Laurinburg, NC, The Technical University of Ostrava in the Czech Republic, and The Techical University in Kaiserslauten, Germany.

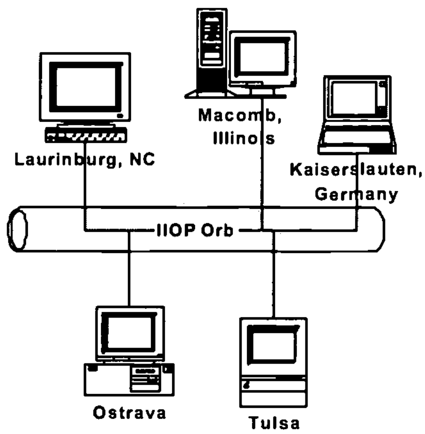

Figure 1

This research explores real-time object-based direct manipulative user interfaces[10] that are specially enhanced for the PC. The type of user interfaces used in Moseley's research[11] (eye-trackers, sensor-controlled processes, special hardware devices, etc) can often be prohibitive in cost when duplicated across platforms for distributed locations. Sharing the access to objects that control distributed devices provides a cost-effective means of research into this area.

This project goes deeper than just sharing documents and data. A researcher will access the GIDL-PC through the event services manager of a CORBA (Common Object Request Broker Architecture)[12] Compliant Object Request Broker(ORB). It was critical to the universal nature of this project that it be open and vendor neutral. The OMA(Object Management Architecture) of the Object Management Group(OMG)[13] is the only distributed component architecture available today that is open and vendor neutral.

GIDL-PC requires both time critical events and non-time critical events. For non- real-time transactions any ORB will suffice. There are several ORB's that support real-time services but GIDL-PC decided on TAO [14] as the standard for real-time events. In addition to sharing objects this project is sharing real-time location data via worldwide GPS Satellite Receiver. Software written by a researcher in Macomb, Illinois can be used by a PC person's wheelchair in the Czech Republic.

ORB's allows for connections of objects from the repository in any location to access the objects in any other location without knowing the location of the particular object. If not for research sharing through CORBA ORBs, each location would have to have duplicate installations. Duplication implies the possibility of configuration problems, as well as installation problems at either place in the project. As it stands now when the ORB places a request for an object one automatically gets the latest version.

A constant problem for emerging countries is the availability of resources. With the emergence of free ORB's such as TAO, ORB-it[15], JavaORB[16] the ability for these countries to provide excellent software development talent has increased the potential to produce cost effective solutions. The PC technology marketplace is not a volume-intensive market, and hence cost-effective solutions have not been prolific.

OMG – Object Management Group

In June 1995, an OMG-hosted meeting of all major methodologists[17] (or their representatives) resulted in the first worldwide agreement to seek methodology standards, under the aegis of the OMG process. The UML is nonproprietary and open to all. It addresses the needs of user and scientific communities, as established by experience with the underlying methods on which it is based. This standardization of the UML boosts the possibility of a global research sharing platform, in that the modeling process is now standardized, and is available under the vendor neutral and open nature of the OMG[18]. The parameters, vendor neutral, open architecture and standardization are essential to the success of such an effort.

The Unified Modeling Language (UML) is a language for specifying, visualizing, constructing and documenting the artifacts of software systems, as well as for business modeling and other non-software systems. The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems. It is important to the success of a project such as GIDL-PC to have a unified modeling language, and a unified modeling process. The approach to modeling promotes reuse and reduces duplication of effort.

Research Processes

Processes are viewed as being made up of activities that are inter-connected via dependencies along which resources flow. There are several kinds of dependencies [19] including flow (one producer to one consumer), fit (many to one), and sharing (one to many)[20]. Dependencies can be associated with coordination mechanisms [21], which are simply processes whose purpose is to manage that dependency. Dependencies and coordination mechanisms[22] represent a powerful abstraction mechanism for revealing the key features of a process while hiding implementation details.

The OpenDoc Vision

Apple Computers had a grand vision for the future of computing. It was called OpenDoc[23]. OpenDoc promised to end the age of bloated do-everything applications by providing an architecture where users could mix and match collections of highly focused "containers" or "parts" to suit their needs. Tough times hit Apple and they abandoned OpenDoc for economic reasons. Although OpenDoc in its original format is not used in GIDL-PC the concept is embraced in all aspects of its design and implementation.

Document Sharing is also important

Document sharing in GIDL-PC is also a very important component. The OMG is integrating XML[24] into the CORBA technical infrastructure, so that new XML-based applications will plug and play with current applications. This was the goal of the original OpenDoc effort. Document sharing is enhanced by the eXtensible Markup Language(XML)[25]. XML is an extension of SGML[26], the Standardized General Markup Langauage. In XML, however, you can define your own tags (hence the "eXtensible"). Each XML file is prefaced by a link to Document Type Definition that describes the tags it contains and how they may be used. The next version of Microsoft Office will use XML as its standard file format.

XML's goal is to facilitate the exchange of data and documents between applications (and platforms). It will make it easy to edit the same file in different applications, each one excelling at a specific task.

GIDL-PC is architecture-centric, and this center is CORBA. CORBA encompasses a series of standards and protocols for inter-process communication in a heterogeneous environment[27]. Using CORBA, researchers can easily write applications that can be tailored for multiple platforms at once, in any number of languages. It thus comes as no surprise that the CORBA specification has caught on so quickly as the standard for interprocess communication, particularly in the research community.

The Object Request Broker (ORB) describes a ``software bus", a mechanism which handles communication between distributed objects. The ORB allows for client-server interaction between heterogeneous objects distributed over a wide-area network with meta- information describing the objects in a system. Through a standard interface(IDL) an object may access other objects as a client without prior knowledge of their existence or location. Any object connected to the ORB can play the role of both a client and server object. That is, it can initiate calls to other objects and respond to requests for services from other objects on the ORB. See the figure below.

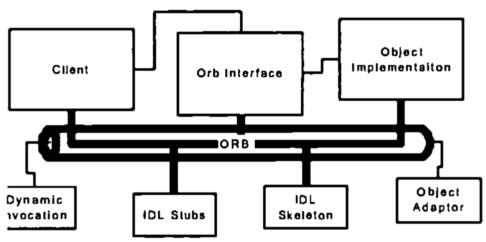

Figure 2

At the heart of every CORBA application are objects. Objects reside on various machines throughout the distributed environment and are tasked with performing duties defined by their implementation and interrelationship. In the standard two-tier architecture, the objects are often thought of as the servers in the system. However, unlike such standard servers, objects have the ability to move around if needed. Approximately one year into a two year research cycle, Western Illinois University joined this effort. The server objects were move from computers at St. Andrews Presbyterian College, and Abott Laboratories in Laurinburg, North Carolina without interrupting the flow of activities of the globally distributed researchers. For a research sharing effort such as GIDL-PC this is critical.

A client communicates to an object through an object reference. This is a pointer to the object that allows requests for operations and data access to be sent from the client to the server via an ORB.

Every object on the ORB must have an implementation. This implementation is code written to perform tasks on the server machine. In other words, the implementation is what does the actual work of the object. An implementation can be in any language. It is allowed to perform tasks supported by the language, operating system, and underlying hardware. GIDL-PC examples include wheelchair add-ons, digital manipulative devices, eye tracking mechanism and unique devices for each of the physically challenged. In addition to code designed to interface with a legacy library, it was necessary in GIDL-PC to have a common interface so that it was comfortable for the researchers to interface to the environment. KDE and GNOME[28] are Linux[29]-based user interfaces that are CORBA Compliant.

There are two common ways in which a client can receive an object reference by using interoperable object references[30] (IORs) or by using the naming service. Every object on the ORB has an IOR. The IOR is a global identifier string that identifies the machine on which its associated object is located and the interface that the object supports. If given the IOR for an object, a client can use standard function calls on the ORB to turn it into an object reference. With the information contained in the IOR, the ORB knows what type of object is being referenced and the machine to which all requests should be routed.

Wide Area Networking and GIDL-PC

The World-Wide Web and the ease of access to the Internet is now radically changing our perception of worldwide distributed systems. Such systems should allow us to easily share and exchange information. This also means that it should be easy to track sources of information, even if these sources move between different locations.

Wide-area networks, such as the Internet, offer further motivations for adopting an event-based style. For one thing, the vast number of potential generators of events creates an opportunity for the development of novel applications that can effectively fuse the information associated with different events. Moreover, many existing applications that are already designed around the notion of event interaction can be increased in scale through the global connectivity provided by a wide-area network. For example, a quadraplegic in Laurinburg, N.C needs support software for a robotic feeding mechanism to assist in serving food to this PC person. At the Technical University of Ostrava there is seminal research in the area of robotic feeding. Through GIDL-PC it is possible to demonstrate the feasibility of shared distributed robots and feeding mechanisms. In general, the asynchrony, heterogeneity, and inherent high degree of loose coupling that characterize wide-area-network applications promote event interaction as a natural design abstraction for a growing class of software systems.

The simplest way for a client to get the IOR of a server object is through the naming service. The CORBA COS (Common Object Services) Naming Service provides a tree-like directory for object references much like a file system provides a directory structure for files.

Object references are stored in the namespace by name and each object reference-name pair is called a name binding. Name bindings may be organized under naming contexts. Naming contexts are themselves name bindings and serve the same organizational function as a file system subdirectory. All bindings are stored under the initial naming context. The initial naming context is the only persistent binding in the namespace.

For an applet or application to use COS naming, its ORB must know the name and port of a host running a naming service or have access to a string initial naming context for that name server. The naming service can either be the IDL name server or another COS-compliant name service.

More on COS Event Services

GIDL-PC is a network-based software system constructed as assemblies of loosely-coupled components. A promising approach to supporting component-based systems is the so-called event-based or implicit invocation architectural style.[31] Under this style, component interactions are modeled as asynchronous occurrences of, and responses to, events. The CORBA event model[32] is the basis for events in GIDL-PC.

The CORBA Event Service introduces the concept of events to CORBA communications. An event originates at an event supplier and is transferred to any number of event consumers. Suppliers and consumers are completely decoupled: a supplier has no knowledge of the number of consumers or their identities, and consumers have no knowledge of which supplier generated a given event.

In order to support this model, the CORBA Event Service introduces to CORBA a new architectural element, called an event channel. An event channel mediates the transfer of events between the suppliers and consumers as follows:

1. The event channel allows consumers to register interest in events and stores this registration information.
2. The channel accepts incoming events from suppliers.
3. The channel forwards supplier-generated events to registered consumers.

Suppliers and consumers connect to the event channel and not directly to each other. From a supplier's perspective, the event channel appears as a single consumer; from a consumer's perspective, the event channel appears as a single supplier. In this way, the event channel decouples suppliers and consumers.

CORBA specifies two approaches to initiating the transfer of events between suppliers and consumers. These approaches are called the Push model and the Pull model. In the Push model, suppliers initiate the transfer of events by sending those events to consumers. In the Pull model, consumers initiate the transfer of events by requesting those events from suppliers. Both types are important to the GIDL-PC researcher and the users alike.

A key issue of event services is quality-of-service (QoS) in a real-time situation such as controlling latency, throughput and jitter end-to-end. In GIDL-PC we needed a communication model that not only de-coupled suppliers from consumers but simultaneously supports advanced quality of service (QoS) properties and event filtering mechanisms. The CORBA Notification Service provides a publish/subscribe mechanism that is designed to support scalable event-driven communication by routing events efficiently between many suppliers and consumers, enforcing various QoS properties (such as reliability, priority, ordering, and timeliness), and filtering events at multiple points in a distributed system.

Figure 3

In classic hard real-time systems the timing constraints are an integral part of the application. If these constraints are not met then the application is not correct. Speed or performance is not necessarily the issue. Predictability is. Speed and performance can contribute to meeting demanding timing constraints. However from a design standpoint the concern is that in the worst case situation the timing boundaries are not exceeded. Guaranteed behavior is required. Best effort is not sufficient. Average performance is not meaningful, but,bounded limits are.

For the real-time portions of GIDL-PC we chose the TAO's open source model[33] and configurable design to enable the developer to understand exactly the intent of the software, and to select only those elements that are required to solve the problem at hand. Figure 3 shows a diagram showing the real-time portions of the TAO ORB. TAO can be configured and compiled to exactly match the need of an embedded systems designer.

Foundation of the Research Processes

Because the focus of this project is research-sharing, it is important that the process that controls the interaction of research participants be based on a solid theoretical foundation. At the MIT Center for Coordination Science significant research in the area of coordinated processes[34] is being conducted. However, the foundation of these process are not based on a solid theoretical foundation.

To correct the ambiguity Vondrak introduced Interaction Coordination Nets [35] (IC-Nets) to represent a tool that provides for concurrent threads for coordinated process management and control. These IC-Nets provide a graph-grammar petri-net foundation for the coordination of networks. Vondrak[36] originally used these to represent steps in the development process, but has since extended these to include process interactions and coordination in actual programs. Moseley[37] extends IC-Nets to the area of coordinated process for people who are physically challenged. This includes interface processes as well as software processes.

The processes modeled using IC Nets are inherently concurrent and often distributed. Synchronization of object interactions is simplified by the visual nature of IC-Nets.

Importance of User Interface

As important as the theoretical foundations are for a solid support for GIDL-PC, the simplicity of the interface, and the consistency by which the researchers interface to the system are equally important. Simplicity of interface has become a consistent thread for the research for people who are physically challenged.[38] The GNOME Interface provides a simple connection to the CORBA foundation that is the underpinning of GIDL-PC. It utilizes the GTK+ toolkit which requires the use of the IDL as the mechanism of linking components to the GIDL-PC desktop. In order to execute a program built with the GTK+ toolkit one must define the interface of the program to the environment by use of IDL. This encourages a standard interface mechanism by using the toolkit.

It is important to GIDL-PC that the pieces (CORBA, XML, UML, etc.) fit together seamlessly. GNOME provides the functionality of network transparency combined with component technology with the IDL to the ORB, and also the extensive use of XML and it is resident on the researchers desktop.

Future Enhancements

Current continuing research for the physically challenged is not only important but has become law in the United States. Employers must make reasonable accomodations to the Physically Challenged by law stated in the ADA. It is the hope of this research team that this effort can become a standard vertical facility under the OMG auspice. Future enhancements will be to add a Trader Service. A CORBA Trader Service locates appropriate objects that provide the desired functionality at runtime. To provide this service, the trader service federates a local trader and remote traders by considering the traders or link policies.

Summary

The initial direction and systems prototype for GIDL-PC has been in Computer Science and Software Engineering Techniques for Effective Software Engineering for systems that affect the Physically Challenged. We hope to extend this sharing to included Electrical Engineers, Psychologist, Sociologist, and anyone interested in research for the physically challenged.

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The Numerical and Literary Six-Year Old, 125 IQ Dyslexic Explores IT and Opens Up New Avenues of Thought and Areas of Practical Experience for In-Service Education in a Bi-Lingual Environment

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Abstract: Because of their learning difficulties, dyslexic children are often looked upon as being the lowest common denominator on the academic scale, or even regarded as problem students. Using traditional methodologies and new technologies, this project allowed students with specific learning difficulties to utilise, examine, explore, plan and design new thematic programmes which permitted them to go beyond the apparent barriers of the 'chalk and talk' classroom to experience the joy of learning and explore avenues of thought. The results of their work are now benefiting all students and teachers, at all levels, as the lowest common denominator has become the highest productive factor. One such child is Tom. His case study epitomises the path this journey has taken and together with his story, the programmes which eventually resulted from all our experiences.

Introduction

In 1999, as co-ordinator of a locally-based national *Schools Integrated Project in Technology* (SIP) concerning the development of oral and aural language skills at the primary (elementary) level in Ireland, it became apparent to the author that traditional methods of utilising and reinforcing language acquisition skills were failing to meet the needs of specific groups of children, especially in a bilingual (Gaelic/English) school environment. In a variety of schools, there were obviously highly motivated and intelligent students who seemed incapable of absorbing the information being presented to them, albeit by excellent teachers employing a variety of non-technological methodologies, and teaching styles.

Investigating the source of the barriers to learning with the students themselves, their parents, and their teachers, the author discovered that a significant number of them had been previously diagnosed by developmental and educational psychologists as being numerical and/or literary dyslexics with above average IQ. It was only on discovering this, that the possibility of exploring, understanding and incorporating more effective learning strategies in language/second language acquisition presented themselves. An old Irish saying tells us that God never closes one door without opening another. In the case of these dyslexic children, all we had to do was allow them to give us the keys to enter and perceive their realm of thought and learning to begin more effective communication.

Our project, SIP 056, was entitled "The Development of Oral and Aural Language Skills at Infant and Remedial Levels in Primary Schools, in both Irish and English, through the Medium of Full Multimedia Programmes and I.C.T., within the Guidelines of the Revised Irish Primary School Curriculum". (The term "Remedial Levels" refers to Learning Support.) The project undertook the task of addressing these challenges and presented both teachers and students, with a potential blueprint for the development of language usage. It was conceived that it might also open up avenues of practical applications for in-service education. Allied with this was the co-ordinator's belief that technology-enhanced language learning could be more fully utilised to increase the possibilities of this project.

Tom's Story

Tom came to our Gaelscoil (All-Gaelic, Bi-Lingual Primary School), at the age of five years, having already attended another elementary school. In consultation with his parents, he was referred for assessment, because of concerns over reading and language difficulties. Tom's cognitive functioning was assessed using the *Wechsler Intelligence Scale for Children III UK*, which yielded the following profile:

Cognitive Ability

Verbal Intelligence Quotient	126 Centile 96
Performance Intelligence Quotient	116 Centile 86
Full Scale Intelligence Quotient	125 Centile 95

Table 1: Tom's overall Cognitive Scores for the *Wechsler Intelligence Scale for Children III*

Strengths in Tom's cognitive profile related to exceptionally high performance in Comprehension, Vocabulary and Similarities Subtests. This suggested exceptionally high ability in verbal fluency, word knowledge, word usage, social comprehension, and logical thinking and reasoning. An exceptionally high performance was also recorded for the Picture Arrangement Subtest, which suggested particular strength in visual perception and the ability to plan ahead. In contrast, difficulties were experienced in the Arithmetic and Object Assembly Subtests, which were a measure of numerical accuracy, reasoning and mental arithmetic. Low scores suggested inadequate memory and poorly consolidated reasoning skills.

Literacy Skills

Assessment using the *Wechsler Objective Reading Dimension Test*, yielded the following profile:

Test	Predicted Score	Difference	Significance	Frequency
Basic Reading	115	34	P=0.01	<1%
Spelling	113	29	P=0.01	<1%
Reading Comprehension	117	45	P=0.01	<1%

Table 2: Tom's overall Literacy Skills Scores for the *Wechsler Objective Reading Dimension Test*

The above profile suggested that Tom's degree of underachievement was statistically significant and that he had a specific and severe disability in relation to reading, spelling and reading comprehension. The subtests also indicated difficulties in identifying and distinguishing rhyming pairs in word strings and delays in processing numbers. It was further discovered that Tom's learning style preference was towards a Kinesthetic and Accommodative Learning Style (Harthill and Busch, 1998). This led us to examine and explore areas of practical experience in understanding the various learning styles in second language classrooms both as in-service and on-line processes to more fully accommodate all students in language assimilation.

In summary, Tom presented with a significant and severe learning disability (i.e. dyslexia/specific literary difficulties) in relation to basic reading, spelling, reading comprehension, number reasoning, and number operations. The nature of his difficulties related to visual memory and sound processing.
When his participation in the programme was proposed and explained to him, his immediate response was; "Don't ask me to do this, Máistir (the students' Gaelic term for Principal). I know I'm no good at remembering words and doing things like that. The others are better." Tom's words would seem to typify the dyslexic's attitude to school and learning which McDermott argues is a natural by-product of the "schooling system (which) is inherently competitive.... the inevitability of failure is built into the system...By the normal line of reasoning, the child is the unit of analysis and the (learning) disability is a mishap that scars a child's road to competence", (1993: 237).

The Study

The original idea for this project, SIP056, came as a natural development from the experiences of the principal of a Gaelscoil, an all-Gaelic primary school, in the areas of language usage and development, and information communication technology. It has long been recognised that the Irish language in particular has failed to catch the imagination of students and teachers. One could go as far as saying that most students dislike having to study Irish because the traditional methodology behind its teaching has become outdated. This also could be true of the methodology behind the development of language usage in some English, bilingual and multilingual settings (Nunan, 1988, 1989).

Within the guidelines of the Revised Irish Curriculum, particularly in the areas of the development of the Irish and English languages, it is proposed that teachers would embrace a new perspective in,

> *"Promoting positive attitudes and developing an appreciation of the value of language -- creating, fostering and maintaining the child's interest in expression and communication -- developing confidence and competence in listening, speaking, reading and writing -- enhancing emotional, imaginative and aesthetic development through oral reading and writing experiences".*
> (Curaclam na Bunscoile, NCCA, 1999. English Language. Pp. 10-12; Curaclam na Bunscoile, Gaeilge, Teanga. Pp. 14-15).

Our project interpreted these curricular guidelines in a very simple way -- making language learning fun. We believed that through the identification of key words in the Irish and English languages, integrated into a thematic visual arts programme -- drama -- we could encourage children to develop confidence and competence in language usage. Not alone that, but by encouraging them to use I.C.T. (digital cameras, scanners, video cameras and multimedia programmes), we would place at their disposal a multitude of potential learning experiences, which would systematically lead them along the path of language acquisition and familiarisation. We also believed that if we succeeded with what may be considered to be the lowest common denominator in our schools (kids like Tom), from a language development perspective, then the project would naturally extend to all other students.

There have been some memorable milestones in our project to date, one of which was the identification and compilation of the key words used in Gaelic and English in the development of language skills. We examined, from a learning support perspective, the Dolch lists of words and in consultation with Tom, our staffs and other educational bodies, we supplemented these lists to include more modern words. We then divided all of these lists and words into both class and age group categories. From a Gaelic perspective, we looked at the work carried out in the early 1960s in the identification of the key words in the spoken language and, following a similar pattern of research, we compiled a comprehensive and yet not exhaustive wordlist. The project schools and others then tested these lists, to verify their appropriateness to age and class grouping, and their feedback allowed us to consolidate the lists. These lists are available for downloading at www.gaelscoil.com/site2002

Following that, we decided to design a full and inclusive, whole school programme in drama and phonetics, using the wordlists. The programmes in Gaelic and English, encompassed the various levels already recognised, allowing us to introduce language learning, in a fun and novel way, through the medium of eight themes which Tom and the other students had identified. These themes were:

Junior Infants – (4-5 years) - Our homes and families / Ár dtithe agus ár dteaghlaigh
Senior Infants - (5-6 years) - People in our community / Daoine in ár bPobal
First Class - (6-7 years) - Nature all around us/ An Nádúr, thart timpeall orainn
Second Class - (7-8 years) - Our school / Ár scoil
Third Class - (8-9 years) - Lots to do/ Rudaí le déanamh
Fourth Class - (9-10 years) - Customs and traditions / Custaim agus Traidisiún
Fifth Class - (10-11 years) - Local history/ Stair in ár dtimpeall
Sixth Class - (11-12 years) - Local industry and commerce / Domhan áitiúil tionscail agus gnólachtaí.

Using these themes, the word lists, and the drama and phonetic schemes, we implemented the programme of language development and usage, in the hope that the children would use their experiences to transfer their thoughts and their ideas into computer-generated, multimedia programmes in the quest for creative technology-enhanced language learning.

Microsoft PowerPoint was chosen as the medium. In essence, we the teachers, in partnership with the students and parents, sent Tom and his fellow students out into the environment to research these various themes: to take digital images, to build story lines around them, to present them in the drama class and develop the whole concept, so that their experiences could be integrated with the curricular aims and objectives of the Revised Curriculum in both Gaelic and English.

In the infant classes, the teachers introduced the word lists in a phased manner using the drama programme as the medium of expression. In the learning support classes, already having experienced the words in their drama schedule, the children were introduced to the various word and phonetic lists in a more formal and focused manner. The themes mentioned above were always utilised to help the children to focus on the possibilities of word usage. This was a very challenging task as the ability and age range of the students in question varied greatly, but in small group situations, the teachers were able to elicit responses from them without the students being under too much pressure. This proved to be very effective, and the teachers noticed that the responses of the students who were attending learning support were very positive in class.

The development of the programme has not been without its problems. As the old saying goes, "*Is fada an bhóthar gan casadh* -- It is a long road, which has no turns". The fact that many of the teachers had not experienced any formal training in the use of ICT and multimedia presentations meant that a detailed, logical and sequential programme had to be designed by the author to ensure that they were equipped with the necessary skills to develop and implement the project. The provision of substitute cover by the Department of Education and Science for the teachers involved facilitated the implementation of the training programme and the project in general.

Because of the extension of the programme to a selection of pilot project schools (small rural to large urban), it was occasionally more difficult for the smaller schools to find time to implement the project. This was due to the fact that some schools were sharing learning support teachers and in some cases, the same teacher was teaching multiple class groupings. At times this was found to be an advantage, as older children were able to mentor younger children, and peer to peer teaching was seen to be very effective, as the teacher was afforded the time to be a more creative support.

In summary, all the above has entailed many, many hours of research, evaluation, implementation, assessment, re-design and re-implementation of the various strands of the project. Moreover, the challenge of identifying the learning styles of the children with learning disabilities, which ""refers to a person's general approach to learning and problem-solving" (Reid 1995), and observing their learning strategies, which are "any specific conscious action or behaviour a student takes to improve learning" (Oxford and Nam 1998), dictated the manner in which the project and teacher in-service education evolved.

What Has Been the Impact on Teaching and Learning?

This project caught the imagination of the parents involved as they willingly offered their services to help with its implementation. This ranged from studying various words and themes with the children, to providing advice on the possibilities of implementing the chosen themes of the project and understanding their children's learning styles. With this came a sense of true partnership in education.

The manner in which the aims and objectives of the Revised Curriculum, with reference to the development of language skills, has been implemented in the schools, is undoubtedly one of the major impacts of our project on teaching and learning. The use of technology and multimedia has become a natural ally in designing programmes, which are student-driven, and therefore more interesting to them. The teachers, on the other hand, having seen the benefits to the students, naturally adapted their learning and teaching styles to the advantage of the children. So both the academic requirements of the Revised Curriculum and the fun aspects of language learning have been successfully fused together.

Tom and many of the other children attending learning support, have developed their own personal programmes using the words which they themselves felt most comfortable with and we believe that this is one of the major, unforeseen successes of the project. The infants, on the other hand, may have needed a lot more mentoring, but they totally enjoyed looking at their work and hearing their voices on the computers. Parents were able to use some of these programmes on their home computers, and therefore to enhance learning by complementing the schools' programmes. The teachers were presented with well-constructed exemplars, which allowed for as much creativity as they wished to input, in the development of both the Gaelic and English language programmes.

An unexpected impact of the project, was the demand from a variety of schools for access to the phonetic and word lists, the drama programmes, and the multimedia presentations. The possibilities for using the project in the teaching of minority languages and other major European languages in a bilingual setting, was also recognised, as it was felt that the project addressed language teaching methodology in a novel manner. Some students attending teacher training college at third level requested permission to try out some of the Gaelic programmes and they found these extremely effective in classrooms, encouraging schools around Ireland to request permission to download the information.

Conclusion

Language and its usage is one of the most important means of communication in the world. Our project continues to show us that this is a very complex and challenging area of the Revised Curriculum especially in a bilingual environment. In essence, the major contribution of our project to understanding children with learning difficulties, the process of education and new technologies is that they should not be mutually exclusive. Not alone that, but young dyslexic children such as Tom, are like natural sponges, absorbing at deeper levels through body and mind, and well able to handle the challenges of the technological world and an extra language, through the medium of a more traditional curricular area -- drama. Teachers also, when presented with a curricular framework for the development of language skills, were able to integrate their own knowledge with ICT, to creatively produce exemplars for the development of confidence in language usage, which could be emulated by any school. These facts lead the author to believe that the project will continue to develop after SIP and more importantly, be emulated and replicated in other local, national, and international settings to open up new avenues of thought and possibilities for in-service education.

Tom, as a literary six-year old 125 IQ dyslexic, with all of his academic problems, has shown that IT, when creatively integrated with, and connected to, his preferential learning style, can open those other 'windows of wonder' to boost self-confidence and enhance the learning experiences of students and teachers both inside and outside the classroom. The most significant remaining challenge for us, the teachers, is to continue our work and be satisfied that we shall probably never reach a stage when we can say that we have actually realised all the ramifications of our own learning curve when dealing with children like Tom, in a bilingual environment. They say that from small acorns grow great oak trees. We look upon our project from the point of view of the well-planted acorn and hope that the participation of other schools and organisations will continue to nurture it.

There is no doubt in our minds that this project has incredible possibilities and far-reaching implications for teachers, learning support in schools, in-service education in a bilingual environment and the development of language skills internationally. It is hoped that schools will download the information and associated links to the 'Avenues of Thought and Areas of Practical Experience for In-Service Education', at www.gaelscoil.com/site2002 and eventually design their own programmes and multimedia presentations. All that remains is a recent comment from Tom as he sat confidently at his computer; "You know Máistir, even my Dad thinks this is great fun, isn't it?"

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Enhancing Parent Teacher Partnerships Through Technology

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Abstract: This paper provides real-life examples of ways technology are used to enhance parent-teacher partnerships in special education. A framework for identifying the needs and strengths of families as they interact with school professionals regarding the academic and social progress of their children in the school setting is presented. The use of various technologies in the schools and how they fit into the framework is then described. The availability of technology to both families and schools is a key issue when making decisions about what technologies can best support collaboration between home and school.

Introduction

The availability of technology provides an opportunity to communicate with parents in different formats. It is important to individualize the technology choices for methods of communication and collaboration as partnerships are developed between home and school. Understanding the needs and strengths of parents makes it possible for teachers to individualize involvement with families, just as they individualize programs for students.

The Mirror Model for Parental Involvement (Kroth, 1985; Kroth & Edge, 1997) is built on the premise that parents are a heterogeneous group. Educators could use the Mirror Model as a framework for identifying parents' information needs and special strengths as they interact with school professionals regarding their children's academic, social, and emotional progress. The Mirror Model is depicted in Figure 1. In addition, technology options and uses range from low to high tech, and need to be carefully selected to match parents' and teachers' needs and skills.

The Study

Information on technology use in the schools was collected from graduate students enrolled at the University of North Texas. Participants were special education and general education teachers in both public and private school settings. We then sorted the information into the Mirror Model framework.

Examples of email communication were collected to describe how technology can be used to enhance parent/teacher partnerships. We selected email samples collected from teachers to illustrate how electronic communication fits into the framework provided by the Mirror Model. Specifically, we use the framework to categorize email messages that reveal parents' needs and strengths. We selected email because of growing accessibility of computers in homes, businesses, libraries, and schools. Teachers and parents can collaborate on a topic without coordinating when and where the communication takes place, as in communicating from different locations and at different times.

School and classroom web pages were examined based on the Mirror Model framework to determine if information needed by parents, was available. Phone and television systems used by the schools to communicate information to parents were also identified. We also examined teachers' and parents' use of portable microcassette recording machines and videotapes as other means of communication.

Findings

E-mail communication illustrates how the Mirror Model framework can be applied to authentic examples of parent teacher communication using technology. The various levels of the Mirror Model can be identified through actual samples. For Levels 1 through 4 there are parents' needs and strengths. For example, in Level 1 all parents need information regarding parents' and students' rights, school policies, and school events. A sample E-mail from John's mother to the special education teacher: *Will you tell me when Spring Break is? I also need to know about the next time for the parent training program on "Helping Your Child with Homework".* Level 2 of the Mirror Model relates that most parents need knowledge about their child's progress, school environment, and their child's friends are. A sample E-mail from Sue's father to Sue's special education teacher illustrates Level 2: *When I opened my E-mail today, I had a note from Sue's general education teacher. She said Sue is not turning in assignments. Will you check with the teacher? Could we get an assignment notebook going again? Thanks.* There are also E-mail samples of parents' strengths. For example, in Level 1, Steve's mother provides needed information to Steve's teacher. *Steve has new glasses, but does not like to wear them. Could you encourage him to wear them? I think once he gets used to them, they will be easier for him to wear.* Level 2 includes a parents' special information about their child. *Joe's been upset at home since his grandfather died last week. Our house has been filled with company and it is hard to focus or get any homework completed. Do you have any suggestions for us during this difficult time for Joe?*

Other technology uses were also examined and sorted according to the Mirror Model framework. Most uses were identified in Levels 1 and 2 on the Mirror Model framework. Parents need to know basic school information, school policies and procedures, calendar events, as well as how their own child is progressing in school, academically, socially, and emotionally.

Conclusions

E-mail messages collected and sorted in the Mirror Model framework shows that E-mail is a powerful tool for use in enhancing parent teacher partnerships. Parents have a direct line with the teacher, and the teacher and parent can communicate on an "as needed" basis. The availability of E-mail to parents and teachers is key when making decisions about its use.

Some web pages include daily and weekly reporting systems provided in a secure format for reporting student attendance, student progress and achievement. Parent support groups were also established through chat rooms on the Internet.

A list of web sites used in the schools that focus on particular issues can be provided to parents with specialized needs. The National Rehabilitation Information Center (NARIC, web site: http://www.naric.com) conducts computer searches for families who request information on disability organizations, funding opportunities, and products and devices. Parents who have expertise and strengths in particular areas can serve as resource people who can provide web addresses or search topics for particular issues. A parent could be referred to http://www.ldonline.org for additional information on the topic of learning disabilities. In addition, parents serving on school committees can use the Internet to broaden the learning experiences for the school community. Discussion groups such as SpedTalk@virginia.edu deal with a large number and variety of topics in special education, including special education law. They distribute information with funding they receive through the U.S. Department of Education (Turnbull & Turnbull, 2001). The NICHCY (web site: http://www.nichcy.org) disseminates free information about children and youth with disabilities and disability-related issues to families, educators, and other professionals. The Beach Center on Families and Disabilities (web site: http://www.lsi.ukans.edu/beach/beachhp.htm) conducts research and training to enhance professional practice, public policy, and families' quality of life.

Technology that is "low tech" should also be considered for some families and educators. Portable microcassette recording machines are easy to use and can relay messages, such as tips for homework completion or test taking, in a convenient way. Students and parents can listen together to the teacher's voice and record their responses. Students can record messages to homebound students, with the message content ranging from a simple greeting to an explanation of a homework assignment using a student's voice. A videotape is another means of communication. Many parents, including some cultural groups, benefit from the visual format for communicating and learning new information.

An option for enhancing parent/teacher partnerships is two-way audio/video desktop conferencing. These types of systems can be used for meeting at a distance for a variety of purposes in a convenient way. Accessing professionals, demonstrating teaching techniques, and conferencing can all be accomplished at a distance.

Understanding the needs and strengths of parents makes it possible for teachers to individualize involvement with families. The Mirror Model is one framework that can be used during the decision process. As technology options increase, it is important to individualize the methods of communication used. Effective parental involvement leads to improved teaching and learning in our schools. Technology offers opportunities for collaboration to facilitate the goals and desired outcomes of those involved.

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		WHAT	HOW
NEEDS			
Few	Level - 4	Therapy - intensive education and support	Provide or refer to counseling group therapy
Some	Level - 3	Skill training in management, interaction with system, child rearing	Conduct parent education groups; bibliotherapy, parent support groups
Most	Level - 2	Knowledge of child's progress, environment, friends; assistance in parent-home programs	Utilize notes home, daily/weekly reporting systems, conferences, phone calls, home visits
All	Level - 1	Parents' and children's rights, consent to test and place; school policies and procedures; school and class events	Develop newsletters, handbooks; hold conferences
All	Level - 1	Special knowledge of child's strengths and needs, family characteristics, and aspirations	Conduct intake interviews, hold conferences, utilize questionnaires
Most	Level - 2	Short-term assistance with projects at school, projects at home; special knowledge of world of work	Telephone for PTA's or parent meetings; talk to classes at school; assist with meeting arrangements; reinforce at-home or schoolwork; talk to classes at school
Some	Level - 3	Leadership skills, with time, energy, and special knowledge	Serve on parent advisory groups, task force, as classroom volunteers, tutors; write newsletters, engage in fundraising
Few	Level – 4	Special skills, with time, energy and commitment for leadership training	Lead parent groups; work on curriculum committees; develop parent-to-parent programs
STRENGTHS			

Figure 1: Mirror Model for Parent Involvement

From "The Mirror Model," by R.L. Kroth, 1985. *Communicating with Parents of Exceptional Children* (2nd ed.)., p. 10. Reprinted with permission of the author.

Using Microsoft Word's Tracking Changes to Improve the Writing of Students with Special Needs

Description of the Project and Literature Review

Beginning in Spring 2000, Linda Miller-Dunleavy and Lynn Schultz, of Old Dominion University, (ODU), began work to develop teaching strategies using technology to improve the writing of special needs students. Their extensive and numerous teaching experiences, and their work in technology, suggested that by using a unique editing feature built into Microsoft Word, Tracking Changes, teachers could use existing software and new teaching strategies to enhance writing instruction. Tracking Changes is a rarely used tool imbedded in Word that allows editing marks to be entered on any Word document. While this is a business feature, the authors have developed several strategies for using Tracking Changes specific to the education setting.

The opportunity to learn has long been considered one of the major factors influencing achievement (Carroll, 1963). Minimal requirements for improving writing achievement should be to provide effective writing instruction to **ALL** students. Additionally, students will not become better writers if they do not spend a substantial part of most school days engaged in productive writing activities. Graves (1985) stated that students should write for at least 30 minutes a day, at least four days a week, as opposed to a national average of writing one day in eight. Since written expression is the most complex language arts skill, it is generally not stressed daily in instructional programs for students with special needs.

Recent research has suggested that students with special needs in middle and high school benefit when strategy instruction is integrated with word processing to teach written expression (Graham, 1991). Furthermore, strategy instruction in writing has been used to help students learn to better internalize and regulate the cognitive activities involved in effective planning, production, and revision of text (Graham et al., 1991) & (Deshler, & Schumaker, 1988).

Project Implementation:

The Chesapeake Public School (CPS) system in Chesapeake, Virginia was selected to pilot and field-test the project during the 2000-2001 academic year. The teacher-participants included 11 special education teachers from this system. Ten of the participants are located in middle schools, which serve grades 6 – 8, and the eleventh participant teaches high school. Eight of the middle school teachers have classes for students with learning disabilities that are taught either in self-contained or resource classrooms. The remaining two middle school teachers teach either students with emotional disorders or a mixed classroom of students with emotional disorders and those with learning disabilities. The high school teacher teaches resource students with learning disabilities.

Beginning in the Spring 2000 and continuing through the academic year 2000-2001, several planning sessions and workshops were held to develop a plan of action. The team of ODU personnel and CPS teachers developed ways to use Tracking Changes in the classroom, and shared writing strategies that assisted their special needs population through the difficult writing process.

The importance of selecting specific strategies based upon "best practices" was highlighted during the first summer workshop. A specific learning strategy, **POWER (Plan, Organize, Write, Edit, Revise)**, was selected. Teachers selected different approaches for the **P**lan and **O**rganize stage of POWER based upon their classroom needs (e.g. webbing, four-square). Directions for using Tracking Changes during writing instruction were created and field-tested. All teachers used Tracking Changes for the **W**rite, **E**dit and **R**evise stages. A rubric was created and revised to evaluate different aspects of the writing process. A sample of the rubric and directions for Tracking Changes can be found on the project website: http://www.odu.edu/webroot/orgs/Educ/Misc/VETA.nsf/pages/tracking.

During the academic year 2000-2001, three dinner meetings were held with participating teachers for reflection, encouragement, and problem-solving, and each teacher was observed in their school setting at least once during the year. The project leaders found this to be an invaluable part of the experience; for without periodic support and reflection, this would become just another summer workshop.

The project continues in the 2001-2002 academic year, with seven of the original teachers returning. In addition, one regular education English middle school teacher, an additional middle school LD resources teacher, and two high school LD resources teachers have been added. Teachers will continue to collect pre- and post- writing samples, which will be graded using the rubric from the previous year. Dinner meetings and school observations will also continue.

Poster Session Activity:
The poster session will take participants through a **POWER** strategy session. This strategy, a process approach to writing, begins with the Planning and Organizing stages of **POWER.** Examples of the various individualized writing approaches and activities used by the teachers will be displayed.
Next, participants will examine sample documents using Tracking Changes to edit and revise writing, thus allowing them to observe both the role of teacher and student (Writing, Editing, Revising). Adapting the business function of Tracking

Finish the story:

The July 4^{th} weekend was quite exciting. Mom decided to jump in the pool...

The water wen't eveywere (sp). The whole bake (sp) yard was washed out and mom was noware (sp) to be found. She cracked the bottomof the pool and endup (use different word) in Chinea. She had swlenhed (tell me what you mean) for 10 days. The nexet day (no period make this one sentence) She saw her famley (sp) in China. She side haw did you get her(sp) run on sentence we followed your tralle (sp) thre (sp) – quote? the pool and end up har (sp) run on sentence they lived in China the rast (sp) of tare (sp) life.

Changes, which encourages all corrections to be entered, presents a challenge to teachers using this tool. A method was devised, tailored by each teacher, to use Tracking Changes to SUGGEST changes to students, thereby not making all corrections for the student.

Preliminary findings:
The authors hoped to improve both quality and quantity of the writing processes and produce significant gains in outcome-based results for these students. Improvement was measured by scores on the writing rubric, with the ultimate achievement to result in an increase in mastery of Virginia's Writing Standards of Learning (SOL). Recently compiled data show a significant gain in 7 out of the 11 areas of the writing rubric. These seven areas represent the mechanics of writing. It was felt that the use of the computer and editing features increased student scores. Of the 4 areas not showing improvement, it is the opinion of the authors that writing strategies for Plan and Organize could be improved and emphasized.

Conclusion
Teachers need to introduce students to the entire process of writing from the initial idea generation to editing of the final draft (Issacson, 1995). The inclusion of Microsoft Word's Tracking Changes in the POWER strategy resulted in significant gains in writing skills of special needs students.

Reading + Technology = Literacy

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This presentation will focus on the sustained integration of a hypermedia-based software application called READ 180. Integrated across Kansas City, KS Middle Schools, Read 180 has had a significant impact of student reading, both general and special education students, over the past two years. Data will be shared with participants concerning its effectiveness and its overall impact on the reading process.

READ 180 infuses the anchored instruction model researched by Hasselbirng and his colleagues at the University of Vanderbilt (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990; Hasselbring, Bottge, & Goin , 1992). Hasselbring and colleagues (1997) have examined the implication of READ 180 and its application to literacy development and the needs of the at-risk learner. In cooperation with the Orange County Public Schools, research has illustrated dramatic student improvement in the area of reading when instruction is anchored through multimedia applications. This presentation will also share findings from a study currently underway in the Kansas City, Kansas school district across seven middle schools.

READ 180 applies the components of anchored instruction benefiting from the interactivity of hypermedia. Hypermedia-based children's literature has several potential advantages for students with learning disabilities who are struggling to acquire basic reading skills. First is the motivational appeal of this body of software. For example, READ 180 with its dazzling graphics, realistic sound, and plentiful opportunities for interactions between the learner and the task, this type of software has the capability to capture and hold students' attention. As Erickson and Staples (1995) reported, even students with autism respond to the attractiveness of these programs with increased attention to the reading task. This level of motivational value may increase the probability that reluctant readers will persevere in their interactions with text. This would be a particularly valuable outcome because repeated readings of the same text have been found to be of value for students with learning disabilities (Sindelar, 1987).

Also, hypermedia-based children's literature offers students text that is speech-enhanced. Speech makes the text more accessible to readers or, in the words of Boone, Higgins, Falba, and Langley (1993), more cooperative. In addition, this software is a comp uter translation of children's literature. When transformed into computer-mediated "books," the quality of the texts and illustrations are preserved. Texts are typically heavily illustrated; also, they are often predictable and include narrative features such as repeated lines and rhymes. These features, like software speech enhancements, increase the cooperativeness of the text. Comprehension is aided because of the graphical cues and the predictability of the text. Also, if a computer-mediated book is used as a springboard for instruction in skills such as decoding, that instruction is easily "anchored," as Hasselbring and his colleagues (e.g., Bottge & Hasselbring, 1993) explain, to the student's experiences with that piece of children's literature.

This presentation will feature an extensive demonstration of the READ 180 software and how it has enhanced students with learning disabilities reading over the past two years. Data will be shared with participants concerning its effectiveness and its overall impact on the reading process.

Providing an Online Instructional Medium for the Deaf

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Abstract: Deaf and hard of hearing students can benefit from participation in text-based online learning. Such online learning avoids the use of audio information, or provides captioning or supplies a written transcription for the course activities. Deaf students can then participate on an equal footing with their hearing counterparts. The special assistance that would normally be required in a traditional classroom setting for the deaf student is not needed. With reliance on web-based learning, those students with hearing loss are provided with a level playing so they can participate unimpeded with their hearing colleagues and have full access to their academic program. By providing an equal educational opportunity to deaf students, online learning becomes not only anywhere, anytime learning, but also learning for anybody.

Introduction

Online learning, or distance learning using the Internet, provides a medium that allows deaf and hard of hearing students in K-12 and higher education an equal footing in their classes without the inconvenience of an interpreter in the middle of the communication. Using the text-based medium of such online instructional platforms as Blackboard, deaf and hard of hearing students can participate without assistance.

The use of Internet-based online learning (OLL) presents faculty and students with multiple opportunities not found in traditional face-to-face (F2F) courses. Using web-based instructional platforms, classes can be run without incorporating verbal communication. Instructors can post course information such as announcements, assignments, documents (e.g., PowerPoint presentations), and grades for viewing anytime from anywhere by their students. A threaded discussion board can facilitate "asynchronous communications (non real-time) where students and the instructor post questions, answers and comments" (Lorenzo, 2000, ¶ 10). Synchronous (live, real-time) text discussions using a form of virtual, text-based chat also can play a role in the class (e.g., virtual office hours, group meetings). For course readings, students can be referred to selected Internet sites or use other Internet-based alternatives such as XanEdu's electronic CoursePacks (http://www.xanedu.com/). Students can submit their work via electronic communication, using e-mail and digital drop boxes.

With the addition of online learning, K-12 and higher education classrooms can morph into interactive "24-7" experiences in which deaf and hard of hearing learners do not need communication help from others. Students communicate with one another and with the instructor through their keyboards, mice, and the Internet, not needing to hear the other course participants.

Why Online Learning?

Online learning offers many conveniences and upgrades for students and teachers over the traditional face-to-face (F2F) class. These advantages include:

- *Anywhere, anytime learning.* No longer is the educational process confined within the four walls of the conventional classroom at a prescribed date and time. OLL permits, even encourages, a form of 24-7 education that provides maximum flexibility. Instructors can teach their OLL classes right from their own offices or even homes. Students can avoid the hassles of driving to the campus and trying to find a place to park by accessing OLL courses from office or home. While it may be frowned upon and discouraged by some employers, students do use workplace computers to connect to their OLL courses, mainly because of the faster Internet connections found in many school and office settings. Even web-enhanced traditional courses, which use OLL to extend the teaching-learning relationship beyond the F2F setting, benefit from 24-7 access to course information and online discussion groups.
- *Increased communication.* OLL provides additional opportunities for student-student and student-instructor interactions. Participants in OLL have opportunities to post and reply to communication threads about course-related topics. Questions get raised and answers debated that might well not have been in the F2F classroom. Shy students, or ones with disabilities such as hearing loss, do not have to worry about speaking up, being called on by the teacher, or having their answers understood. If a question is posed in a discussion board, the student has time to craft a response either directly within the discussion board or first in a word processing program and then copy it later into the discussion board. Web-enhanced OLL allows the teacher to post additional information and create study groups that extend learning beyond the confines of the F2F class. In web-enhanced classes, OLL can necessitate additional time and effort on everyone's part, but the learning is

enhanced with the resulting richer exchanges (perhaps more so than many F2F classes) among students and between students and instructor.

- *Heightened awareness of others*. The quick pace and instructional methodology of many F2F classes does not permit students and teachers sufficient time to get to know one another. With the back and forth replies in an online discussion board format over the duration of a course, however, each participant gets additional insights into one another. Information is gained from the written exchanges and additional contacts (teacher-student, peer-peer) among course participants, adding to the quality of the learning. Graduate students can find out about one another, creating more of a bond than exists in a typical graduate classroom where the students rush in from work and flee to their homes directly after class.
- *Time considerations*. Time is one commodity that students and teachers cherish. OLL prevents the telephone tag time-waster with reliance on e-mail and discussion forums. Students appreciate the more immediate access their teacher (if the teacher checks his/her e-mail with regularity). No queuing in the hallway waiting to see the instructor during office hours as OLL provides opportunities for virtual office hours. Instructors and students are at their keyboards miles apart, yet communicating individually or as part of a live, real-time group discussion. However, these communications come at the price of increased time and effort in web-enhanced courses, especially for the instructor who has to reply to individuals and the class over the Internet, as these communications are in addition to the regular F2F class meeting times. Web-based courses can save time or at least not waste time. Web-enhanced courses, while more enriching and beneficial, can add to the time commitment of faculty. But, based on the student response, the extra time can be worth the effort.

Personal Online Learning Experiences

This writer's own experience with OLL started with participating in a six-week training program operated by OnlineLearning.net. This organization manages OLL courses for UCLA Extension online and the University of San Diego (USD) continuing education online. After successfully completing the training program, an opportunity was offered to teach a six-week web-based OLL graduate course, Mainstreaming: Teaching Individuals With Special Needs in the Regular Classroom, for USD. Subsequently, additional mainstreaming teaching opportunities were offered this writer by USD. While the initial course had only 10 students, the other courses have had enrollments in the high 20s.

The mainstreaming courses are primarily for California teachers needing to "clear" their teaching credential by taking the course, which fulfills a state requirement for their teaching certification. Each student has been pursuing a master's degree in teaching. The students represent a wide range of teaching experience, including those teaching full-time for the first time, and an extensive breadth in grades and subjects (e.g., elementary, secondary, Spanish, GATE, band) found in public education. Since the instructor is located in New York State, teaching a California-based OLL course with a three-hour time difference can be a challenge. The asynchronous nature of OLL, apart from the real-time virtual office hours, allows the arrangement to be successful.

OnlineLearning.net uses Blackboard, which its promotion states is an "e-Education enterprise software platform that encompasses course management, academic portal, online campus communities, and advanced architecture allowing easy integration with multiple administrative systems" (Blackboard Inc, 2001). It provides a "skin" or shell that hides the programming underneath so that instructors do not have to do any programming, as they would if they were programming their own Internet sites for instruction.

> Blackboard's core features include content management that supports most common file formats in an easy click-and-point process, communication and collaboration tools to support individual and group communications as well as group project work, online assessment and testing tools, and administrative tools with which an instructor can easily build and manage a virtual classroom. (Rochester Institute of Technology, 2001, ¶ 5)

The instructor merely types, copies-and-pastes, or uploads text into the appropriate sections of the course's Blackboard site. Instructors and students communicate by exchanging replies in discussion board forums or by e-mail. The latter can be directed to specific individuals, mailed to sub-groups, or sent to the entire class from within Blackboard. The instructor has control of settings for the Internet site appearance and contents. Tests can be taken online. The experience for the students has been positive, as judged by their informal comments during the courses and by their formal end-of-course evaluations.

Besides working with the University of San Diego, this writer has taught online classes for Buffalo State College using the Blackboard infrastructure. The first course was a graduate course in educational computing and used Blackboard.com, which is a free service available on the Internet for anyone's use. This was a web-enhanced course as the students and instructor still met in a traditional F2F setting once a week for a semester. The OLL component of the course presented the students and instructor with opportunities as previously outlined. This OLL course was the first one for each graduate student. Again, as with the USD mainstreaming courses, after their initial skepticism, the students were enthusiastic about incorporating OLL into their course, perhaps because the course topic involved educational technology.

After this initial OLL course at Buffalo State, this instructor has taught five other web-enhanced OLL courses, including two for undergraduates, using Blackboard on the college's computer server. As one may or not expect, the quality and quantity of the discussion board forum conversations were higher in the graduate courses, although the undergraduates' discussions were engaging and with merit. The undergraduates enjoyed OLL, but their replies tended to be "short and sweet," while graduate students composed longer replies with more thought and substance. The only consistent negative comments were directed at the slowness of the Blackboard connection that was due to insufficient bandwidth and other technical issues at the college. Such problems are being addressed. Also, this writer is scheduled to offer a web-based OLL graduate course for Buffalo State College in fall 2001. This OLL course will be the first one at Buffalo State to rely on the State University Learning Network (SLN) for the delivery infrastructure.

Online Learning and Deaf or Hard-of-Hearing Students

Online Learning can be termed "deaf-friendly," if an OLL course steers clear of the use of audio information, provides captioning, or supplies a written transcription for that information. A deaf student is able to participate in a text-based online discussion without an interpreter clogging up the middle of the communication. By avoiding non-text information or providing text equivalent information, deaf and hard of hearing persons can be assessed on *what* they say rather than on *how* they say it. Using the Internet, people with hearing loss then have a level playing field with their hearing colleagues and full access to the academic program. Keyboard and mouse input constitutes the mechanism to facilitate communication among students and between students and the instructor. The instructor can post PowerPoint presentations, with slide notes or sans sound effects, onto a website or into a course infrastructure provider for easy anytime, anyplace access.

With text-based OLL, instructors do not have to adapt their instruction for deaf and hard of hearing students. The deaf student does not need special assistance "to become part of a mainstream educational setting" (Kinner and Coombs, 1995, ¶ 4). Time and expense do not need to focus on accommodations since deaf and hard of hearing students are on an equal footing in a non-verbal class. As long as the participants can read and type, no one knows if anyone in the course is deaf or hard of hearing. "Once appropriate access has been provided to the computer...students function as equals in the computer classroom, and their disability vanishes" (Kinner and Coombs, ¶ 5). No wonder that deaf and hard of hearing students feel more involved in OLL classes than in traditional F2F classes.

As such, online learning can provide fully inclusive classroom settings within the spirit of the least restrictive environment language found in the Individuals with Disabilities Education Act (IDEA). However, as the bandwidth of computer connections continues to increase, OLL will inevitably include fuller media communications featuring voice and video with sound in real-time, such as a streaming video and perhaps a "map with audio descriptions of historic locations which are activated by mouse rollover" (National Center for Accessible Media, Rich Media Accessibility, Frequently Asked Questions, 2001, ¶ 1). As this change occurs, OLL's "silent web era" will parallel the change from silent movies to talkies that occurred in the early twentieth century. Now in a new century, deaf and hard of hearing students will brace themselves for another "advance" in presentation technologies. The hope is that this time technology also will aid these students with web-captioning, embedded media, and other solutions, rather than shut them out.

Buttressing this hope will be Section 508 of Rehabilitation Act that specifies that "Federal agencies' electronic and information technology is accessible to people with disabilities" (Federal IT Accessibility Initiative, ¶ 5). Additionally, other government entities may follow New York State in adopting the "W3C Web Content Accessibility Guidelines as a means to provide optimal access to State agency web sites and the content therein" (Natoli, 1999, ¶ 4). As stated in those guidelines, websites should "provide content that, when presented to the user, conveys essentially the same function or purpose as auditory...content" (Web Content Accessibility Guidelines 1.0, 1999, chap. 6, ¶ 1).

For the time being, though, deaf and hard of hearing students will benefit from the text-based aspects of OLL, at least as represented by instructional delivery platforms like Blackboard. Online learning will not only be anywhere, anytime learning but also anybody. As one OLL deaf student put it,

> As a deaf adult, distance learning courses have opened additional opportunities and avenues that have long been available to my hearing peers....Besides allowing me to focus on learning as opposed to, say, wondering how much of the essence of a teacher's message the interpreter or note-taker has captured, distance learning provides a forum where deaf adults like me can share technical and non-technical expertise unhindered by language, negative attitudes, geography or distance. All told, distance learning gives me a fighting chance to stay current, competent and competitive in a fast-changing technological environment. (Lorenzo, 2000a, ¶ 16)**References**

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CHALLENGING DECISIONS: SOFTWARE SELECTION and the IEP PROCESS

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Abstract: This paper provides a rationale for using an Individualized Special Needs Software Evaluation (ISNSE) instrument, designed with teacher identified criteria for specifically recognizing each student's individual need, when evaluating software to be included in the Individual Education Plan (IEP). The Individuals with Disabilities Education Act (P.L. 101-467) mandates that all students with disabilities, regardless of the severity of the disability, be considered for any assistive technology needs. Specifically, the law requires that each child's IEP team must, "consider the child's need for assistive technology devices [§300.346(a)(2)(v)], and reflect in the child's IEP both the nature and extent of the assistive devices and services to be provided to the child [§300.346(c)]." Software is considered a type of assistive technology. Thus, IEP teams should carefully determine if a child could benefit from using a specific software program and then document the number of uses on the child's IEP.

Introduction

Selecting software for any classroom use is challenging. But, for teachers of children with high incidence disabilities (learning disabilities, behavioral disorders, and mild mental handicaps), the task may be even more daunting when the Individual Evaluation Plan (IEP) goals are taken into consideration fully. The tremendous growth in the number of commercial software programs is staggering, which makes the selection process for a special education teacher even more time consuming and crucial. In order to attain the goals set forth in the IEP and provide positive student outcomes with technological integration, which is now expected and written in the national and state standards, teachers would need to be trained and competent in the software selection process. Purchasing software for the special needs classroom should no longer be left to a generalist or the media/technology specialist. Responsibility for the selection must now fall to the special education teachers who know the specific needs of each learner as well as how appropriate a program is, for meeting IEP goals. A review of numerous studies have been conducted to assess the software evaluation process with evidence showing that special education teachers often rely upon external evaluations as the most commonly used evaluation process. Results of the authors' study suggest an internal evaluation process is necessary and ought to be considered in the writing of IEPs (Forgan & Weber, 2001).

External Software Evaluation

An external evaluation of software is defined as one in which someone reviews the software program other than the student's teacher. External evaluations rely upon another persons' opinions. In most cases, the external evaluator of educational software does not have a special education background and certainly does not know the students' individual disabilities. Although external evaluations often provide the teacher with an overview of the software program, this type of evaluation does not encourage the teacher to evaluate the software with a specific child in mind.

Internal Software Evaluation

An ISNSE is a type of internal software evaluation (one in which the teacher completes the evaluation). This type of software evaluation begins when the teacher creates a mental representation of the student(s) likely to use the program, by focusing on the individual's characteristics and needs, before familiarizing themselves with the program features. After exploring the program thoroughly, the teacher completes an ISNSE instrument rating form with the particular students' needs in mind. This type of an ISNSE instrument evaluation procedure provides the teacher with powerful knowledge of the program and its relationship to the students' educational goals. A program that is suitable for one child with a high incidence disability may not meet the unique needs of all children with these disabilities. Thus, upon evaluating a program using an ISNSE instrument, teachers may confidently integrate the program into the curriculum to help each student master his or her IEP goals and objectives.

Including the ISNSE on the IEP

Sharing this information at the IEP meeting with the multidisciplinary team will help the members address the assistive technology component, as required by the Individuals with Disabilities Education Act (Public Law 105-17). Additionally, as the teacher completes this very comprehensive process using an ISNSE instrument, knowledge will be gained to provide a launching point for IEP team members and others to initiate dialogue about the appropriateness of the software for instructional enhancement. This process would be used to supplement the integration of technology for special education applications and could provide an additional measurable component for the IEP based upon the attainment of goals and objectives expected from the use of instructional software.

Existing Software Evaluation Models

A number of general software evaluation models exist which contain characteristics to assist teachers in evaluating educational software, but these models do not contain criteria special education teachers report as critical to consider (e.g., Bos & Vaughn, 1998; Lindsey, 2000). Taking into account the perspective of special education teachers is valuable since they interact with students and the software on a daily basis. The special education teacher also has the most comprehensive knowledge of students' educational performance and needs. The following introduction of the ISNSE model of software evaluation is based on characteristics reported in a study of 144 special education teachers as the most important criteria to consider when selecting software (Weber, Forgan, & Schoon, 2001).

Special Education Teachers' Software Evaluation Characteristics

Special education teachers of students with high incidence disabilities at the elementary level identified characteristics they viewed as important to consider when evaluating computer software. Qualitative data analysis revealed 10 major themes identified by the teachers. . Six themes were comparable to indicators described previously in the literature and four themes showed a discriminating influence addressing the special needs perspective and distinguishable from current evaluation criteria. These four themes were classified as: (a) individual instructional integration; (b) narration; (c) curriculum encompassing; and (d) teacher functionality. The special education teacher identified themes similar in other evaluation instruments to aid in software evaluation were addressed as: (a) welcoming; (b) sensory stimulating; (c) learner program design; (d) learner empowerment; (e) technology adaptation; and (f) diversity. A copy of the authors' Special Needs software Evaluation Scale (SNSES) is available by contacting rweber@fau.ed

Supplemental Software Evaluation Forms

The authors recommend using supplemental software forms to help in the identification of the learners' overall academic and social characteristics and to designate the frequency and duration of use. These forms were developed by the authors and could be modified to meet specific needs of the evaluator or the district. It is suggested that a supplemental software evaluation forms be completed to document the appropriateness of the selection for each learner.

Figure1: Student Characteristics

Directions: In order to use this form, first think about your child's unique characteristics. Read the list of characteristics and determine which descriptors relate to your child and place a check mark in each pertinent box or write in your own characteristics. Focusing on the child's characteristics helps with evaluating the software program and provides evidence that the software program can help meet their needs.

Figure 2: Recommendations Form

Recommending the Evaluated Program

A note of caution: some school districts are hesitant to write a specific software title on the child's IEP in concern that if the child changes schools, the new school might not have that specific software program. The school district may prefer to write a general statement about the type of software program recommended such as, "software to improve letter and sound identification." We strongly argue against this and suggest that teachers and parents require the specific software title written on the child's IEP. Overall, by using the individualized special needs software evaluation instrument in conjunction with the supplemental software evaluation form, school personnel and parents can discuss the assistive technology requirement for their child's IEP and make well-informed recommendations that assure the software programs the child uses are instructional, educational, and enjoyable.

Conclusion

Fortunately, federal law gives each school district flexibility in creating and utilzing forms to document the assistive technology component of the IEP. The model presented here for software evaluation is based upon the perspective of practicing special education teachers of elementary students with high incidence disabilities. This evaluation model was developed specifically for special education teachers and related service providers to use when evaluating the appropriateness of a software program for meeting an individual child's IEP goals. With the national focus on student and teacher accountability, teachers must be certain and able to document that the integrated use of technologies, including the effect use of software programs, are used productively which hopefully will lead to improved student outcomes. Using the Individualized Special Needs Software Evaluation (ISNSE) approach for assessment reflects the most up-to-date knowledge in software evaluation and incorporates teacher identified characteristics that are vital for individual instructional supplementation. Teachers who use this model for software evaluation can be confident their results portray an accurate evaluation of the program's features and value to enhance the learning process.

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Figure 1: Student Characteristics

School Name

Name of Student ______________________________

____

Student ID ______________________ **Date** ______________________

These programs are appropriate for students with the following characteristics:

Short attention span	Confuses similar letters
Difficulty making friends	Difficulty understanding directions
Difficulty completing a task	Difficulty memorizing and recalling information
Difficulty expressing feelings appropriately	Mispronounces sounds or words
Difficulty working independently	Difficulty understanding figurative or literal language (e.g., "hold onto your hat")
Difficulty composing a correct sentence	Difficulty with basic addition or subtraction facts
Spelling difficulties	Difficulty with basic multiplication or division facts
Poor reading comprehension	Difficulty with math word problems
Difficulty recognizing the names of letters.	Other ____________
Difficulty recognizing the sounds of letters.	Other ____________
Difficulty sounding out words.	Other ____________

Figure 2: Recommendations Form

Title of Software	Bailey's Book House		
Recommendation	Daily	Weekly	Minutes/ Session
Title of Software	________________		
Recommendation	Daily	Weekly	Minutes/ Session
Title of Software	________________		
Recommendation	Daily	Weekly	Minutes/ Session
Title of Software	________________		
Recommendation	Daily	Weekly	Minutes/ Session

Signatures:

Parent/Guardian ________________

ESE Teacher ________________

General Ed Teacher ________________

Technology Specialist ________________

LEA Representative ________________

These programs selected will supplement:

Math	Reading	Social Studies
Language Arts	Science	

Effectiveness of QuickTime VR as an Instructional Environment for Students with Special Needs

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Abstract: Virtual reality (VR) has been shown to be an effective tool to enhance and support a variety of educational activities. QuickTime VR (QTVR), developed by Apple Computer Corporation, is a technology for creating and moving through virtual environments. QTVR provides a number of advantages over "traditional" VR. These include lower cost of the development software as well as the hardware required to run it and it does nor require advanced training or programming skills. The study will evaluate the effectiveness of using QTVR as a virtual environment to train students with special needs in developing life skills.

Introduction

Virtual reality (VR) has been shown to be an effective tool to enhance and support a variety of educational activities (Andolsek, 1995; Maule, Oh, & Check, 1998; Taylor & Disinger, 1997). In addition to instruction, VR has also come into increased use in diagnosis and treatment of severe psychological and emotional disorders. Although effective, its use has been limited primarily due to the high cost of both the equipment required to create and participate in the VR world, but also the time and expertise required to develop the environments (Dunning, 1998).

QuickTime VR (QTVR), developed by Apple Computer Corporation, is a technology for creating and moving through virtual environments (Kitchens, 1998). QTVR provides a number of advantages over "traditional" VR. The cost of the development software is very reasonable at less than $400. It requires no advanced computer system to run, only a Power Macintosh running System 7.5 or later. Software for creating similar environments is also available on the Microsoft Windows operating system. Creation of the QTVR environment is relatively simple, requiring only the step-by-step instructions in the user manual, not advanced training or programming skills. Traditional VR environments are created by building a 3D model which the computer uses to generate the visual environment. Due to the comp lexity of this operation and the amount of possessing power required, the representations forfeit detail for economy of use. Consequently the virtual word resembles a low cost video game more than reality. In comparison, QTVR utilizes actual photographs to create its virtual world, making the scenes visually realistic. Lastly, Fully immersive VR requires costly technology such as head mounted displays (HMD) and movement tracking devices to allow the user to interact with the virtual world. QTVR movies only require the use of either a Macintosh or Windows based system and the free QuickTime Player for interaction.

QTVR creates VR environments by "stitching" together photographic images to provide either a panoramic view or a stationary view of an object which can be rotated and view from any angle. The QTVR movie allows the user to actively pan through the full 360^0 of the panorama. This provides the illusion of standing in one location and turning around to view your surroundings. Once these individual panoramas are created, they can be linked to allow the user to move from one to another by selecting "hot spots" or doorways (see Figure 1). The linking of multiple panoramas creates a virtual representation of a locality such as a school or historic site, which can be accesses remotely either over a local area network or the internet.

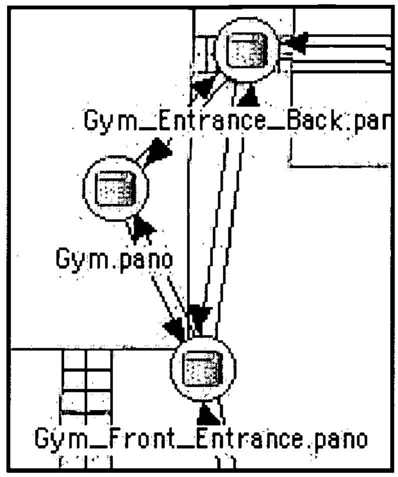

Figure 1. Example of Linked Panoramas

This paper will describe a pilot study currently underway to determine the effectiveness of QTVR as an instructional tool to assist students with special needs (mild to severe mental retardation) to develop life skills.

Uses of VR in Education

Currently the use of virtual reality in education and training can be divided into two general areas. First, it provides students with the opportunity to interact with environments or phenomena that would be difficult or impossible to work with in a traditional classroom setting. Examples of this methodology would be fieldtrips to distant locations measured both in miles and time (Pape et al, 2001), viewing biological, chemical, or physical reactions (Taylor & Disinger, 1997), and the visualization of complex data sets. The second use is when the students are actively involved in the design and creation of the VR environment. Activities based on this method promote a high degree of constructivism and cooperative learning environments (Roussos, Johnson, Leigh, Vasilakis, & Moher, 1996; Winn, Hoffman, Hollander, Osberg, Rose, & Char, 1999). Work with students with disabilities using VR technologies have included life-skill training for students with physical handicaps (Germann & Broida, 1999), students with severe learning disabilities (Neale, Brown, Cobb, & Wilson, 1999), and students with behavior disorders (Muscott & Gifford, 1994).

Project Description

The current project builds upon the work of Neale et al (1999), who utilized traditional VR environments to train students with special education needs in life skills. The VR environment provided very limited visual authenticity and required the development of 3D worlds representing a house and supermarket. The object of the VR training was to provide the students with multiple opportunities to work within a real life situation (e.g. shopping, cooking, etc) virtually before encountering the tasks in the actual environment. This is particularly helpful since it allows the students to gain experience without traveling to the location and encountering difficulties which may prove to be embarrassing, hazardous, or costly.

The current project utilizes QTVR to represent similar environments but will provide actual photographic imaging of the virtual world. If similar results are obtained it will show that effective virtual learning environments can be created utilizing the capabilities of QTVR. This would mean that educators could produce VR environments quickly, simply, and inexpensively.

The ultimate goal of the project is to create a QTVR representation of a local supermarket used by our school system to provide life skills training. The pilot study will determine if the subjects can interact with and learn from a QTVR environment. QTVR models will be created of the elementary, middle, and high school in the district (see Figure 2). The elementary students will begin using the model of their own school, one with which they already are familiar. After they are comfortable with using the system, they will begin to use the model of the middle school, a building they do not know. When they can locate specific landmarks (media center, gym, cafeteria, etc.), in the virtual environment, they will visit the facility and will be evaluated on their ability to successfully navigate the building in real life. The same procedure will be conducted with the students at the middle school except they will be evaluated using the high school as their test environment. This will be done to see if there is a difference in the effectiveness based on age/grade level.

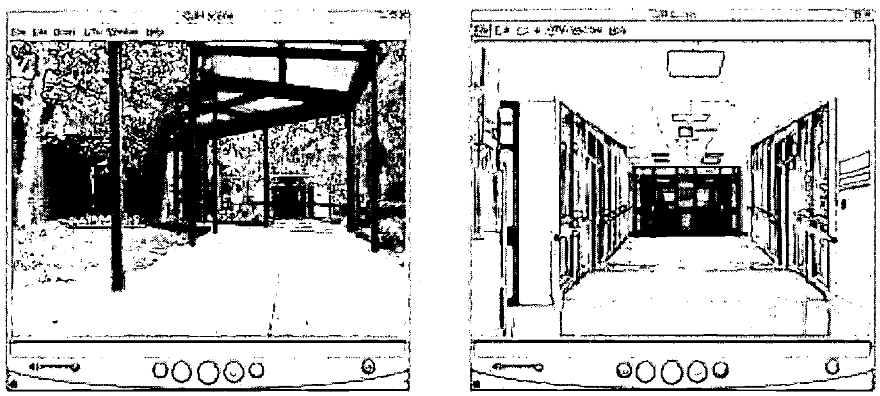

Figure 2. Examples of QTVR Scene at the Junior High School

If the pilot study shows success, the students will move up to using the supermarket environment. Other QTVR models will be created based upon the recommendations of district's special education teachers to meet the educational needs of their students.

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