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ABSTRACT

This document contains the following papers on special needs instruction and technology: (1) "Hawaii Special Education Teacher Induction" (Kalena Oliva and Quinn Avery); (2) "The Impact of Group v Individual Use of Hypermedia-Based Instruction" (Lewis R. Johnson, Louis P. Semrau, and Gail E. Fitzgerald); (3) "Assistive Technology Meets Instructional Technology: A Standards-Based Approach to Implementation in Teacher Education" (Joyce Pittman); (4) "Infusing Technology into a Preservice Teacher Education Program for Special Educators" (Evelyn M. Dailey); (5) "Web Enabled Teaching Aid for Non-Orthographic Languages" (Georgios Kouroupetroglou, Constantinos Viglas, and Christina Metaxaki-Eossionidis); (6) "Special Needs Software Evaluation: Choosing the Right One" (James W. Forgan, Roberta K. Weber, and Perry L. Schoon); (7) "Effective Technology Practices in an Inclusion Classroom: A Proposed Teacher Training Model" (Tandra Tyler-Wood, Joyce Rademacher, and Mark Mortensen); and (8) "Teaching Faculty and Future Teachers about Web Site Accessibility: Issues and Challenges" (Pamela Luft and Drew Tiene). Individual papers contain references. (MES)

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SPECIAL NEEDS

Section Editor:
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In late January, the Technology and Media Division of the Council for Exceptional Children held the TAM 2000 Technology Access Conference in Milwaukee, Wisconsin. The wide variety of presentations, ranging from discussions of assistive technologies, new hardware and software developments, and inclusion, showcased the innovative thinking, which has occurred in the past few years in the area of technology access for individuals with disabilities. Most technology conferences include sessions covering technology access. We will see more conferences, such as SITE, which provide a major strand focused on technology access, and conferences, such as the CEC conference in Milwaukee, which showcase the effective use of technology to improve educational opportunities and increase the independent living of individuals with disabilities and for those who are gifted.

The inclusion of web-based information into the curriculum of those who work with individuals with disabilities provides yet another tool for our parents and our teachers. The March 1998 final regulations for the Individuals with Disabilities Education Act (IDEA) require that accommodations for students with disabilities include assistive technology, therefore, student IEPs must address these needs for assistive technologies. The articles in this section of the SITE proceedings display the wide variety of research and study which is being devoted to the inclusion of technology into the daily lives of individuals with disabilities. Research continues, and the articles presented here provide an additional source of information for those with questions. We have teachers helping parents helping students helping teachers ... these are very admirable goals for any organization.

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HAWAII SPECIAL EDUCATION TEACHER INDUCTION

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Abstract: The purpose of the *new* Hawaii Special Education Secondary and Elementary Teacher Induction Program is to enhance pre-service and intern teachers' practices of classroom management, parent/community communication, and technology usage throughout their first year of teaching. Participants in this program are familiarized in the unique culturally diverse traditions and procedures of their school communities. The Department of Education in Hawaii has projected, between now and the year 2005, a need to hire 200-250 special education teachers annually. Darling-Hammond (1995) argued that collaborations among teacher educators, beginning teachers, and experienced teachers have resulted in shared knowledge and norms of practice that further the development of the profession. The participants attended seminars to receive training in utilizing five standards of effective pedagogy (CREDE, 1997). Classroom instructional technology of PowerPoint presentations, overhead slides, digital camera images and electronic mail are modeled, and pre-service and intern teachers implement their usage in their classrooms with relevant curriculum.

Introduction

Student populations are becoming increasingly diverse in America. A successful teacher must be able to teach in an increasingly culturally diverse classroom. Teachers must work with other professionals, para-professionals, parents and the community to accomplish this success. It is very important for this collaboration as school districts have a duty to make good faith efforts to include students with disabilities in regular education classroom settings. The least restrictive environment (LRE) provisions of the Individuals with Disabilities Education Act (IDEA) require that children with disabilities be educated in regular education classroom unless "the nature and severity of the disability is such that education in the regular class with the use of supplementary aids and services cannot be achieved satisfactorily" (IDEA, 1997). Special education teachers, general education teachers, social workers, administrators and others are beginning to collaborate for the successful educational development of student teachers. Darling-Hammond (1995) argues that collaborations among teacher educators, beginning teachers, and experienced teachers will result in shared knowledge and norms of practice and further the development of the profession. The literature of practice in teacher education urges reform that includes collaboration across disciplines essential to educating teachers for increasingly diverse student populations (Miller & Stayton, 1999). Collaboration amongst teachers and other professionals is not complete without the collaboration of parents and the broader community. Effective family-school collaboration depends on professionals who are (a) sensitive to their own cultural experiences, values, and attitudes toward ethnically, racially, and culturally diverse populations, socio-economic levels, and gender groups; (b) knowledgeable about the linguistic, cultural, and familial backgrounds of the children and youth in their classes and the larger society; and (c) culturally responsive to and inclusive of diverse students' and pedagogical perspectives (Sileo & Prater, 1999). The Center for Research on Education, Diversity and Excellence developed five standards for effective pedagogy. These include (1) teachers and students producing together, (2) developing language across the curriculum, (3) making meaning by connecting school to students' lives, (4) teaching complex thinking, and (5) teaching through conversation (CREDE, 1997).

We are going to need over two million new teachers to replace retiring teachers and support an expanding student population over a short period of time. The need for qualified teachers is constant in Hawaii. Contributive factors include retirement, termination, long-term leave, student enrollment increases, and new programs. Currently, the 'critical' teacher shortage areas include Special Education. Vacant positions of schools in geographically remote locations are also difficult to fill. There were 1,008 teachers hired during the 1998-1999 school year, 42% of these new teachers were special education teachers (Teacher Employment Report, 1998-99). The projected need of new special education teachers continues through the year 2005. Currently the Department of Education has developed partnerships with several universities to provide 200-250 special education teachers each year as the Felix Action Plan, to bring the State of Hawaii

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into compliance with the Felix vs. Cayetano Consent Degree (Felix Implementation Plan, 1998). If these new teachers are to enter the classroom prepared to utilize technology creatively and efficiently, there needs to be a comprehensive restructuring of teacher preparation programs (Carroll, 1999). The student population in Hawaii is very diverse. The current classifications for students and teachers in the Department of Education include Caucasian, Chinese/Korean, Filipino, Hawaiian/Part Hawaiian, Japanese and other. At the present time, according to the ethnic classifications Chinese/Korean, Filipino, and Hawaiian/Part Hawaiian teachers are underrepresented in the state school system. This presents critical issues such as the education of linguistic and cultural minority students and students placed at risk by factors of race, poverty, and geographic location (CREDE, 1997). The teacher retention rate in special education is five years on average. Teachers have expressed concern about their level of professionalism and knowledge of culturally diverse teaching and learning styles in Hawaii. Teacher needs according to the Comprehensive Needs Statement (1999) includes the following statement, "Teachers are under prepared for what is expected of them and are not knowledgeable enough about the life, culture, and community of their students to teach effectively." These issues address the need to promote and implement effective ways to teach linguistically and culturally diverse students. Our program attempts to address these issues through its teacher preparation programs.

The Pilot

Two teacher preparation programs at the University of Hawaii are currently being included in the teacher induction program. The Programs are the Bachelor of Education Degree (B.Ed.) Programs in Elementary or Secondary Education and Special Education and the Post-Baccalaureate Certificate (PBCSE) in Secondary Education and Special Education. The Bachelor of Education degree program prepares students to become eligible for an initial dual license in either elementary or secondary and special education. The Post-Baccalaureate program prepares students with a Bachelor's degree outside of education to teach secondary general and special education. The rapid advances in technology and the diverse student population and challenging communities necessitate the need for this induction program, which is in its pilot stage. Students in the programs are advised to have access to or to purchase a computer for the program. Collaboration with the Department of Education, University personnel, mentor teachers, parents, and other para-professionals at the schools with the pre-service and/or intern teachers has proven to be a valuable effort to retain special education teachers.

Students receive seminar opportunities utilizing the Center for Research on Education, Diversity and Excellence five standards for effective pedagogy through out the program. These include (1) teachers and students producing together, (2) developing language across the curriculum, (3) making meaning by connecting school to students' lives, (4) teaching complex thinking, and (5) teaching through conversation. The culturally responsive pedagogy focuses on and promotes social equality and democracy, and affirms diversity. The students are taught to recognize and respect the differences of the student and community population and utilize the commonalties among each student to unite the group. The in-service sessions focus on culturally diverse learning styles, self-assessment and instructional conversation emphasizing the use of technology. Classroom instruction on web page analysis, PowerPoint presentations, overhead slides, digital camera images and the mentors and university personnel model electronic mail. The pre-service and intern teachers implement their usage in their classrooms with relevant curriculum.
Experienced university teachers who are trained as mentors, work continuously building the bridges between the school personnel and parent/community members at the school placement sites throughout the school year. The university mentors provide assisted training by visiting their beginning teachers to observe lessons and offer feedback. The mentors model effective teaching strategies at the seminars and in classrooms using culturally relevant learning styles. The promotion of sharing personal information in a safe, non-evaluative atmosphere, listening to the new teachers needs, and risk minimization of shared experiences parallel learning styles of diverse students (G. Kishi and M. Hanohano, 1992).

Survey

Initial surveys were given at the beginning of the program to offer feedback to the university personnel once the syllabi and expectations were discussed. The idea of a computer community was also discussed as the students learned to sign on and use the University MAILE (Manoa Advanced Interactive Learning

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Environment) system. The varying levels of comfort were expressed in the surveys as well as the levels of understanding. Many students had little computer usage while others use the computer daily. This was a benefit for the program as it portrayed a typical classroom range of abilities, experiences and educational different levels. Several comments are outlined below. "I don't know what my expectations are as far as grades go." "I don't know much about computers." "I like the pilot as it will give me more time to be creative in my coursework." "I like the freedom of getting my assignments off the computer." Other questions were asked addressing the issue of the importance of mentoring; these are a few of the comments. "Discussing lesson plans and our teaching give constructive feedback," "Discussing individual students with us helps us understand the students and their needs," "Modeling and demonstrating by the mentor teacher is helpful." The pilot does not allow any inferences to be made with this first survey. At the end of this school year (1999-2000), another survey will be administered to the teacher participants, mentors, school personnel, students and university personnel affiliated with the program.

Conclusions

The *new* Hawaii Special Education teacher induction program is in its pilot stage. As the program continues through its first year, an assessment of the participants' teaching practices will be conducted through interviews, reflective e-mail journals, surveys, and the use of a rubric assessment instrument in classroom observations. Participating teachers will share program information in faculty and community meetings during the school year and ask for enhancement feedback regarding the program. At the present time, we have observed the increased use of technology in the participant school sites. As the new teachers demonstrate their knowledge of this technology in their classrooms and in meetings, many other educators are benefiting from the possibilities of materials developed through technological means. The multiplication effect of modeling and sharing knowledge has also pervaded to the school staff, faculty, parents, and the community as teacher participants share the students' progress.

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The Impact of Group v Individual Use of Hypermedia-Based Instruction

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Abstract: Students enrolled in an undergraduate introductory special education class were provided the option of supplementing traditional reading/lecture instruction with an interactive multimedia program to determine if individual or paired use of the program produced greater learning than those who received no supplemental instruction. Learners who worked cooperatively in pairs achieved higher achievement scores on a criterion-referenced test than those who worked individually with the hypermedia program or the control group. Implications for the use of hypermedia instructional programs with novice learners are presented.

Introduction

Traditional college instruction in the form of lectures, text assignments, and projects may not be sufficient to facilitate the higher-order thinking that is required for the application of new knowledge. Hypermedia-based instruction, which simulates real-world situations, may help move the learner from the knowledge level on Bloom=s continuum of learning through comprehension, application, analysis, and synthesis to the evaluation level. In addition, learners working in small groups with a case-based multimedia program may acquire the knowledge and skills at a faster pace than those working the same program independently. This paper reports the preliminary findings from a study to determine 1) if group and individual use of hypermedia-based instruction impacts on the outcome of learning from traditional lecture and reading assignments and 2) what factors may influence performance.

The hypermedia instructional program Assessment and Planning in Emotional and Behavioral Disorders, part of the Teacher Problem Solving Skills (TPSS) series (Fitzgerald, et al., 1996; Semrau, Fitzgerald, Daniels, & Carlson, 1996; Semrau & Fitzgerald, 1997) is the case-based hypermedia program used in this study. The TPSS program is based on Cognitive Flexibility Theory (Spiro, Feltovich, Jacobson, & Coulson, 1991) in that there are multiple representations of the content and the learner may revisit the content in different contexts. In the TPSS program the multiple contexts are case studies which include problem solving tasks. To parallel the ill structured nature of the information related to behavior disorders, the program's content is purposely ill structured, and contains extensive scaffolding to facilitate schemata building on the part of the learner. TPSS focuses on assessment and observation of children across settings, types and uses of assessment information, program placements, support services, and resource planning. Although two cases are profiled in this program, *Jimmy* and *Joyce,* only *Jimmy* was utilized for this study. A unique feature of the program is the collection of data (date and time used, time spent in each program segment, choices made, sequence of activities, and written notes and responses) on a user=s floppy disk entitled *Student*, which provided some of the data for analysis. A thorough description of the program is provided by Fitzgerald, Semrau, and Deasy (1997) and Semrau and Fitzgerald (1997). The hypermedia program paralleled the class lectures and reading in the assigned class textbook.

Ayersman (1996), in an exceptional review of the literature, stated Ahypermedia has been shown to result in significantly higher levels of performance in a variety of content areas for college-age students@ (p. 515). He supported his position by citing the findings of Overbaugh (1995), Fitzgerald (1995), and Chen (1993) where subject performance was determined while using hypermedia programs. He goes on to say that Ahypermedia is at least as effective as lecture...comparisons of hypermedia treatments to lecture no longer seem to warrant research focus@ (p. 517). Evert (1996) looked at the benefits of hypermedia in a high school population and found that the hypermedia instruction group performed better than the traditional instruction group. Luna and McKenzie (1997) researched the effectiveness of hypermedia using a college-age population. Their data established a weak statistical link between hypermedia instruction and overall student performance. However, not all research on hypermedia-based learning has been positive. Rojewski, Gilbert, and Hoy (1994) supplemented the instruction of undergraduate special education students (novice learners) with the individual use of a hypermedia program and found no significant difference between these learners and those students who received no hypermedia instruction. In their study, students who supplemented their classroom instruction with a drill and practice program that presented the content in a linear fashion performed better than the hypermedia and control groups. Students in their study reported difficulty with the nonlinear hypermedia format, and this caused feelings of frustration and anxiety. This underscores the need to continue the research on hypermedia-based learning and learner characteristics.

Tergan (1997) critically reviewed the effects of hypermedia on learning. He specifically addressed the assumptions that learning is enhanced when content is presented in multiple contexts as in the TPSS program. Cunningham (1993) (as cited in Tergan, 1997) noted that a student=s engagement with hypermedia is a complex interaction of the user=s goals, prior content knowledge, and prior experience with hypermedia. Tergan cautioned that hypermedia may enhance the learning of persons with some knowledge of the content, but hypermedia use may depress the learning performance of novice learners due to the increased cognitive load of integrating the content and managing the program. To describe this condition, Wenger and Payne (1996) use the term Acognitive overload@. Tergan Asuggests that students need explicit modeling and scaffolding support in order to gain knowledge from a Cognitive Flexibility Theory-based hypermedia learning environment@ (p. 11). It appears that there is a novice learner effect which influences the performance of individuals who use hypermedia-based learning programs which may be remedied by supportive scaffolding, similar to that available in cooperative learning groups.

Crooks, Klein, Jones, and Dwyer (1996) addressed the use of computer-based instructional programs with student groups for teacher training. Their review of the literature revealed several studies which reported mixed results, some attributed to varying factors. In their study 128 undergraduate education students participated in a computer-based lesson for teachers who were learning to identify and write good assessment items. The subjects who worked individually on the computer program performed slightly better than the cooperative learners. Despite their results, they assert there is a strong rationale for using computer-based instruction (CBI) with groups of students citing better attitudes and increased task orientation as outcomes. Hooper (1992) studied the effects of peer interaction during CBI and noted a positive correlation between increased student interaction and increased achievement. Both studies justify a need for continued research on variables which have Arevealed positive results in favor of cooperative groups for various nonachievement measures@ (p. 110). Rogoff (1998) cited a number of studies by Johnson and Johnson where participation in cooperative groups facilitates achievement of individuals, particularly in higher order thinking skills.

Some of the factors influencing learning on a hypermedia program were explored by Fitzgerald, Semrau, and Deasy (1997) using the TPSS case study training materials. Their study of learner differences resulted in findings that learner differences (rank in school, prior experiences using computers, and cognitive controls of field dependence and independence) did not impact learning outcomes using hypermedia case study programs. They concluded that hypermedia-learning environments provide equally effective instruction for learners regardless of their differences, whereas the amount of time engaged in the use of the program was most critical to the outcome. Their study did not attempt to look at individual versus group learning, and the impact that group learning may have on program engagement time. Therefore, it seemed necessary to address in this study the question of whether group or individual use of hypermedia instruction is more beneficial.

The purposes of this study were to determine: 1) if individual or group use of supplemental hypermedia instructional materials has a positive effect on student performance as measured on a criterion-

referenced test of course content requiring higher-order thinking skills; and 2) what factors (anxiety of computer use, prior use of computers, time spent with the program, and grade point average) influence pre/post difference scores on a criterion-referenced test requiring higher-order thinking skills.

Method

Subjects

Subjects for this study (n=54) included undergraduate education majors enrolled during the 1996-98 academic years in the course SE 2623 Introduction to Exceptional Children at Arkansas State University. Participation in this study was voluntary and did not influence the grade of the participants in the class. The students were divided by random assignment into three groups: a control group, a group which worked on the multimedia program individually, and a group of 14 students who worked in pairs and 3 who worked in a triad on the multimedia program.

Measures

The subjects were administered the following instruments:

1. Spielberger's Self-Evaluation Questionnaire, a 20 item computer anxiety instrument, was based on a modified version of the Spielberger Self-Evaluation Questionnaire to which participants respond on a four-point scale of agreement/disagreement related to feelings and anxiety toward the use of computers. This instrument has been used in numerous studies to measure computer anxiety and has proven to be valid and highly reliable (Reed & Palumbo, 1992). For data analysis, the sum of the ratings was combined to form a total score.
2. Prior Computer Use Survey (Reed & Giessler, 1995) includes nine statements to which an individual responds that indicate expert knowledge of computer usage on a scale of 0 Ano knowledge@ to 9 indicating Aexpert knowledge@. For data analysis the sum of the item ratings were combined to form a total score.
3. A 38 item criterion-referenced multiple choice format chapter test was developed using the textbook test bank and instructor written questions, and used as a pre/post measure of change in knowledge and skills in the area of emotional/behavioral disability. The test items were selected to be representative of the chapter content and class sessions; and included higher order thinking skills such as comprehension, application and evaluation. For data analysis, the pre/post difference score was used for data analysis.
4. Time spent in Teacher Problem Solving Skills (TPSS) program was calculated by summing all of the time recorded on the *Student Disk*. The TPSS multimedia program is capable of recording the individual student's or student group=s activity while using the program.
5. Grade Point Average (GPA) was taken from each subject's transcript based on all class work completed.

Procedure

Prior to beginning the chapter on emotional/behavioral disabilities in the course Introduction to Exceptional Students, the undergraduate students volunteering to participate were divided by random assignment into three groups. All three groups were administered the instruments listed above. The TPSS multimedia program was made available for student use in the university computer lab and training in the operation of the program was provided to all except the control group to enable students to enter the program and make use of the features of the program. Students in the individual or group condition worked on the multimedia program to supplement their classroom instruction. Upon completion of instruction and working with the program, all subjects were administered the posttest which was same 38 item criterion-referenced test used as the pretest.

Results

During the academic years of 1996-98 data were collected for 21 control group subjects, 16 subjects who worked individually with the program, and 17 subjects who worked in small groups. Descriptive statistics for each variable for each group are listed in Table 1. The authors used a t-test to compare the means of the groups with a criteria for significance of .05. To determine the relationship of the academic

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performance factors to the criterion-referenced test difference scores, Pearson r correlations were computed and compared to an established criteria.

Table 1 Descriptive Statistics for Variables for Each Group

Measure	Control (n=21) M	SD	Indiv. (n=16) M	SD	Group (n=17) M	SD
Spielberger's Self-Evaluation Questionnaire	41.61	11.73	41.13	8.21	41.93	8.48
Prior Computer Use Survey	30.76	17.75	30.67	16.73	32.93	16.36
GPA	2.99	.44	2.95	.53	2.63	.68
Pretest	17.57	6.29	18.50	5.15	17.00	4.54
Posttest	23.57	5.27	24.19	5.38	26.71	6.56
Criterion-referenced Test Difference Score	6.0	4.91	5.69	4.88	9.71	4.93
Time in Minutes Spent in TPSS	—	—	152.0	47.3	180.0	73.4

Research Question 1:

Does the individual or group use of hypermedia-based supplemental instruction result in a significant difference in learning, as measured by a criterion-referenced test? When comparing the mean difference scores of the individual (M = 5.69) and group (M = 9.71) users of the multimedia program a significant difference was found, $t(21) = -2.350$, $p = .025$.

Research Question 2:

Does the use of a hypermedia-based instruction result in statistically significant higher scores on the criterion-referenced test when compared to students who did not use the hypermedia-based instruction? The mean difference score of the individuals (M=5.69) who used multimedia was lower than the control group (M=6.00), therefore hypermedia use did not have a positive impact on the learning of this group of subjects. However, when comparing the mean difference scores of the control group (M = 6.00) to students who worked on the hypermedia program in groups (M = 9.71) there was a significant difference between the means, $t(36) = -2.72$, $p = .020$.

Research Question 3:

What academic performance factors (anxiety of computer use, prior use of computers, time spent with the program, and grade point average) are moderately related ($r > .40$) to the pre/posttest difference scores on the criterion-referenced test? To answer this question, Pearson correlations were examined to determine if any correlations met the researchers' criteria. Correlations between the pre/post difference scores and the following academic performance factors are as follows: 1) anxiety of computer use ($r = .203$), prior use of computers ($r = .028$) , time spent with the program ($r = .292$), and grade point average ($r = -.011$)
No factors measured in this preliminary data collection met the established criteria.

Discussion

Although the findings of this study should be considered cautiously due to the small number of participants, the primary finding is that learners working with supplemental hypermedia instructional materials in pairs or triads performed better on a criterion-referenced test of course content than the learners working independently on the same hypermedia materials. Furthermore, when comparing pre/post difference scores, it must be noted that the individuals who worked with the hypermedia materials did no better than the control group on the criterion-referenced test. Finally, no academic performance factors (anxiety of computer use, prior use of computers, time spent with the program, and grade point average) met the established criteria for a significant relationship.

The finding that there was no difference in learning outcomes between individual use of the hypermedia programs as a supplement to traditional classroom lecture and readings and the control group is

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difficult to explain. While the researchers anticipated group learning outcomes would exceed individual learning outcomes, the absence of an added benefit to learning is perplexing. Perhaps as Payne (1996) and Tergan (1997) suggests, the individuals using the hypermedia program, learners in their first course in special education, had their performance depressed by the loosely structured content and the nature of the hypermedia environment.

Our finding on achievement is contrary to the study done by Crooks, Klein, Jones, and Dwyer (1996) where individual learners using CBI did better than learners working on CBI in pairs. However, our findings are consistent with those of Rojewski, Gilbert, and Hoy (1994) who found no significant difference in test scores between learners working individually with hypermedia instructional programs and control subjects. Furthermore, our findings are consistent with those of Singhanayok and Hooper (1998) who found higher achievement performance in students who engaged in cooperative learning. Singhanayok and Hooper (1998) found that students in cooperative learning groups spent more time than individuals interacting with the computer program. The students using the TPSS program in pairs also spent more time, an average of 30 minutes, or 20% more time than those individuals using the TPSS program.

From a theoretical prospective, Lev Vygotsky believed that children learn from a dialectical process by sharing problem solving activities with others (Vasta, Haith, & Miller (1995). Piaget believed that cognition is a collaborative process where individuals engage in shared thinking (Rogoff, 1998). This theoretical prospective could explain why students in this study who worked in groups performed better than individuals working alone.

Another explanation for a group performing better than an individual could be that the very nature of special education planning and placement is a collaboration between professionals and parents. The program, Assessment and Planning in Emotional and Behavioral Disorders (Fitzgerald, et al., 1996; Semrau, Fitzgerald, Daniels, & Carlson, 1996; Semrau, & Fitzgerald, 1997) was designed with that collaboration process in mind. Therefore, our study allows us to expand upon the position of Rowjewski, Gilbert and Hoy (1994) who stated Ahypertext may promote a forum with which to engage students in the process of learning and application as opposed to the acquisition and recall of facts@ (p. 258). This observation appears to be true when the learning occurs in pairs when each individual in the dyad or triad is able to reciprocally encourage, support and scaffold the learning of the other individual. The findings of this study seem to indicate that collaboration is preferable to individual efforts when novice learners engage in learning activities using hypermedia learning programs. It is clear that hypermedia instructional programs are valuable learning tools; however, research on the interaction of types of hypermedia programs, the anticipated learning outcomes, the nature of the content, characteristics of learners, and learning conditions in which the program is used must continue.

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Assistive Technology Meets Instructional Technology: A Standards-Based Approach to Implementation in Teacher Education

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Abstract: The issuing of the new IDEA legislation adds a new challenge to technology integration and educational reform efforts. This new challenge relates to equal access to learning opportunities in general education for all students. The reauthorized legislation focuses especially on students who experience overt personal disjunction in the general education classroom, commonly referred to as special needs students. This study examines the implications of findings from a literature review and field experience on assistive technology in a teacher education program. Special attention is given to strategies for developing an assistive technology curriculum for preservice and graduate teacher education by restructuring instructional technology programs that prepare K-12 teachers.

Overview

Under the P.L. 105.17, Section 504 of the IDEA 1997 legislation student eligibility for special education is not a requirement for services under this section of the law. Therefore, the term special needs imply a much larger population and more inclusive group of students than ever before. The accommodation of special needs students may include, but is not limited to instructional and assistive technology, technical support, and services. This is significant because teachers will not only be required to learn and integrate new computer technologies, but must now be prepared to create inclusive learning environments. This will only be possible through the help of assistive technologies. This means teachers will need new levels of knowledge and awareness, instructional and technical skills to meet these new challenges and standards. These new challenges are incorporated into the new high quality teaching standards that will require teachers to demonstrate their ability to teach all children in ways that improve their achievement levels. Without adequate access to effective professional development for educators and administrators, the efforts of IDEA and other reform measures aimed at improving the quality of teaching will be thwarted.

As result of the movement towards increasing inclusive learning environments, we have a new body of literature that is emerging to explain new professional development, technical support, knowledge and awareness, and information needs of educators. Considering the broad nature of this subject, this examination is focused on K-12 education. Preliminary examination of this subject indicates there may be a special concern about access barriers to professional development and new technologies in inner city, metropolitan, and rural schools for teachers and learners. As a result this examination will attempt to focus on the following thematic issues:

1. Problems or biases in the previous research and theories about the use of general and assistive technology to include special education students in the general education classroom.
2. Contradictions in the legislation and literature that represent gaps in existing views.
3. Information that might help the reader to develop new ways of framing issues surrounding assistive and general technologies and inclusive education, especially for minority students in inner-city and rural schools.
4. Ideas about assistive and general technology in the IEP and strategies being employed to adapt general education curriculums.

Summary of the Findings

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The traditional literature review in educational research is typically valued because it can be very powerful. This power can set the tone of the research by reporting what others have done which can have the effect of supporting preliminary assumptions. Considering this potential risk, the focus of this session is to minimize this potential by positing specific questions and reporting what the literature, research, legislation, and practitioners report. The intent is to make an original contribution and stimulate dialogue to expand understanding, knowledge, and awareness of challenges that inclusive technology present to educators and administrators in K-12 schools.

Therefore, this session will extend beyond simply summarizing what others have written about or attempted but will also provide an analysis of this information and how it is influencing teacher education programs in higher education. The review will attempt to show how implementation guidelines can have an impact on interpretation of the IDEA legislation in this process. These different interpretations influence the context and implementation of assistive technology and inclusion in practice. These interpretations in practice could result in further limiting or expanding access to adequate professional development and technology and service needs of students and teachers. Without a system for gauging progress in this area, it will be impossible to determine the impact of IDEA on teaching practices and services to special needs students in these programs and in practice.

The review will result in a speculative framing of the issues. This framing will help construct a conceptual context of the problems that might emerge for educators and Teacher Education in their attempt to support inclusion (Equal Access) in Schools. Four components will help contribute to this process:

1. Researcher's experiential knowledge, technical background, and personal experience
2. Existing theory and research
3. Pilot and exploratory research

Practical Questions About Education for Individuals with Learning Disabilities Legislation and AT/IT Integration

1. What is the nature of the IDEA legislation and its authorizations?
2. What actions are state departments of education and teacher education programs taking to address the requirements of IDEA and Section 504?
3. What are the prevailing attitudes and perceptions of administrators, educators, and parents about the IDEA legislation?
4. What does the research show about the impact of AT/IT on special need students and their academic achievement?
5. What are best practices in AT/IT integration in the inclusive learning setting?
6. What kinds of support services and resources are accessible to help educators, schools, and parents?
7. What does "technical support" mean" in this environment?
8. What does "equal access" mean?
9. What type of professional development do educators and administrators need to increase their "knowledge and awareness" of the new inclusive education environment and new technologies?
10. How do educators access training in AT/IT?
11. How do educators access information about assistive technology, training, technical support, materials, and technology?
12. What is the projected impact of this new legislation on teacher education programs, and especially programs to train K-12 educators?
13. What are some potential and existing access barriers to inclusive education, AT/IT integration in higher education?
14. What are educators' views on curriculum adaptation and AT/IT in the IEP?
15. How is AT/IT documented in the IEP?
16. What are the criteria for judging the quality of AT/IT in the IEP, curriculum, and in practice?
17. How is AT/IT accessed and implemented in early childhood education?
18. How significant is IDEA and AT/IT in K-12 education?
19. How is the impact evaluated?

Legislative Actions

To establish the grounding for the review the following questions are addressed in this section.

1. What is the nature of the IDEA legislation and its authorizations?
2. What actions are state departments of education and teacher education programs taking to address the requirements of IDEA and Section 504?
3. What are the prevailing attitudes and perceptions of administrators, educators, and parents about the IDEA legislation?

The IDEA Legislation and Authorizations

The Individuals with Disabilities Education Act (IDEA) authorizes three programs to support and improve early intervention and special education for infants, toddlers, children and youth with disabilities. The **IDEA Amendments of 1997, P.L. 105-17**, is the most significant and comprehensive reauthorization of IDEA since its inception in 1975. The research reports that the proposed rules are challenged for failure to incorporate past policy interpretations on issues not addressed in the statue.

Therefore, there is a very active political environment tracking congressional rulemaking process as states' localities attempt to implement the changes enacted. This review is focused on Educational Improvement. The rule is that most disabled students should be offered services according to an individualized education program (IEP) within 60 calendar days of parental consent of the initial evaluation. A congressional research reports states that educators have complained that this timeframe is unreasonable

P.L. 105-17 undertakes the effort to increase access to learning for children with disabilities. This effort is focused in three primary areas: IEPs, performance goals, and assessments. Prior law did not call for performance goals and was silent on the participation of disabled students in assessments administered to students at large in school districts. Under the new law states are required to include students with disabilities in state and district-wide assessment programs, with appropriate accommodations. States and local districts have until July 1, 2000 to develop alternative assessments for students who cannot perform on regular assessment (p. 11).

The mandates that are most significant relate to the development and content of the IEP: The IEP team, Special factors, and Contents of the IEP.

1. IEP team must consist of educators. This IEP team is expanded to include, if appropriate, the teacher of the general education classroom where the child would be placed.
2. There are five special factors that the IEP team must take into account: behavior problems, limited English, blind, special communication needs, or *special technology needs*.
3. The programming of the IEP must be related to the general education curriculum. The IEP must also include references to modifications needed to allow the child to participate in the district or statewide assessment programs or an explanation of why not and a description of the alternative assessment process. This process must reflect any parental influence or involvement.

There are many issues that have emerged as a result of these measures. Some critics argue that IDEA's accountability rules restrict practices that could benefit other students while doing no harm to others. This type of policy is known as a Pareto policy (p. 12).

However, under this law new special programs are authorized at "such sums as may be necessary" through FY 2002. Programs supported include:

1. State competitive grants program for special education reform and improvement. Under certain circumstances these funds could be used to train teachers in new instructional approaches.
2. Coordinate research and personnel preparation (e.g. early childhood education, innovations and development, personnel development, and special studies).
3. Coordinated technical assistance, support, and dissemination program (E.g. parent training, clearinghouses, regional resource centers, and technology applications).

State Departments of Education and Teacher Education Programs

The research shows a trend in SDEs to support professional development programs for educators and teacher education programs that focus efforts on adapting the entire curriculum using multiple technologies (**Cormier, Folland, & Skau, 1998**). Several states have incorporated provisions for assistive technology for general education in their technology plans to meet teacher training and the learning needs of special needs students (Vermont, Maryland, Kentucky, Arizona, Connecticut, New Mexico, Wisconsin, and others).

The work of educators describes how a single book can be adapted using thematic activities supported by technology. **Metheny (1997)** believes that one of the most difficult challenges faced by teachers is educating students who have special needs to achieve outcomes or standards expected of all students. He emphasizes that the strong push for higher standards of learning poses a challenge to states and schools to implement these standards to ensure that they include all students.

Another observation is the emphasis being placed on software for special needs students that are designed to provide a wide range of options. Many of these options allow hardware/software to be tailored to meet student's needs (**Hurley & Shumway, 1997**). Teacher education programs are showing interest in integrating assistive technology with emerging instructional technology programs as they revamp their programs to meet not only IDEA requirements, but NCATE technology and diversity standards (**Bohren, 1999**).

Molly Mead (1995) advocates that teacher education programs must place more emphasis on principles of effective instruction to appropriately use technology. The effective strategies include demonstration-prompt-practice, pace, wait time, and coaching. She adds now that computers are used in education a new challenge facing teachers is selecting appropriate software to match both curriculum goals and the student's stage of learning.

To meet the growing need for training and professional development the use of telecommunications (Internet) is establishing virtual learning communities for educators and administrators to acquire more just-in-time learning opportunities. An interview conducted by the Research Institute of Assistive and Training Technologies discusses distance learning training modules being prepared for pre-service teachers in early childhood education. The modules will focus on infusing technology into the early childhood curriculum (**Benton, 1997**). Despite the best intentions of many efforts, recent studies reveal that a very small percentage of teachers feel comfortable working with special need students in the general classroom (**Riley, 1999**).

Implications for Program Development in Teacher Education

The implications for program development and restructuring of technology infusion components of teacher education programs will be presented and discussed in this session.

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Infusing Technology into a Preservice Teacher Education Program for Special Educators

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Abstract The presenter of this session will describe the process by which technology has been infused into the preservice teacher education program for special educators. Presently, 9 credit hours in technology are required of all special education majors.

Overview & Perspective

Students with disabilities continue to be integrated into inclusive classrooms (NCERI, 1994). In fact, over 4 million students with disabilities spend the majority of their day in inclusive classrooms with general and/or special educators (NASBE, 1992). In addition, an increasing number of students with disabilities in inclusive classroom utilize various technologies (Behrmann, 1995; Flippo, Inge, & Barcus, 1995). Specifically, 2 million students with disabilities use assistive technologies in the inclusive classroom daily (Behrmann, 1995). In response to the increasing role technology plays for students with disabilities, the Council for Exceptional Children, the largest professional organization for special educators, has cited technology training as one of its many preservice competencies (CEC, 1994). Accordingly, as more students with disabilities are integrated into inclusive classrooms, it is important that general and special educators become competent with the usage of technologies and integrate these into the teaching process. Therefore, the purpose of this paper is to present recommendations for course programming focusing on the integration of technology. The paper builds upon previous paper presentations with a specific focus on how to develop special education programs which have strong technology components.

Course Goals & Objectives

In the spring of 1998, Towson University was granted program approval from the Maryland State Department of Education (MSDE) for a major in Early Childhood Special Education leading to a Bachelor of Science Degree, Similarly, in the fall of 1999, Towson was granted approval for a second program by MSDE for a major in Secondary Special Education with a Bachelor of Science Degree. Presently, Towson has submitted a proposal to MSDE for a Bachelor of Science Degree in Elementary Special Education. With this final program approval from MSDE, Towson University will have a comprehensive program of preservice special education. As part of the required course work for each of these programs, students are required to complete 3 courses or 9 credit hours in technology. These courses include Using Information Effectively (ISTC 201), Utilization of Instructional Media (ISTC 301), and Assistive Technology for Students with Disabilities (SPED 413).

Students are first introduction to information and its importance to teaching in the class ISTC 201, Using Information Effectively in Education. This class is an introduction to gathering, evaluating and communicating information. Emphasis is on using team collaboration and problem solving to examine current issues in education. Students review the history of information in education; define the current issues in education; develop team building; develop strategies to locate information from a variety of sources; assess information validity and usefulness; examine the ethical use of information; report information in written reports and oral presentations; and consider the future of information in education. Sample projects and/or assignments include research papers, PowerPoint presentations, Internet scavenger hunts, and team presentations on hot topics in education via multimedia. Optional assignments for more technologically advanced students include building a home page on the Internet, developing an extensive software review, and becoming an expert on a particular software package and making a presentation to the class. The class is taught in a computer lab setting using a constructivist approach. Cooperative learning and group learning with individual accountability are the primary teaching strategies.

In ISTC 301, Utilizing Instructional Media, materials, devices, techniques and settings are presented in an overview of the field of instructional technology. Laboratory experiences are provided in the operation of instructional hardware. Students gain experience in the evaluation and integration of current educational technologies into classroom instruction; produce an educational technology portfolio which demonstrates proficiency in curricular integration of media and technologies; analyze various technology and media resources including hardware, and software with an emphasis on computing applications and effective use of the Internet with K - 12 students; develop support strategies for employing technology, media, and materials within the K - 12 learning environment; and recognize and utilize representative present and future applications of technological systems in teaching and learning strategies. Sample projects and/or assignments include creating a technology portfolio, completing projects which are web-based or use Hyperstudio, and constructing sample lesson plans which incorporate technology.

In SPED 413, Assistive Technology for Students with Disabilities, students design instruction for students with special needs using assistive technologies. The purpose of the course is to familiarize special and general education teachers with various assistive and instructional technologies which may be used in the classroom to assist students with special needs and to demonstrate how these technologies can be integrated into the instructional setting. Specifically, students review learning styles and differential characteristics of children and youth with disabilities and apply this knowledge to the selection and use of technology in the classroom at the age appropriate level; identify low and/or high technology accommodations appropriate for children and youth with disabilities; identify the historical and legal foundations which support the use of technology for children and youth with disabilities; evaluate & develop a review and comparison of computer software appropriate for a specific disability; investigate the availability and use the technology appropriate for children and youth with disabilities; investigate & demonstrate testing accommodations (low and high tech) ; demonstrate strategies to integrate staff and parent training of assistive technologies for students with disabilities; and demonstrate the integration of technology through lesson/unit planning for children and youth with disabilities.

Sample projects and/or assignments include creating an assistive technology portfolio, downloading and modifying lesson plans from the Internet for students with special needs, consulting and making technological recommendations for students in the reading clinic, and writing a reaction to a visit to a school based site and where assistive technology is integrated into the classroom.

Critical Shortages in Special Education

The infant/primary and secondary special education program approval came about as a response to the critical shortage need in special education. According to projections in the Maryland Teacher Staffing Report 1999 - 2001, during the 1999 - 2000 academic year, Maryland required 987 new special education teachers --- 71 of these teachers at the infant/primary level and 416 vacancies at the secondary level. Based upon these projections, Towson is attempting to address the critical shortage need for special educators with the newly approved programs in infant/primary and secondary special education. A key component of the infant/primary and secondary majors in special education at Towson University is technology. The aforementioned courses build upon a hierarchy of skills to better prepare special educators and form a strong technological component to the special education major at Towson University.

Outcomes & Impact

There are several important outcomes of these programming efforts. First, these programs serve as models for other special education programs throughout the country. Secondly, they address the critical shortage need of infant/primary and secondary special education. Finally, these new programs further the mission and the strategic plan of Towson University to emphasize technology across the campus.

Time Line & Completion Dates

The infant/primary special education major was implemented in September of 1998 and the major in secondary special education was subsequently implemented in September of 1999. Plans are currently underway to secure program approval for a major in elementary special education. This program will also lead to a Bachelor of Science Degree and is anticipated for the spring 2000 with implementation scheduled for the fall 2000. With the approval of this final program, Towson University will have a fully operational major for generic certification in infant/primary, elementary, and secondary special education.

Evaluation Plans

As students exit each class, they evaluate the effectiveness of their technological preparation and they also complete performance based outcomes which demonstrate their technological

competence. Upon exiting the special education major/program, students will be tracked through surveys. A key component of the survey will be questions about technology and their use of it in the classroom setting as well as student perceptions as to how well prepared their undergraduate training prepared them for the use of the technology in the classroom.. Evaluation data will be used to modify course syllabi. Current dissemination plans include presentations at local, regional, and national organizations such as the Maryland Association of Educational Users of Computer (MAEUC), the Eastern Educational Research Association (EERA), and of course the Society for Information Technology and Teacher Education (SITE).

Summary

In summary, this paper provided participants with (a) an overview and time line of the program and implementation process, (b) an outline of the course objectives & goals (c) outcomes and impact of the project, (d) time line and completion dates, and (e) evaluation and dissemination plans of the project.

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Web Enabled Teaching Aid for Non-orthographic Languages

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Abstract: In conjunction with the technological advancements of Telecommunications and Information Technology and the outbreak of the World Wide Web (WWW), the production of educational software is undergoing a shift towards the shared resource paradigm. Recognizing the need expressed by people with special needs and special education teachers in enabling students to access such resources, this paper describes the design and the implementation of a Web-based, open system for the effective support of the teaching process of non-orthographic languages for people with special needs. There will be a discussion on user requirements, system specifications and characteristics as well as the system's architecture. Features that enable learner centered education and fulfill teachers' needs to prepare, organize and update the training material in a cost-effective manner and focus on content specification and other high level tasks, while developing courses, will also be mentioned, followed by reached conclusions and plans for future work.

Introduction

Information and Communication Technologies have undergone a rapid development over the last few years, with the Internet and multimedia technologies experiencing the biggest growth. In this respect, new prospects and mechanisms were introduced to the educational community (Ewing et al, 1999), greatly affecting teachers and learners alike (Gilliver et al, 1998). Both teachers and learners seek out new forms, sources and methods for acquiring and transferring knowledge, elevating their needs and demands, while courseware shifts from the traditional monolithic model to the collaborative co-development of shared and accessible material.

While the educational community opts for open, accessible and shared courseware, there is a number of students with special needs who want to harness what education has to offer them, but because of their disabilities seem to have less chance. Especially in cases of mild-to-severe mental disability, they can't use a natural language nor communicate with speech, thus they need to use an *Alternative or Augmentative Communication (AAC)* system usually taking the form of a non-orthographic language (in contrast with a natural-orthographic one), sometimes in conjunction with written text. Non-orthographic languages in general, belong to *Graphic Representation Systems (GRS)* since they use standardized graphic symbols (ranging from photographs resembling the depicted object, to abstract linear drawings with no apparent relation to the referred object) as their building elements and to convey communication content. Apart from their specific sets of symbols, icons and associated meanings (see Fig. 1), non-orthographic languages may incorporate syntax and grammar (like Blissymbolics, see Bliss, 1965) thus requiring substantial effort and time from both sides (teachers and learners) in order to be taught efficiently. For a more detailed and comprehensive description of the various types and characteristics of GRSs one can consult (Fuller et al, 1992).

To become a literate reader though is by no means an easy task (Ehri, 1993). To teach an individual to communicate via a non-orthographic language is much more complicated, especially during the early stages of learning (von Tetzchner and Martinsen, 1992) since graphic symbols are not as easily or naturally passed on from parents to children as the words of a natural language are. For that purpose there have already been

development efforts (see Kouroupetroglou et al, 1990), while research discusses the potential results of using graphic symbol systems in the process of acquiring or developing natural language skills (Gerber & Kraat 1992).

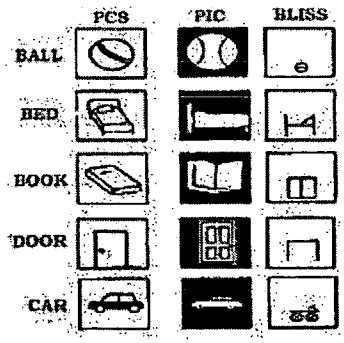

Figure 1: Representation of various concepts in different non-orthographic languages

Students with special needs have a right to equal opportunities in education, but they are more difficult to train since they require more specific and sometimes individualized training. Moreover, to use a non-orthographic language not only does the student need to be properly trained but also the teacher requires to be properly aided. However, the special education teacher is usually left alone in his/her effort though, without much technological assistance. A teaching aid in the form of a piece of software would be a major asset, and yet such software hardly exists due to its diverse nature. Let us not forget in the meantime, that teachers constitute the most important factors for the direct and successful implementation of new technological advancements especially in the field of teaching non-orthographic languages. Therefore the need to provide the teacher with easily accessible and effective support becomes obvious. Nowadays, the most promising medium to support the teacher is with no doubt the World Wide Web (Astreitner et al, 1998). The Web's potential lies in its flexibility and ease to provide properly devised educational support systems which enable access to various information resources, such as Data Bases, Electronic Dictionaries, and on-line context-sensitive learning aids (Metaxaki et al, 1988).

In the light of the above, the design and implementation of a WWW based, open and flexible system that can handle multiple natural and non-orthographic languages and their elements in a variety of formats and representations will be presented. Because of its open and flexible presentation nature in can act as an aid to the special education teacher in the course of teaching non-orthographic languages to students with special needs.

System Design

Our design was based on a vast number of technical specifications derived from a user requirements study and will be presented henceforth in brief. The main design goals though, called for multilinguality, reusability, flexibility, openness, efficient development and access to shared educational material, and most importantly the ability to offer a learner-centered education.

User Requirements and Specifications

For the last two decades, application of non-orthographic languages and graphic symbols, has become widely accepted in a vast number of cases of children who can't speak or suffer from some language disorder, and who are in need of learning a language (McNaughton & Lindsay, 1995), (Stephenson and Linfoot, 1996). Users of a standardized non-orthographic language, combine a number of graphic symbols in order to put together a sentence (von Tetzchner & Martinsen, 1992), but in order to convey communication information to a natural language speaker a link or association to a natural language needs to be present. Such a link, in written and spoken forms, becomes necessary to any kind of application used to facilitate teaching or use of a non-orthographic language for the prospect of a future transition to the natural language as well. The importance of verbal language information in the framework of multi-language AAC systems has already been recognized and described in the field (Antona et al, 1999).

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The need of in-time preparation, structuring and update of the educational material in a cost effective and viable manner is also imperative for the teacher of non-orthographic languages (Norman and Spohrer, 1996). Additionally, since learner centered education is considered more appropriate for non-orthographic language students, the courseware needs to have some degree of personalization. However, the various characteristics (abilities, skills, requirements and preferences) may vary significantly for each non-orthographic language learner. One of the most important requirements though, regardless of learner characteristics has to do with the effective access and manipulation of the learner's vocabulary. The teacher would need to select, organize in sections, modify, update and expand vocabularies according to the learner's communication and language capabilities and preferences. Different educational resources should be able to be successfully unified or combined in a single educational package, and should also be generic enough so that people outside their development team would express interest in them. What's more, adaptation, modifications and update costs, language barriers and constraints, as well as cultural differences of the educational material are also important elements of the educational software distribution and must be considered accordingly. Moreover, it is well understood that certain symbols in a GRS may convey different meaning according to cultural and national context. The system's design should ensure that on the one hand such differences are compensated through the provision of alternative symbol sets and different languages and proper associations, and on the other that no restrictions whatsoever are going to be present in terms of locality, culture, language or accessibility.

Moving towards a global learning scenario, necessitates making the learning resources more accessible (Collins et al, 1996), while requirements for more effective learning call for the educational content and information to be readily accessible by the teacher. The main factors in this process are the production cost of educational material, the delivery cost, availability and delivery both in time and on demand, availability of educational material as independent as possible from specific location or time barriers. Therefore true internationalization, global access around the clock, and multilingual support should be considered. Additionally, computer-based systems designed to support such a teaching process should be open, catering for reusability, and able to offer a large number of either non-orthographic or natural languages (Kouroupetroglou et al, 1993, 1994). Moreover, such a system should allow the teacher or a team of teachers to focus on the definition and structure of the educational content and other high level activities while developing courseware.

Implementation

The developed system at large, constitutes a multilingual environment for both natural/orthographic and non-orthographic languages. It can be viewed as an on-line multilingual lexicon, able to manage, store, retrieve and depict the various language elements in a multitude of forms and multimedia representations including text, phonemic, pre-recorded speech, pictures, and video / animation. It can also hold user specific information concerning vocabularies, plus multiple modifiable dictionaries per learner. The system also provides omnidirectional "word-by-word" translation between the elements of the various defined languages, after specifying the source and target languages and desired concept for translation. The system is open and expandable by means of user profiles, languages, and language elements and representations. Since the system uses multimedia elements (as one can realize considering the variety of representational media) can fall into the multimedia application category. Interactive multimedia have earned a prominent status among software developers due to their variety and flexibility and the ease of incorporating different learning modes. However since there's no guaranteed way of applying such a technology effectively, constant evaluation is imperative. In this respect, and in order to develop the software described herein, there was an extensive use of the generic methodology and instrument for the multimodal evaluation of interactive multimedia (Kouroupetroglou, 1995).

Technology

The software has been developed as a 32-bit application to run under MS-Windows (95/98/NT). The architecture that was chosen for the web part of the application was the Server Side technology. The reasoning behind this choice is twofold, since according to that, all the time and resource consuming functionality are handled by the Web Server, while the Client receives information in simple HTML format, thus rendering our application independent form the Client software. Such architecture calls for compatibility between the various development

tools and the database and the web server. In this sense, we incorporated Active Server Pages (ASP) technology, essentially a mixture of VBScript code and HTML (ASP, 1998), which works on a Microsoft Internet Information Server (IIS) acting as the Web server software (see Fig. 2). The aforementioned combination of technologies allows for a Web Interface that caters for the dynamic construction of queries to the Data Base. The web user enters the parameters (s)he wants and the query is put together by the Active Pages engine and passed on to the CDB. Another important aspect and functionality of the web interface is the dynamic production web pages bearing the result set coming from the CDB. The Web pages used in our application were designed and developed using Home Site 4.0 and MS Front Page 98 along with MS Visual InteDev 6.0. The CDB was designed using ErWin Version 2.6 and implemented in MS-Access 97.

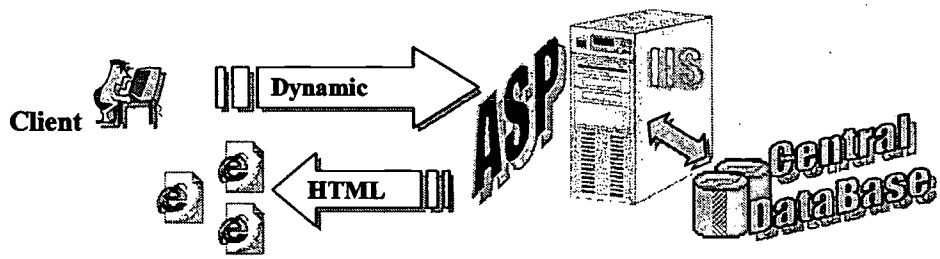

Figure 2: The general concept of Active Server Pages

Structure

The essential structure and architecture of the system (depicted graphically in Fig. 3) follows the design specifications set, and consists of the following functional components: a) a Central DataBase (CDB), where all information on users, languages, concept elements and representations is stored, b) a multi user software application to manage the CDB, c) a compact, mobile User-specific DataBase (UDB), d) a software application to access and manage the UDB, and e) Active Server Pages to access the CDB via the WWW (see Fig. 4).

The Central DataBase handles a variety of different information concerning users, languages, language elements and representations. More specifically, the CDB manages: a) a set of concepts which have a meaning independent of language (we use the notion of the interlingua for this set, see also Dorr 1993) , b) a set of orthographic and non-orthographic languages, c) sets of written (in text) representations of the various concepts in every orthographic language defined, d) a description for each concept and for every orthographic language defined, e) sets of graphic representations for each concept and for every non-orthographic language defined, f) one or more pictures, videos and/or animation for each concept (if necessary), g) three sets of spoken representations of each concept in every orthographic language defined (in prerecorded male, female, and child voice), h) onomatopoetic representation for each concept, and i) user specific information, in order to be able to map users with sets of languages and concepts.

The User DataBase, is in essence a subset of the CDB, and is produced by the teacher's actions according to the specific requirements for each individual learner. The UDB consists of one and only pair of orthographic and non-orthographic language (the learner's native natural language and alternative communication system respectively), and a subset of concepts relevant to the learner's vocabulary, along with all the associated concept representations. Extra care has been taken towards providing student vocabulary manipulation facilities, as well as offering the ability to adapt the system to the specific needs of each individual learner. In this respect, a specially designed software application allows the teacher to modify at will the UDB to better match the student's learning curve. In this respect, the teacher can make modifications to the vocabulary size (by means of defining the part of UDB "visible" to the learner), and structure (by organizing the individual language elements into subject categories according to whatever subject matter is felt more appropriate for each individual learner).

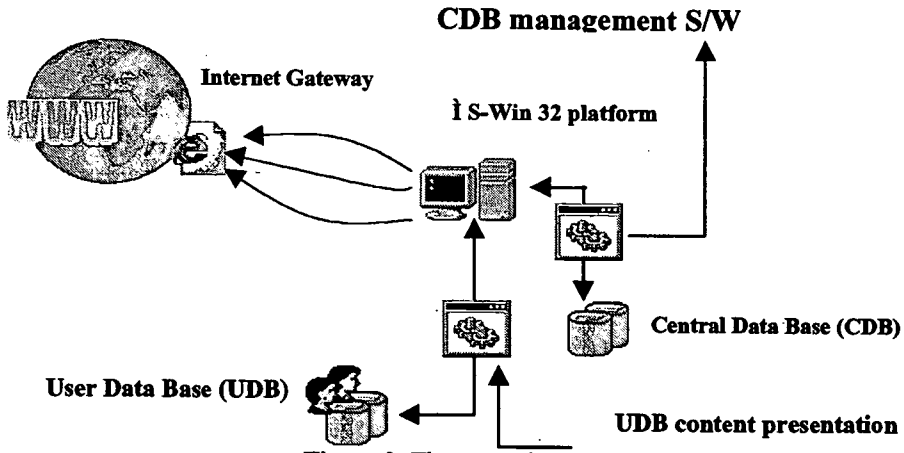

Figure 3: The system's structure

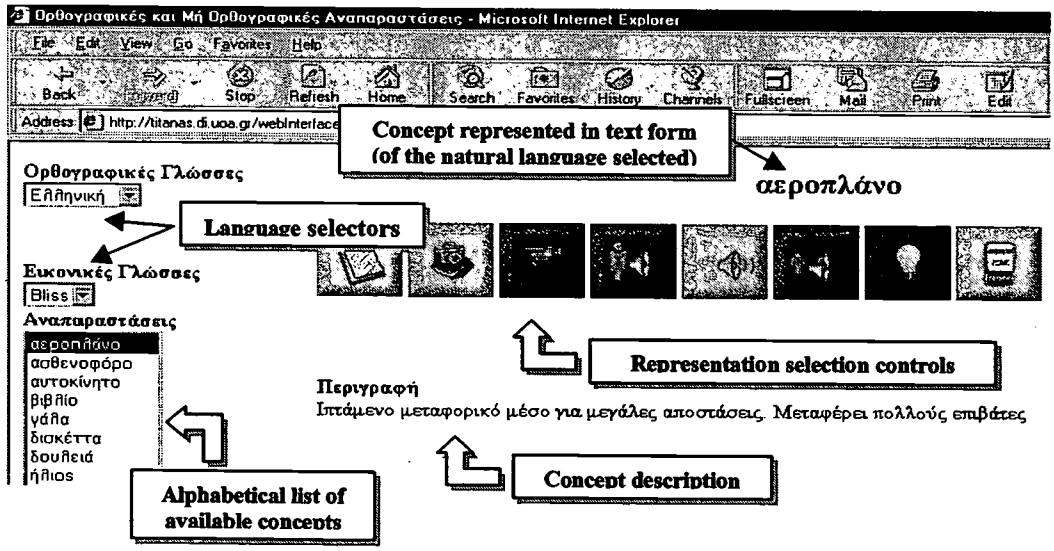

Figure 4: The Web Interface (presented in Greek)

Conclusions

The developed system fulfills the crucial need to prepare, organize and update the training material on time even online, free of any constrains brought forward by the environment or location, or even the operational platform (it is managed over the WWW). Teaching non-orthographic languages can change radically in the not so distant future by using what technology advancements have to offer. The system we have developed constitutes an integrated web-based environment that can cover the basic requirements of special education teachers to provide learner-specific educational content towards learning non-orthographic languages. The system is currently undergoing user trials in real life situations in the process of refinement and adaptation with the evolving technology and user needs. Our plans for future enhancements include, full support in all supported media representations of the BLISS language in Greek and English transcript, modification of the user interface incorporating special accessibility options for people with special needs in order to provide universal access to the system, extended user profile mechanisms holding user characteristics, skills, abilities and communication requirements, and the provision of both web-based and stand alone local versions of the lexicon, using ActiveX, JAVA and XML and ADO technologies. Another promising enhancement would be the inclusion of language specific grammar and syntax information that would allow for better and more correct whole phrase translation. The teaching process would also benefit even more should our system cooperate with other computer aided teaching applications specifically in the non-orthographic language domain.

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Special Needs Software Evaluation: Choosing the Right One

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Abstract: Choosing the right software for children with high incidence disabilities can be challenging as the selection of titles grows in our technology rich marketplace. Teachers are expected to select appropriate software for the classroom as well as recommend software to parents for supplemental support. Unfortunately, having more software choices does not make the task of selection less difficult. This study was designed to (a) provide a better understanding of how special education teachers in elementary grade classrooms evaluate and select computer software for use with their students and (b) suggest alternative characteristics to be considered for inclusion in evaluation instruments designed to aid the novice evaluator based on the analysis of teachers' needs.

Introduction

Currently, pre-packaged consumer oriented software selection is becoming a topic of discussion in the teachers' lounge and at parent teacher conferences. As the looming technological revolution forces technology integration into all classrooms, teachers of children with high incidence disabilities (learning disabilities, emotional/behavioral disorders, mild mental retardation, and developmental delays) continue to face the confusing task of selecting software. For those teachers charged with the selection process, making the right choice becomes very complex and may be uncomfortable as well as professionally challenging. Understanding the selection process regarding instructional software is not a new research paradigm. The evaluation of educational software has been under scrutiny for almost two decades. A review of literature shows the enormity of studies conducted as well as a wealth of models and evaluation instruments to be used by consumers of software. Unfortunately, all of the previous research may not have provided the foundation for transfer of this knowledge into teacher education programs or today's learning environments. To supplement traditional special education teaching methods, school districts are acquiring numerous software titles that are being sold as an interactive multimedia designed unit of instruction. According to some software publishers their products will "...build skill, confidence, and a lifelong love of learning" For Ages 9-12. The Learning Company, *The Clue Finders Reading Adventure* and "...children will learn an entire year's worth of reading, writing, math, and other essential 2nd grade skills" The Learning Company, *Arthur's 2nd Grade*.

For teachers, deciding if software is of value for the vast continuum of students with high incidence disabilities in our classrooms may prove demanding. Determining the instructional value of the pre-selected software may be difficult if not impossible by teachers who are allowed to read only the

description posted on the outside of the boxes or the synopsis that has been supplied by the publishing company. Most software programs have been marketed as beneficial for the development of a variety of skills our children need to obtain or improve. To add to the selection confusion, those brightly colored software packages seen in every retail store or publisher's catalog carry a variety of ratings or developmental level ranking to suggest they have been reviewed by some educational "authority". But for many of our special education teachers, just looking at the box to validate the accuracy of the selection process may be insufficient.

Each teacher must draw conclusions from some form of evaluation system regarding their students' ability to reach the instructional outcomes described by the manufacturer. That is, if there are learning outcomes included and described on the software package. Making the most appropriate decisions becomes very difficult for any teacher without an in depth knowledge of instructional design. According to Smith & Vokurka, (1990), "Special educators must also realize that learners with the same condition may not respond in the same manner to the same software program. A program that is effective with one may not work with another. Software selection should not be haphazard" (p. 38). Additionally, selection of the most appropriate software programs for children with high incidence disabilities, without proper teacher training on software evaluation, may increase the likelihood that an instructional unit might not meet specific instructional objectives or in some cases hinder the learning process.

Historical Perspective

A plethora of software evaluation studies were conducted in the 80s and early 90s (Allessi, & Trollip, 91; Borgh, & Dickson, 86; Haughland, 92; Malouf, et al, 89; Moore, 90; Nave, et al, 83; Richards, 93; & Smith & Vokurka 90.). "Organizations sprang up for the sole purpose of reviewing and recommending good instructional software (Roblyer et al (1997, p 116). One study by Malouf, et al, (1989) identified eight sources that were used by special education teachers to evaluate software. These preferred sources of information for selecting software for use with students with disabilities included: (a) talking with other educators; (b) tryout with students; (c) tryout without students; (d) written ratings/descriptions from evaluations or reviews; (e) pictures of sample screens from evaluations or reviews; (f) school system lists of recommended software; (g) documentation or manual included with software; and (h) software catalogs/advertisements. It appears that not much has changed in the last ten years with regards to the way special education teachers select software titles for instructional purposes.

Researchers from regular and special education have attempted to create models for software selection. The model posited by Smith & Vokurka (1990) describes their conceptualization of the steps for evaluation that establishes the interrelationships between people and procedures. These include: (a) define program parameters; (b) assess needs; (c) analyze content and analyze students characteristics; (d) develop/revise IEP; (e) select communication strategies (f) develop selection instruments (g) select software; (h) field-test software; (i) implement use of software; and (j) modify/adapt software. They distinguish between and the management process and the instructional process for software selection. According to Smith & Vokurka "The selection process must be grounded on the principles of functional utility of the chosen software and not on the creation of 'window dressing'" (p. 37). They also suggest an effective evaluation instrument ought to be: (a) easily used by evaluators; (b) organized in understandable and legible format; (c) detailed enough to present a reasonable determination of the value of a program and short enough not to discourage use; and (d) include a final overview that at a glance indicates the evaluator's recommendation.

As the research in the area of software evaluation progressed throughout the decade, the fundamental concerns of teaching and learning foundations have not been disputed. Researchers such as Lahm & Nickels (1999) still report it is "Essential for all teachers is the knowledge of procedures for determining if a software program or assistive device has potential for a student or class of students. Often school districts have a particular procedure defined for general software evaluation, but the specific learning needs of students in special education may demand additional or adapted procedures. The essence behind this set of skills is the assurance that technology will be matched to the student's specific needs, with the goal of keeping the student on target within in the curriculum and moving toward meeting the student's IEP

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Moore (1990) has a variety of recommendations that he suggests ought to be used by those who work with special needs students. His list includes: (a) contacting software companies to acquire the product descriptions that correlate each program to specific curriculum areas and academic levels; (b) gathering information from the national organizations for special needs to have them help in the identification of appropriate software that has been evaluated by "educational software experts who know how to critically assess a software program", and (c) obtaining a working copy of the program to preview it as well as review the documentation. Concerning the program's instructional soundness he states "unless you are and expert, you may not be able to make that kind of an assessment,.... however, if the program looks good on the evaluation criteria it will score well on other counts as well" (p. 61). His evaluation criteria are fundamental and look at these characteristics: (a) computer compatibility; (b) documentation thorough, clearly written, and well organized; (c) focus on skills (d) supplement or complement work; (e) appropriate for age, grade, & reading level; (f) can it be customized; (g) design features – music, colors; and (h) use of adaptive devices. Another example of the characteristics used in an evaluation instrument is represented here by the Northwest Regional Educational Laboratory, *Evaluator's Guide for Instructional Packages* (1994).

Content Characteristics
The content is accurate
The content has educational value.
The content is free of race, ethnic, sex, and other stereotypes.

Technical Characteristics
The user support materials are comprehensive.
The user support materials are effective.
Information displays are effective.
Intended users can easily and independently operate the program.
Teachers can easily employ the package.
The program appropriately uses relevant computer capabilities.
The program is reliable in normal use.

Instructional Characteristics
The purpose of the package is well defined.
The package achieves its defined purpose.
Presentation of content is clear and logical.
The level of difficulty is appropriate for the target audience.
Graphics/color/sound are used for appropriate instructional reasons.
Use of the package is motivational.
The package effectively stimulates student creativity.
Feedback on student responses is effectively employed.
The learner controls the rate and sequence of presentation and review.
Instruction is integrated with previous student experience.
Learning can be generalized to an appropriate range of situations.

Purpose

This study was designed to (a) identify the characteristics special education teachers in elementary classrooms believe to be important to consider when evaluating and selecting educational software; and (b) identify their students' favorite software titles.

Methodology

Participants

The participants from this study were employed in two school districts in Southeast Florida. The first school district had a total student enrollment of approximately 145,000 students and district two had a total student enrollment of 80,000 students. Both school districts gave permission to contact each elementary school with an ESE program and request their teachers complete our survey. A total of 182 surveys were distributed and 115 completed surveys were collected for a return rate of 67%.

Teachers surveyed included: (a) specialists teaching in varying exceptionalities resource classrooms; (b) teachers instructing in self-contained E/BD classrooms; (c) teachers providing instruction in classrooms implementing inclusion, and (d) teachers serving students in pre-K exceptional student education classrooms.

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Design of the Instrument

The instrument was developed by generating a list of important items based upon our prior experiences developing surveys and the review of literature. Second, we created an initial draft of our instrument designed to elicit information from teachers to answer the research questions. Ten exceptional student education teachers reviewed the initial draft and provided feedback and suggestions for improving the questionnaire. Based upon their responses, questions identified as unclear were removed and the instrument was re-written to shorten the length.

The second draft of the instrument was piloted with 18 exceptional student education teachers from six elementary schools. The pilot test helped us to further refine the instrument by reorganizing the question sequence and removing information that did not address the research questions. The final survey contained 19 items and required approximately fifteen minutes to complete.

Data Collection

The data was collected both quantitatively and qualitatively using the Technological Needs Survey -ESE Teachers-questionnaire. After approval from the university as well as the school district central administration to conduct the study, a letter was sent to each elementary school principal in the county requesting permission to survey the ESE teachers. A two weeks deadline was requested for return of completed surveys after which time we made a follow-up phone call as a reminder. All questionnaires were returned after eight weeks for data analysis.

Data Analysis

The quantitative data from the Survey items were analyzed using SPSS for Windows v. 10.0. A Microsoft Access for Windows 95 database was designed to improve the reliability and ease of entering and organizing the data from the completed surveys for descriptive analysis only.

The qualitative data from the teachers' written description for choosing software titles was analyzed as described by Miles and Huberman (1994). Data were coded for recurrent patterns to identify themes. Two researchers independently read and unitized the data, completing the first level coding. Additionally, the data were then pattern coded and grouped into themes. The researchers then met to compare pattern coding. When differences existed, the researchers discussed and mutually agreed upon a common pattern. The researchers identified themes through concept mapping of the data (Carley, 1993). When analyzing qualitative data, this process is analogous to the cluster analytic and factor analytic devices used in statistical analysis (Miles & Huberman, 1994).

Results

The survey results indicated that special education teachers identified many of the same characteristics evident in numerous evaluation instruments available today to aid in the software selection process. Content analysis of the qualitative data has led the researchers to identify four areas that are salient and distinguishable from current evaluation scales criteria. These characteristics include the thematic content identified as: (a) individualizing; (b) integrating; (c) diversity; and (d) narration. Further study will be undertaken to support these findings.

The following list categorizes the characteristics and their indicators

WELCOMING
Indicators: **Entertaining, Interacting, Pacing, Timing,** Gaming, Tutoring, Clarifying Instructions, Pricing
BUILDING SKILLS & KNOWLEDGE
Indicators: Self-Correcting, Rewarding, Practicing, Reinforcing, Evaluation/Assessing, Scoring, Charting

INDIVIDUALIZING
Indicators: Adapting, Assisting, Keyboarding Skills
INTEGRATING
Indicators: Meeting Standards, Meeting Curriculum Goals, Specializing in Content Areas, IEPs
NARRATION
Indicators: Reading/Non Reading, Storytelling
PROVIDING DIVERSITY
Indicators: Bilingual, Multicultural, ESOl/ESE
TECHNOLOGY ACCOMMODATING
Indicators: Used by current technologies in classroom

This list identifies the most selected software titles chosen for use in the special education classroom. These software titles are dated and indicate a lack of current software selection by the teachers sampled.

Choice	*Title*
1st	***Just Grandma & Me***
2nd	Bailey's Book House
3rd	Math Blasters
4th	Millie's Math House
5th	Dr. Seuss ABC Instruction
5th	Reader Rabbit
6th	Carmen San Diego
6th	Jumpstart Pre K
6th	Student Writing Center
6th	Treasure Math Storm
7th	Earobics
7th	Jumpstart K
7th	Kid Pix
7th	Magic School bus
7th	Print Shop
7th	Sammy's Science House

Findings

This study provides a better understanding of the characteristics special education teachers in elementary classrooms identify when they consider evaluating and selecting educational software for use with their students. The study has also provided the researchers with crucial information for developing a software evaluation scale specifically designed for use by teachers of students with high incidence disabilities.

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Effective Technology Practices in an Inclusion Classroom: A Proposed Teacher Training Model

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Abstract: This paper reports on the rationale for a study designed to determine the effectiveness of technology enriched assignments integrated into a pre-service teacher education program for future special education teachers. The requirements of new federal legislation which emphasizes the inclusion model are discussed. The role that technology can play in implementing effective teaching practices in the inclusion classroom is explored. The possibilities of enhancing recognized effective teaching practices such as strategies training and curriculum based assessment through technology is discussed. Methods for determining the effectiveness of a technology integration plan into pre-service teacher education programs are explored.

Acknowledgements

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Review of the Literature

Federal Legislation

For over 25 years, research reviews and position papers have called for the education of students with mild disabilities in general education classroom settings. Of particular concern has been the lack of evidence that separate class placement improves the academic achievement or quality of life of students with mild impairments (Waldron & McLeskey, 1998). Recent federal legislation places a priority on educating children with disabilities in regular education environments. A provision in the Individuals with Disabilities Education Act (IDEA) states that students with disabilities should be removed from the general education environment "only when the nature and severity of the disability is such that education in regular classes with the use of supplemental aids and services cannot be achieved satisfactorily" (20 USC Section 1412 (5) (B)). Recent amendments to Part H of the IDEA of 1991 have promoted the use of computers and assistive technology to enhance and further the educational options of students with disabilities. Despite federal legislation, there is some resistance to implementing the inclusion model among regular educators. Some of the concerns regular educators express when considering an inclusion model for providing services for students with special needs include:

1. Discipline problems
2. Providing appropriate instructional activities and materials
3. Negatively impacting the academic progress of "regular" education students as well as special education students in the classroom. (Tyler-Wood, 1996).

Effective Inclusion Practices

Researchers in special education have proposed that technology offers a potential method of solving one of the greatest deterrents to inclusion by offering the potential of truly individualized instruction that addresses all students' specific academic needs (Woodward and Reith, 1997). The effective implementation of technology into the regular classroom setting offers many possibilities for implementing an individualized instructional plan for any student with specific learning needs. It is important for future

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special educators to utilize effective technology based instruction so that special educators can assist regular educators with implementing an effective inclusion model.

Training Technology Fluent Teachers

Sheingold and Hadley (1990) estimate that it takes between five and six years for teachers to master the use of computers and technology, and implement effective technology into everyday teaching practices. Sheingold and Hadley further hypothesize that if pre-service teachers were well prepared this time would decrease significantly.

Teachers have indicated that their greatest barrier for use of technology is a lack of understanding of how to use it in classrooms. (Hancock & Betts, 1994). A recent survey of teachers indicates that only 28% of teachers believe they possess adequate computer skills, 48% of teachers surveyed state that their computer skills could benefit from improvement, 17% indicate their computer skills are limited and 7% indicate they possess no computer skills (Tyler-Wood, Putney, & Cass, 1997). In certain areas of technology the need for training for educators is even greater. Lesar (1998) indicates that in the field of assistive technology 92% of pre-service teachers indicate inadequate preparation.

To address the need for computer competence among future teachers, many colleges and universities have implemented a technology-specific course (Hess, 1990). Stuhlmann (1998) indicates that a single course offering in technology isolates the subject and does not provide pre-service teachers with learning activities that demonstrate how technological applications may be used in specific academic disciplines. Harrington (1993) indicates that colleges of education must develop systematic plans for integrating technology into teacher training programs if future educators are to use technology effectively

Benefits of an Inclusion Model

As previously stated, one of the major concerns regular educators express regarding inclusion is the effects that the model will have on the achievement of "regular" students in the inclusion classroom. The academic skills and levels of students in the average classroom vary greatly. Many students with significant academic deficits who are referred to special education do not meet criteria and continue to receive services in the regular class setting. Often the student who is denied access to special education services is considered a slow learner and can present significant challenges both behaviorally and academically to the teacher in a regular classroom environment. It is possible that some of the techniques and strategies used in special education can benefit any child. Whitworth indicates that more and more children fall into the "gray area" between regular and special education. There continues to be a significant overlap in the needs of these "gray area" students and students who actually meet criteria for services from special education (Roblyer & Edwards, 2000). Although academic goals may vary for regular and special needs students, Hanley has assigned many of the same benefits and limitations to technology for all students, regardless of the groups in which school systems place them.

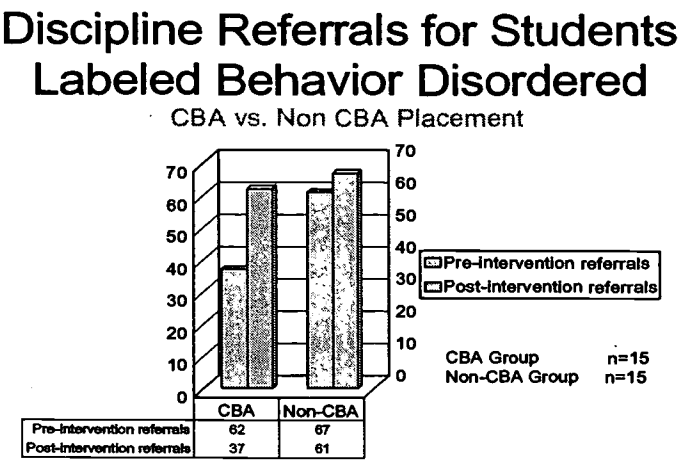
Effective Teaching Practices Enhanced Through Technology

There are some possible "tools" which could benefit all learners and assist all educators to meet the educational needs of students who have special learning needs but who do not qualify for special education services. These tools include curriculum based assessment (CBA) and strategies training enhanced through computer usage. Jones (1998) indicates that CBA includes systematic monitoring and recording of a students' performance in the school curriculum as a basis for obtaining information to make instructional decisions. Rapid developments in hardware and software have allowed special education teachers to develop ongoing assessment systems that track student progress on a daily basis. Combining technology with curriculum based assessment allows a teacher to frequently assess skills and transform data into a detailed picture of student progress (Woodward & Rieth). CBA offers a dramatic alternative to traditional concepts of instructional technology used in special education. Rather then using technology for merely drill and practice activities, CBA attempts to modify daily instruction based on the results of systematic assessment procedures. Using the adopted "regular classroom curriculum", the teacher administers skill tests or probes from a domain of items reflecting the schools adopted curriculum. Deficit areas and areas of strength are readily identified for all students. Appropriate instructional materials including specific software can be used to remediate a student's weakness and further enhance a student's

strengths. Because CBA allows each student to experience instruction at the appropriate level, all students including high ability students can benefit from instruction based on CBA.

One of the main concerns that teachers have with implementing an inclusion model involves controlling student behavior. Tyler-Wood & Pemberton (1999) have demonstrated a reduction in discipline referrals for students labeled behaviorally disordered after a CBA program was implemented. They hypothesize that students are less likely to engage in inappropriate behavior when classroom instruction is at a level where students can meet with success.

Figure 1



When students with special needs use the computer for skills beyond the drill and practice level, it is essential to provide for the development of metacognitive planning, evaluation and monitoring. (Woodward & Rieth). Typically students with special needs experience significant difficulties in these distinct areas. Learning strategies are defined as techniques, principles or rules that enable students to learn, to solve problems, and to complete tasks independently (Mercer & Mercer, 1998). For a number of years, special educators have recognized the need to provide training from broadly applicable strategy instruction to strategies that are highly content specific. There is a vast amount of literature concerning effective strategy instruction. There is a general consensus among experts that strategies need to be taught explicitly and in context and that successful strategies instruction requires focused practice and long term follow-up. Technology can be an important component of strategies training. Carnine and Boriero (1990) have successfully used the computer to provide a strategy for solving traditional mathematics problems. When a mathematics problem was presented, a computer program displays a keyword strategy for analyzing word problems. Students met with great success using the keyword approach. Historically, intensive strategies training has been implemented primarily with students served in special education. However, strategies training can provide benefits for many students.

In general, it appears that the effective implementation of a technology based instructional plan can greatly assist in alleviating the three main concerns regular educators express concerning the implementation of an inclusion model. Technology can assist with providing appropriate curriculum and instructional materials for special needs learners. By providing assessment and instructional materials at the appropriate level all students as well as special education students in the inclusion class can benefit from more individualized instruction. Some research also indicates that appropriate instruction can reduce the occurrence of discipline problems. The current literature indicates great potential for effective computer use in inclusion classroom. Recently enacted federal legislation emphasizes the importance of implementing an effective inclusion model.

Technology Standards in Teacher Education

The importance of integrating technology into special education teacher programs has been recognized by the National Council for the Accreditation of Teacher Education (NCATE) (Wise, 1997).

To facilitate inclusion it is important that pre-service teacher education programs for future special education teachers incorporate the effective use of technology into the curriculum. The most desirable model is the integration of technology use in teacher education course, especially methods courses (Dickson, 1989). NCATE and the International Society for Technology in Education (ISTE) have collaborated on evaluation standards for teacher education programs. The role of ISTE is to suggest standards for technology education (Thomas, Taylor & Knezek, 1994). ISTE and NCATE have both developed a list of standards that recommend teacher technology competencies. Of particular note is that NCATE reviews technology pre-service teacher competencies within an entire teacher education program. Competencies cannot be addressed by a single course labeled "the technology course." Prior models that recommend a course to incorporate technology into the curriculum may not meet NCATE or ISTE standards. Clearly, our current challenge is to determine an effective model for training pre-service teachers to effectively use computer technology particularly in an inclusion setting. One course cannot meet the technology needs of pre-service teachers.

Effective Technology Integration Programs

Stuhlman (1998) sought to determine if a sequence of courses with practice-oriented technology components changed pre-service teachers' perceptions of the role of the teacher and of the use of technology in classrooms. Stuhlman discovered that reinforcement and practice in technology over time had an enormous impact on pre-service teachers' abilities to implement technology into lesson plans and to transfers skills to other educational situations. Although the sample size is somewhat limited, Stuhlman's research indicates that infusing technology into teacher education programs is vital if we are to produce teachers who are prepared to educate students to meet the challenges our society holds. It is just as imperative to determine technology skills that will enhance student and teacher participation in an inclusion model classroom.

The Proposed Study

The proposed study provides an opportunity to train pre-service special education teachers to use technology to implement effective teaching methods in an inclusion classroom. In four pre-service curriculum courses, special education pre-service teachers will be required to complete assignments which integrate technology into recognized effective practices such as strategies use and CBA. Through funding provided by the Department of Education though a Preparing Tomorrow's Teachers to Use Technology Catalyst Grant the effectiveness of the technology enriched assignments integrated into pre-service curriculum courses will be determined. Using a survey, students' level of technology proficiency will be determined prior to entry into the technology enriched pre-service curriculum for future special education teachers. A group of students who completed the same courses without experiencing the technology enriched assignments will serve as a control group. A minimum of two technology enriched assignments will be required in each pre-service course. Each special education pre-service teacher is required to complete a portion of student teaching in both a special education classroom and a regular classroom situation. Lesson plans for the control group and the technology enriched group will be monitored to determine if the technology enriched group incorporates more technology into their lesson plans. At the conclusion of the student teaching experience, the control group and the technology enriched group will complete a post-intervention survey to determine perceived level of computer competence. Students in the technology enriched group will also provide feedback on the effectiveness of the technology enriched assignments they completed as part of their teacher training program.

Potential Impact

Data generated from this study should provide valuable insight into:

1. The effectiveness of the technology enriched assignments dealing with strategies training and curriculum based assessment.
2. Determining if providing pre-service teachers with technology enriched training increases their perceived level of computer competence

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3. Determining if providing pre-service teachers with technology enriched training increases the number of technology enriched assignments student teachers implement during their student teaching experience. Data gained from the current study will assist pre-service training programs in determining effective methods to educate effective inclusion model educators.

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Teaching Faculty and Future Teachers About Web Site Accessibility: Issues and Challenges

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Abstract: Kent State University considers itself a highly "on-line" university. Yet, it lacks a comprehensive vision resulting in significant resource and teaching gaps. An example of this is in preparing future teachers in both general and special education licensure programs to make technology accessible to students with disabilities. Individuals are making efforts to address some of these issues. The presentation reviews these efforts and remaining gaps at the university, department, and course levels and identifies suggestions at each level to support a more consistent approach.

Problem Statement

Kent State University considers itself to be one of the most "on-line" universities in the country. It regularly posts technology updates on its home page (Garmon 1999). It markets itself to potential undergraduate enrollees as providing email access from every building on campus and that every student has received an email account as of Fall 1997. Yet, there have been significant difficulties in supporting this image and the infrastructure and training available at the University has not been able to keep pace with the technology marketing. For example, all students received their email address in Fall 1998, however the campus dormitory buildings, from which most of these students needed access, were not fully wired until late Spring, 1998. For graduate students, there has been a significant problem with remote and off-site access. They have had limited access capabilities since Spring 1997, however each connection had a time limit of 10 minutes. For many, this made such connections practically non-functional.

The University has not developed a comprehensive technology vision of itself that integrates efforts occurring across campus. Much is driven by a need to compete with nearby universities. Efforts to use technology for individuals with disabilities is often based upon basic compliance; avoidance of ADA (Americans with Disabilities Act of 1990) complaints is the motivation for most efforts. These are also met with mixed success. For example, a new Recreation Center has been marketed as providing all students and staff with state-of-the art facilities and accessibility. A review of the nearly-completed building showed that wheelchairs could not move into and around the children's nursery, and the lack of sufficient stopping distance for the ramp to the swimming pool put persons in danger of skidding into the pool. Building plans had been reviewed for these issues prior to their finalization.

Kent's interest in and commitment to technology could be a tremendous asset in providing increased services to students, and particularly to those with disabilities. The ability to adapt input and output modes to meet individual user needs is one of it's greatest contributions for equalizing accessibility. By creating an informed and unified vision, the University could expand this accessibility in conjunction with its other technology efforts.

The University is making considerable efforts to seek new recruitment pools of students. Those with disabilities are such a potential pool. This type of recruiting supports a trend for an increasing number of students with disabilities who are entering postsecondary and university settings (Wagner 1993). In addition, Kent was originally founded as a "normal" school to train teachers. Legislative mandates and ongoing emphases to include all students with disabilities in the regular public school classroom (Individuals with Disabilities Education Act of 1990; Amendments of 1997) place learning about disability and accessibility as a critical competency for teachers in carrying out these mandates. Kent's College of Education had a strong interest in technology and commitment to produce qualified teachers. These interests and programs could complement each other very effectively and efficiently. The largest pool of future teachers includes programs in infant/toddler, elementary, secondary education, and administrative licensure through the Curriculum and

Instruction Department for general educators. The Special Education is a large and growing program area that provides licensure in all disability areas except for visual impairments.

Future teachers are currently receiving no training in adapting and adaptive technology features. They also learn none of the cautions and issues. For example, the Windows 95 icon-based menus initiated a new type of barrier for those with visual impairments which they had not faced with prior text- and DOS-based menus. A number of Kent faculty are concerned about adequately preparing future special education and general education majors for using technology in ways that support the unique individual needs they will meet when working with public school students with disabilities. In addition, University faculty are not being given the tools to present a model of this accessibility. There is a significant University and Departmental drive to build web pages for every major office and department, and for individual faculty to have homepages. There has been little attention given to accessibility to this web-based information. To date, there has been no policy discussed or implemented, or any University-wide recognition of this as an issue. There is one little-known website which provides a lengthy description of suggestions, concerns, and processes to use in considering this task (Garmon 1998). The University is currently operating in a "technology-reactive"mode to pressures from the community and its constituents.

University-Level Efforts

Some of the individual faculty have begun efforts to raise issues of accessibility and present more "technology-proactive" recommendations at several layers: at the university level, the department level, and the course level. At the university level, the University ADA Committee oversees accessibility complaints and makes recommendations to the Vice President. The Committee initiated a Technology Accessibility Working Group in Fall 1998. This group has made efforts to gather information on student and faculty activities related to technology accessibility in order to implement a proactive approach aimed primarily at the faculty; this uses a "bottom-up" approach to systems change. Two of the Working Group members collaborated to post a web-page with concise suggestions that could be implemented by individual faculty (Mitchell & Lilly 1999). This contrasted with the prior, little-known document that involved department-wide discussions and committees (Garmon 1998). This new page is organized for several "quick-tips" suggestions for faculty, as a place to start. The site provides hot-links to mandates on disability rights, "The 60-second Seminar" (Freed 1996) and resource sites including the Trace Center, and the "Bobby" site for web-site "validation".

The Working Group will initiate planning efforts with the University personnel training department to develop a number of 30-minute seminars to address building accessible websites. These seminars will be included in the general professional development seminars that are advertised and offered each semester. This will help to achieve two goals: to provide training at the faculty level to support further implementation of accessibility and provide role models to students; and to make faculty aware of and knowledgeable about these issues so that they will be able to instruct their students more effectively. From this "bottom-up" approach, it is hoped that faculty and departments will be motivated to craft guidelines and policy which will then, influence University Administration to do the same. The Technology Working Group will present efforts to the ADA Committee Marketing Working Group so that individual and departmental efforts are publicized within the University Committee.

A second university-level effort took a more "top-down" approach in which one of the Working Group members made a presentation to the University Technology Committee (UTC) about making computer labs accessible (Mitchell 1998). This individual had researched a series of recommendations for low-cost hardware and software solutions for creating generic, accessible workstations. The proposal created two workstations, one for each of the Windows and MAC platforms for a total that was less than $1500. The UTC took the suggestions but has not yet submitted them to a higher governing body. A number of new building projects have been initiated at the University but none have received this or other information on worksite accessibility; there have been some efforts made to comply with building accessibility mandates.

Department-Level Efforts

Through information sharing at the Technology Working Group and ADA Committee, three individuals are in the process of investigating making computer labs with accessible workstations at each of their departments

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(Departments of Speech and Audiology, Special Education/Rehabilitation Counseling, and Professional Development/Classroom of the Future). Speech and Audiology is in the process of installing one lab with the two accessible workstations. Hardware and software has been purchased and space allocated. The lab is in the process of resolving compatibility issues across both platforms through the department network . The two other faculty have passed these recommendations to their departments and colleges but there have been no funding or purchasing commitments made to date. Both currently have lab space allocated.

The Special Education program area has not had much involvement in technology accessibility issues to date. They have faculty with some expertise and in many ways, should be a key component in implementing accessibility projects. To date, there have been superficial discussions about encouraging web page development with a much greater emphasis on scheduling each faculty member to teach at least one course using distance education technology, although implementation has been hampered by a lack of facilities and supportive infrastructures. The department echoes administrative concerns to ensure they have a competitive edge on other neighboring universities in terms of recruitment.

The department underwent a 2-year process of redefining its curriculum including restructuring its several disability licensure programs and rewriting its courses. The state changed and significantly updated its certification/licensure programs and the department used this as an opportunity to update its offerings and program structure. Thus, the department has a strong interest in remaining current and credible. However, it has not been able to take a proactive stance on issues of accessibility. It has been raised as an issue but few of the faculty find it of concern. This is despite having an affiliated faculty member in Rehabilitation Counseling who is legally blind and uses specialized computer-viewing equipment.

The lack of department and faculty interest means that very few, if any, students currently learn about computer accessibility issues or challenges. In addition, few faculty include technology-based teaching in their courses. Some of this is due to the lack of sufficient technology within the College of Education (one IBM lab, one MAC lab, one multimedia lab, and one moveable station with LCD display across 80 faculty). The impact on students is to further reduce their opportunities to see and learn about its use. In terms of general accessibility preparation, there is almost no available assistive technology to share with students. It is addressed theoretically but there are few opportunities to see equipment other than videotape presentations. This situation will need ongoing discussions to raise awareness and then later, to investigate additional equipment purchases.

The Instructional Technology program area is within the same department as Special Education. They have previously been responsible for providing all beginning teacher students (general and special education) with a 3-hour class in instructional media (overhead projectors, making slides, laminating, basic computer skills). This course has not addressed much of the instructional change occurring as a result of Internet use. Students have no background preparation in applying web-based activities to instruction, building homepages, or in multimedia applications for teaching (e.g., PowerPoint). This information is available at the graduate level through the Instructional Technology masters program or through electives. Undergraduate future teachers remain by far, the largest group of students within the College but are unable to take these courses.

The Curriculum and Instruction department prepares all special education and general education students in core content areas of education. In response to state-led licensure changes in Fall 1997, they revised their curriculum and organized instruction to use "instructional blocks" rather than standard coursework sequences. This resulted in the elimination of an introductory special education course and the introductory technology course. Two special education faculty collaborated for two years in organizing these changes to include critical special education instruction. However, these faculty were not included in final course and implementation decisions. As the teacher preparation program currently stands, these issues will be taught be general education graduate students and are no longer considered within the special education program's domain, except for voluntary monitoring.

The Instructional Technology program also lost their introductory course during this change. They have been able to keep a one-hour instructional block to teach about technology and computers. This could be an opportunity to provide more current technology competencies and could include accessibility information as part of a web-site development module. It is unlikely that the Instructional Technology program area would suggest this in the curriculum at this point. One of the faculty in this program area is a member of the UTC, however the program area has shown little interest in accessibility or University-wide technology issues. There primary interest is in supporting their own program including an ongoing struggle to maintain, service, and update their equipment and to compete effectively for College resources in order to do so.

Course-Level Efforts

At this time, no courses within the College of Education teach general or special education majors about Internet, web-page, or multimedia products, or address computer accessibility issues and challenges. Two introductory courses that existed until Fall 1999 could have been used to prepare all teacher education graduates in these competencies. These are now out of the control of the related program areas and are scheduled to be taught be graduate students who are unlikely to have accessibility awareness or skills. The rationale for the new "block" scheduling of education courses was to permit flexible, in-depth learning opportunities in an integrated and thematic manner. Although pedagogically progressive, the expertise of special educators and instructional technologists is not being included.

The current focus on inclusion of students with special needs in the regular classroom places all education graduates in the position of needing to know these strategies. The education block courses will carry the primary content preparation for future teachers including theoretical discussions of working with students with disabilities. Without the involvement of key program area faculty, these graduates will not know how to provide this accessibility information. The current schedule also has significantly reduced instructional time given to special education and to technology instruction. These 2 courses could have been used to address the range accessibility issues that will face these future teachers.

Without students who have background technology skills, faculty are generally unable to assign web- or multimedia-based assignments unless they are willing to use course time to teach the prerequisite skills themselves. At present, one individual special education faculty member requires web portfolios of the students. Faculty cannot demonstrate use of technology because there is a lack of equipment. At present, teacher graduates may leave with little more than a knowledge of some basic applications and email.

Conclusion and Recommendations

In summary, the University's eagerness to be networked and "on-line" is not being supported by development of a comprehensive vision, through basic faculty and student training, or by strengthening infrastructure support mechanisms. Almost no attention is being given to accessibility issues. Yet, all levels of educational institutions are serving increasing numbers of students with disabilities. The following are some suggestions for ways that these skills could and should be addressed for this and other teacher preparation programs.

College of Education Course and Department-level Strategies

Use bottom-up strategies to raise faculty and Department Chair awareness of issues; tie this to University-wide goals to increase enrollment and to faculty obligations to be "current" and responsive to students' future needs.

Provide a few interested Special Education faculty with time to learn accessibility strategies; include at least one representative of the Instructional Technology program faculty in this training also. Use these individuals to continue awareness-raising and involvement in bottom-up change strategies.

Involve at least one interested faculty member from the Curriculum and Instruction department in discussions of technology and/or training (e.g., ADA Committee, needs to co-teach key "blocks"of content, content of interdisciplinary courses should be be reviewed and approved by their respective faculty. Build consensus and a commitment for ongoing collaboration that is overseen at the Department Chair level.

Make presentations at the monthly College Teacher Preparation Council meetings to raise general awareness and concern regarding future teacher competencies. Raise issues about current curriculum and lack of involvement of key, trained faculty. Have Department Chair raise this as an issue at the College Dean's and Chair's meetings.

Develop strategies that build on general awareness: Department policies/projects regarding technology must also address accessibility; faculty projects and assignments using technology should also include aspects of accessibility.

University-wide Strategies

Use Personnel Bulletins to emphasize "easy" ways to learn about making accessible web pages (advertise "30 Minute Seminars" and "quick tips" on ADA web page)

Identify a cadre of interested faculty and staff who are willing to serve as resources across the University; include individuals from the personnel training department and have them co-teach initial faculty training seminars, if desired. Publicize training efforts and successes; utilize and involve the ADA, UTC, and other relevant standing committees.

Use top-down strategies to raise awareness at the Vice President and Dean level that address ADA compliance regarding technology; cost-effective ways to support accessible web pages and laboratories with dissemination of software and hardware recommendations; show students with disabilities as a new recruitment pool and the low-cost nature of these recommendations which comply with the University Mission and the President's goals.

Develop strategies that build on general awareness and move toward University-wide policies/projects regarding technology that must also address accessibility; propose Administrative modeling of technology accessibility for departments, faculty, and students.

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