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Meeting Standards by Integrating Universally-Designed Technology into Special Education Methods

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Abstract

This study looked at preservice teacher perceptions of the impact of the integration of universally designed technology into a class on characteristics and methods of teaching students with learning and perceptual disorders. Using a survey instrument designed using the National Educational Standards for Teachers, students were assessed at the beginning and end of the class. Most results were statistically significant, indicating that students felt that they had improved their ability to use and integrate technology in their teaching. Activities used in class are shared.

Meeting Standards by Integrating Universally Designed Technology into Special Education Methods

Current emphasis in teacher education reform includes training preservice teachers to effectively integrate technology in the classroom. Requirements by NCATE address this issue by ensuring that beginning teachers meet a list of technology standards developed by ISTE (NCATE, 1997). The Council for Exceptional Children Common Core of standards for beginning special education teachers(2002) also includes technology standards expected of beginning special education teachers. Despite this, continuing research indicates that beginning teachers feel ill-prepared to integrate technology (Beckett, E., K. Wetzel, R. Buss, I. Chisholm, E. Midobuche, and H. Padgett, 2001; Congressional Office of Technology Assessment 1995).

Universally designed technology shows great promise for the success of individuals with disabilities. While accessible technology is not new, recent advances have led to legislation guaranteeing the consideration of technology for all students with disabilities (Blackhurst & Edyburn, 2000) including students with learning and perceptual disorders. Yet the field of instructional technology continues to experience a misunderstanding of what assistive technology is (Edyburn, 2004). Edyburn reports that special education suffers from a lack of AT-trained leadership; that IEP teams have little training in universal design; and that special education teachers lack information on using assistive technology for specific use with students in universally designed instruction (Edyburn, 2004). This situation implies that universal design instruction for preservice special educators must be added to the special education training programs that these teacher trainees receive. Indeed, Ludlow (2001) has called for additional training for pre-service teachers in the integration of technology for students with disabilities.

Schools of education have explored several methods for meeting these technology requirements including integrating technology instruction directly into methods courses. In 1999, ISTE found that institutions integrating technology into their teacher methods courses were more effective than institutions providing a separate course in technology

(Moursund & Bielefeldt, 1999). Anderson and Petch-Hogan (2001) demonstrated that integrating special education technology into special education field experience was effective on the students' perceptions of their ability to use and integrate technology for students with disabilities. Anderson and Anderson (2006) demonstrated the success of integrating assistive technology into special education methods courses using preservice teachers' perceptions of their skills and ability to integrate tools for specific disabilities. However, this study looks at how the use of the integration of software designed for universal design impacts the preservice teachers' perceptions of their mastery of the NETS-T standards for technology when addressing students with learning and perceptual problems.

Specific research questions include:

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of technology operations and concepts?

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of planning and designing appropriate learning environments and experiences?

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of curriculum and teaching and learning using technology?

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of using technology for assessment and assessing for the effectiveness of technology-integrated lessons?

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of the use of technology for productivity?

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of social and ethical uses of technology?

Method

Subjects or Participants

Participants in this study included 14 preservice teachers from an urban teacher education program in the Midwest. They consisted of both undergraduate and graduate students who were in a methods class, Characteristics and Methods of Students with Learning and Perceptual Disorders. They met one night per week. Most students were older who were changing careers or changing their teacher certification, although a few were traditional residential undergraduate students. This class was part of a program that included the courses found in Table 1.

Design

This study was designed to investigate the preservice teachers perceptions in their ability to integrate and use technology in their special education classrooms following the integration of universally-designed software and hardware into a learning disabilities methods course. A survey instrument developed using the NETS-T standards was filled out before beginning the technology-integrated learning disabilities class and again after completing the class. The survey (Appendix A) used descriptors that were turned into numerical responses for analysis. These numbers were used to determine means of the pretests and posttests. A paired associates t-test was then used to determine the significant difference of the results. Expected results were that the students would demonstrate statistically significant results on survey items designed to answer the research questions.

Procedure

Students in this study were students in a course on characteristics and teaching methods for students with learning and perceptual disorders. Each student had a laptop computer

that was loaded with appropriate universally-designed software purchased with the funds from a teacher-quality grant. At appropriate points in the class, universally-designed software and hardware were introduced and taught to the students. These tools were then used to carry out technology activities in the course. A list of the topics, software programs, and activities is found in Table 2. Some of the activities used software that was not specifically designed for students with perceptual disorders, however, the characteristics of the software that made it universally accessible for students with perceptual disorders were shared with the preservice teachers during the class.

Results

Results on this study were generally significant. Students were surveyed at the beginning and end of the class concerning their perceived ability level on the technology standards that are required for beginning teachers by the National Council for Accreditation of Teacher Education. The instruction on using universally designed software and the integrated activities involved with the Characteristics and Methods of Teaching Students with Learning and Perceptual Disorders seemed to facilitate the students' mastery of the beginning teacher's technology standards. Specifically, student responses to the questions asked on the survey are reported here.

Question 1

To answer the first research question, will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of technology operations and concepts, students were surveyed about their ability to demonstrate introductory knowledge and skills of concepts related to technology and their ability to demonstrate continual growth in technology skills and knowledge of emerging technologies. Responses to the first question when correlating pre and post means demonstrated a significant gain reflected in a p value of .03, while the second question resulted in a significance level of .004. Complete results are found in Table 3.

Question 2

To answer the second research question, will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of planning and designing appropriate learning environments and experiences, students were surveyed about their ability to design developmentally appropriate learning, technology-enhanced activities to support diverse needs; their ability to apply current research on teaching and learning to planning technology-integrated activities; their ability to identify, locate and evaluate technology resources; their ability to plan the management of technology resources in learning activities; and their ability to plan strategies to manage student learning using technology. Responses to the first question when correlating pre and post means demonstrated a significant gain reflected in a p value of .002. The second question resulted in a significance level of .04. The third question failed to demonstrate a significance, with a p value of .08, while the final two survey items were significant at levels of .01 and .001, respectively. Complete results are found in Table 4.

Question 3

To answer the third research question, will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of curriculum and teaching and learning using technology, students were surveyed about their ability to facilitate technology-enhanced experiences that address standards, their ability to support learner-centered strategies that address the diverse needs of students, their ability to apply technology to develop students' higher order thinking skills, and their ability to manage student learning activities in a technology-enhanced environment. Responses to the first question when correlating pre and post means demonstrated a significant gain reflected in a p value of .009. The second

question results included a significance level of .018. The third question demonstrated a significance level of .004, while the last survey item was significant at a levels of .0005. Complete results are found in Table 5.

Question 4

To answer the fourth research question, will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of using technology for assessment and assessing the effectiveness of technology-integrated lessons, students were surveyed about their ability to apply technology in assessing student learning of subject matter; their ability to use technology to collect and analyze data and interpret results; and their ability to apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity. Responses to the first question when correlating pre and post means demonstrated a significant gain reflected in a p value of .003. The results to the second question failed to demonstrate a significance level with results of .110. The final survey item resulted in a significance level of .035. Complete results are found in Table 6.

Question 5

To answer the fifth research question, will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of the use of technology for productivity and professional practice, students were surveyed about their ability to use technology resources to engage in professional development; their ability to continually reflect on their ability to make informed technology decisions in support of student learning; their ability to apply technology to increase productivity; and their ability to collaborate with their community to nurture student learning. Responses to the initial question when correlating pre and post means demonstrated a significant gain are reflected in a p value of .03. The results to the second question reflected a significance level of .03 also. The third question was significant at level .001, while the final survey item resulted in a significance level of .011. Complete results are found in Table 7.

Question 6

To answer the sixth research question, will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of the social and ethical uses of technology, students were surveyed about their ability to model ethical practices related to technology uses; their ability to apply technology resources to enable learners with diverse backgrounds; their ability to identify technology that affirms diversity; their ability to promote safe and healthy use of technology resources; and their ability to facilitate equitable access to technology for all students. Responses to the first question when correlating pre and post means demonstrated a significant gain reflected in a p value of .01. The results to the second question reflected a significance level of .02. The third question demonstrated a significance level of .03. The fourth question was significant at .011, while the final survey item failed to demonstrate a significant level with a p value of .146. Complete results are found in Table 8.

Discussion

The results of this study for the most part implied that students felt they benefited from the technology integration of universally designed software. Most results on the survey demonstrated a statistically significant improvement from pretest results to posttest results. Students generally felt that they benefited in knowledge of skills and operation of the technology for students with disabilities. They felt that they improved their ability to plan learning experiences using this technology and carry out their plans within a technology-integrated environment. Students indicated that they improved their ability to assess these technology-integrated lessons and employ the technology to

evaluate the effectiveness of these lessons. And all of these technology skills will be done within an improved knowledge of social and ethical uses of technology. Three areas failed to demonstrate statistically significant results. Students failed to demonstrate statistically significant gains in the ability to identify and locate technology resources and evaluate them for accuracy and suitability. While demonstrating gain in this area, the gain failed to be statistically significant. A reason might be explained by the list of activities that were used to prepare the students. No activities were directed toward the evaluation of the resources, only their use. Also, the initial mean was fairly high. Perhaps students responded initially with general technology in mind, such as the technology that they used themselves, and felt that they knew where to get and how to evaluate that type of technology. Indeed, the pretest mean results of the initial survey question dealing with their ability to demonstrate introductory skills in concepts and operations tends to support this possibility.

A second area that failed to demonstrate statistically significant improvements from pretest to posttest is the areas where students identify their ability to use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning. While the results demonstrated improvement, perhaps an explanation is illustrated in Table 1. While this characteristics and methods class addressed assessment somewhat, a separate assessment class is included in the special education training program. This class would focus technology instruction in this area to a greater extent than this course does. The final area that failed to achieve significant results is the survey area designed to measure students' ability to facilitate equitable access to technology resources for all students. An explanation for this score is illustrated by the high mean score of 3.21 at the beginning of the class. While students scores increased over the course of the semester, clearly they felt that they already did this before the class began. Like previous studies of technology integration in methods classes, this study substantiated the success of integrating universally designed software into a special education methods course. Previous studies, Anderson & Petch-Hogan (2001) and Anderson & Anderson (2006) addressed improvements in students' abilities to use and integrate assistive technology when integrated into special education methods and field experience. This study looked at the impact of integrating this special education technology on NETS-T standards. Like previous studies, most areas demonstrated statistically significant results.

Results of this study support continued integration of universally designed technology in special education methods courses. Outcomes would imply that students benefited from their exposure to universally designed software. Future research might focus on the continued impact of this training on their students as they begin to teach in their own classrooms. Study should be made to see if these students continue to use their skills and knowledge of universally-designed technology.

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Table 1

Courses involved in special education training involved in this study

- Exceptional Children and Youth
- Assessment in Special Education
- Characteristics and Methods of Teaching Students with Cognitive Disabilities
- Characteristics and Methods of Teaching Students with Emotional and Behavior Problems
- Characteristics and Methods of Teaching Students with Physical Disabilities and other Health Related Impairments
- Characteristics and Methods of Teaching Students with Perception Disabilities and other Specific Learning Disabilities
- Methods of Teaching Reading
- Methods of Teaching Mathematics
- Internship in Special Education
- Student Teaching

Table 2

Activities demonstrated or used during the Characteristics and Methods of Students with Learning and Perceptual Disabilities class

Universally-designed Software
Activity

Timeliner (Tom Snyder)

LD history topic - create a timeline of LD research through the years with your own group.

Kidpix Studio 4 (Broderbund)

Design your classroom - draw a design of your ideal classroom, including all contents
Excel (Microsoft)

Creating a schedule - create a schedule for students assigned as your cases for their special education/regular education schedule

Intellitalk III (Intellitools)

Autism - write an autism case study. Include the characteristics as buttons that can be selected to identify a specific autistic student's characteristics.

Powerpoint (Microsoft)

LD Theories - Powerpoint slideshow of LD child defined by that theory; assigned to groups

Inspiration (Inspiration)

Tourette's Syndrome - Tourette's Syndrome case study concept map

Draftbuilder (Don Johnston)

LD Characteristics - LD characteristics outline using characteristics

Intellipics Studio (Intellitools)

Planning a lesson - creating classroom, creating learning activity

Co-Writer - Write OutLoud (Don Johnston)

Language arts instruction - write lesson plan for reading instruction for learning disabled student

Start-to-finish story (Don Johnston)

Language arts instruction - demonstrate how to present it as a lesson for an LD student

Intellimathics (Intellitools)

Mathematics instruction - make an ethnic math game using Internet rules

Math Pad Plus (Intellitools)

Mathematics assessment - demonstrate a mathematics miscalculation using the software to create an example of the miscalculation

Graph Club (Tom Snyder)

Mathematics instruction - create a math lesson for an LD student using software.

Broderbund CD ROM storybook CDs

Social Skills - create an example bibliotherapy lesson using the social lesson from the story

Table 3

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of technology operations and concepts?

Mean A

Mean B

t

p value

significance

Demonstrate introductory knowledge, skills, and understanding of concepts related to technology

3.43

4
12.1
.03
*

Demonstrate their continual growth in technology knowledge and skills to stay abreast of current and emerging technologies

3.07
4.14
-3.16
.004
*

Table 4

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of planning and designing appropriate learning environments and experiences?

Mean A

Mean B

t

p value

significance

Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support diverse needs of learners

2.57
3.71
-3.47
.002
*

Apply current research on teaching and learning with technology when planning learning environments and experiences

2.79
3.43
-1.98
.04
*

Identify and locate technology resources and evaluate them for accuracy and suitability

3.0

3.64

-1.5

.08

Plan for the management of technology resources within the context of learning activities

2.57

3.5

-2.51

.01

*

Plan strategies to manage student learning in a technology-enhanced environment

2.86

3.79

-2.62

.011

*

Table 5

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of curriculum and teaching and learning using technology?

Mean A

Mean B

t

p value

significance

Facilitate technology-enhanced experiences that address content standards and student technology standards

3.07

3.78

-2.69

.009

*

Use technology to support learner-centered strategies that address the diverse needs of students

3.00

3.71

-2.35

.018

*

Apply technology to develop students' higher order thinking skills and creativity

3.07

3.93

-3.12

.004

*

Manage student learning activities in a technology-enhanced environment

3.00

4.00

-4.27

.0005

*

Table 6

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of using technology for assessment and assessing for the effectiveness of technology-integrated lessons?

Mean A

Mean B

t

p value

significance

Apply technology in assessing student learning of subject matter using a variety of assessment techniques

2.79

3.71

-3.24

.003

*

Use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning

3.00

3.50

-1.29

.110

Apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity

2.79

3.43

-1.98

.035

*

Table 7

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of the use of technology for productivity?

Mean A

Mean B

t

p value

significance

Use technology resources to engage in ongoing professional development and lifelong learning

3.21

3.86

-2.09

.03

*

Continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning

3.07

3.71

-1.98

.03

*

Apply technology to increase productivity

3.21

4.29

-3.74

.001

*

Use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning

3.36

4.21

-2.60

.011

*

Table 8

Will pre-service teachers involved in a special education methods class integrated with universally-designed technology improve their knowledge of social and ethical uses of technology?

Mean A

Mean B

t

p value

significance

Model and teach legal and ethical practice related to technology use

3.07

4.07

-2.65

.01

*

Apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities

2.79

3.64

-2.28

.02

*

Identify and use technology resources that affirm diversity

2.93

3.71

-2.15

.03

*

Promote safe and healthy use of technology resources

Planning and Designing Learning Environments and Experiences

N
A
L
B
C

Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.

Apply current research on teaching and learning with technology when planning learning environments and experiences.

Identify and locate technology resources and evaluate them for accuracy and suitability.

Plan for the management of technology resources within the context of learning activities.

Plan strategies to manage student learning in a technology-enhanced environment.

Teaching, Learning, and the Curriculum

N
A
L
B
C

Facilitate technology-enhanced experiences that address content standards and student technology standards..

Use technology to support learner-centered strategies that address the diverse needs of students.

Apply technology to develop students' higher order skills and creativity.

Manage student learning activities in a technology-enhanced environment.

Assessment and Evaluation

N
A
L
B
C

Apply technology in assessing student learning of subject matter using a variety of assessment techniques.

Use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.

Apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

Productivity and Professional Practice

N
A
L
B

C

Use technology resources to engage in ongoing professional development and lifelong learning.

Continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.

Apply technology to increase productivity.

Use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

Social, Ethical, Legal, and Human Issues

N

A

L

B

C

Model and teach legal and ethical practice related to technology use.

Apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.

Identify and use technology resources that affirm diversity.

Promote safe and healthy use of technology resources.

Facilitate equitable access to technology resources for all students.

Meeting Standards

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