Running Head: ONLINE LEARNING ENVIRONMENTS

Increasing Access to Teacher Preparation: The Effectiveness of Traditional Instructional Methods in an Online Learning Environment

Steven Bradford Smith

Department of Teaching and Leadership

University of Kansas

Sean Joseph Smith

Department of Special Education

University of Kansas

Randall Boone

Department of Curriculum and Instruction

University of Nevada Las Vegas

Introduction

Educators trained to work with students with disabilities are in short supply (Brownell & Smith, 1993; Lauritzen & Friedman, 1993). Unfortunately, this shortage is expected to become even more acute as the U.S. public-school population age 5 through 13 rose to approximately 38.5 million in 1998 and continues to increase at even higher rates. Similarly, studies have shown that an increasing amount of special education service providers lack certification in the area in which they are teaching. In addition, the need for on-going professional development has been documented to address new concepts, procedures, instruction and general issues concerning the education of students with special needs. Distance education provides one means of integrating technology across teacher preparation to meet the growing needs of preservice and inservice preparation programs (Spooner, F., Spooner, M., Algozzine, B., & Jordan, L., 1998).

Over the past decade, distance education has rapidly become an alternative distribution model for colleges and universities to offer special education courses to individuals at remote locations across the country. As distance education courses grow, colleges have also begun to offer complete programs allowing individuals to earn undergraduate and graduate degrees via a distance education format. For instance, Pepperdine University in California offers a doctoral degree in educational technology, Pennsylvania State University offers a certification program in educational technology integration, and the University of California at Los Angeles offers programs that teach teachers how to develop online instruction. In special education, programs at the University of North Carolina-Charlotte, the University of Kentucky, and the University of

South Florida have created distance education graduate and endorsement programs to train current and future teachers to meet the needs of individuals with special needs. Increasingly, colleges have expanded traditional distance education formats to include significant World Wide Web-based components (Blackhurst, Hale & Lahm, 1998; Dede, 1999).

Distance/Web-based learning has many benefits: (a) continued education opportunities for those in rural and hard-to-reach areas; (b) increased flexibility for the student pursuing education (e.g.,attending class is easier); (c) controlled use and flexibility of course content and materials for the student; (d) an enhanced interactive format offering multiple demonstration and practice opportunities for reinforcing instruction and subsequent comprehension; (e) increased numbers of students can be reached by a smaller number of instructors; (f) expanded geographic areas offering varied information distribution; (g) enhanced communication among students offering diversified perspectives and frames of reference; and (h) decreased costs of instruction for students (CEC Today, 1998; Langone, J., Malone, D. M., Stecker, P. M., & Greene, E., 1998; Spooner et al.,1998). Combined with interactive Web-based instruction, distance education is quality education. According to an expanding literature base, advances in technology have moved distance learning from a less than optimal educational experience to a highly reasonable option to meet the needs of qualified educators (Duchastel, 1997).

In teacher education, Web-based distance education has also begun to be used to enhance current general education teacher preparation curricula (Smith & Southern, 1999; Smith & Jones, 1999). Integrated as learning modules, special education issues can be infused across traditional

elementary and secondary preparation. For example, the Power of 2 (http://powerof2.org) at the University of Kansas instructs educators on collaboration basics through an interactive school-based approach.

A trend towards expanding educational opportunities to a population of learners unable to attend courses in person has many institutions of higher education seeking affordable and flexible student-centered online learning environments (Duchastel, 1996). Many institutions and educators are intrigued with potential opportunities of meeting the needs of many students at remote and diverse geographical settings. Teacher preparation programs seeking to confront significant teacher personnel shortages, especially in the area of special education, are considering online options as a way to expand endorsement and certification programs beyond the confines of traditional teacher preparation programs. Similarly, college and university special education programs have embraced distance education options to address a growing need of poorly trained and improperly certified teachers serving the needs of students with special needs.

However, while many institutions and educators have effectively integrated Web-based technologies into their educational environments to support a variety of courses and teaching functions, the effectiveness and efficiency of these new online technologies as well as their ability to deliver instruction, are still being considered. What most models of online learning do not account for is the method of instructional delivery. It has been assumed for some time that traditional methods of instruction would transfer to online learning environments, as evidenced by the increase in online-based educational systems being used in higher education today. Open

to question is the role that traditional methods of instruction play in online learning environments. Can the use of existing instructional methods in online learning environments be easily facilitated using reliable network infrastructures with access provided by computers and accessed by learners from any place, at any time (Thach & Murphy, 1995)?

While there is not a large number of studies related to the effectiveness of online learning environments, there are several significant studies that have examined different aspects of online learning environments (Davis, Odell, Abbitt, & Amos, 1999; Hiltz, 1994). These studies have contributed to our understanding of online learning and have identified significant findings such as (a) an overall increase in student participation; (b) an improved ability to apply the material of the course in new contexts and express independent ideas relating to the material; (c) improved access to the professor; (d) an improved ability to make connections between diverse ideas and information; and (e) improved attitudes toward the use of computers. This study contributes to this body of literature by examining the effectiveness of traditional instructional methods used in an online learning environment.

Today, technologies like the Internet are being widely used to facilitate instruction through new delivery mechanisms such as Web-based instruction (Khan, 1997), Web-based performance support systems (Dunlap, 1999), and virtual classrooms (Hiltz, 1986, 1994). These online learning environments are providing opportunities for faculty to design, manage, and deliver innovative instruction (Gillette, 1996). What is being questioned is the ability of traditional classroom-based instruction to provide on-demand instruction, robust learning

environments, authentic experiences, and just-in-time learning experiences to a population of educators who, because of time or geographic constraints, are unable to attend local colleges and universities (Perkins, 1996; Relan & Gillani, 1997; Romiszowski, 1998).

The present study examined the effectiveness of three traditional instructional methods identified by Pregent (1994) that are representative of methods used widely within higher education. The study addressed three questions: (a) are lectures, when presented in an online learning environment, as effective as lectures presented in a traditional classroom environment; (b) is guided instruction, when presented in an online learning environment, as effective as guided instruction presented in a traditional classroom environment; and (c) is collaborative discussion, when carried out in an online learning environment, as effective as collaborative discussion in a traditional classroom environment?

Method

Participants

Fifty-eight preservice education students enrolled in an educational technology integration course participated in this study. The course centered on technology integration, accommodation issues, and strategies for all students in the general curriculum classroom. All of the students in this study were undergraduate special education, elementary education, or secondary education majors preparing to teach in an inclusionary environment. Of the 58 students in this study, 42 (72%) were female and 16 (28%) were male. Within this population, 12 students indicated they were special education majors, 24 students indicated a preference for

elementary education, and 22 students indicated a preference for secondary education. The average age of all students was 25. The youngest student was age19 and the oldest student was age 53.

Setting

This study, conducted at a state-supported western university, measured student academic outcomes within two different learning environments: the traditional classroom environment and an online learning environment. Each preservice undergraduate education student was enrolled in one of two concurrent offerings of an educational technology integration course. This course offered an overview of computer-based technology and integrated software applications used in K-12 education and utilized a hands-on teaching environment in which students learned about current educational technologies through using them. The two sections of this course offered a one-to-one student computer ratio and were held in an education computer lab over a period of fifteen weeks beginning in the spring semester of 1999. Students participated in interventions throughout the entire fifteen-week period.

Traditional Classroom Environment. The traditional teacher-based classroom environment for this study was a Macintosh computer lab with 30 student computer stations and one teacher computer station. The classroom had a white board and several projection devices for viewing the instructor's computer screen. Each of the computers in this lab were similarly equipped with educational software and hardware (i.e., zip drives for data storage and scanners

for digitizing graphics). Each was networked into the university local area network (LAN) and wide area network (WAN) systems to provide Internet access.

Online Learning Environment. The online learning environment created for this study was the *digitalclassroom***.** This Web-based online learning environment was created using several Web-based technologies and was designed to deliver instructional content for all online interventions over the Internet. In this *virtual* classroom the students did not need to be present, as they would in a traditional classroom environment, in order to access and receive instruction.

Instructors. The two selected sections of the educational technology integration course were assigned to two instructors with prior experience teaching this course. For this study the instructors used a team-teaching approach for the two sections. Both sections of this course were scheduled to meet two days a week. In order to provide consistent access to both sections by the instructors, each instructor selected one day in which he would meet with all students enrolled in both sections. This permitted consistent administration of interventions on one day, and the administration of coursework not directly pertaining to this study on the other day.

Design and Procedures

Preparation

Course planning and preparation are important activities within the context of online learning (Schrum, 1997). A formative evaluation of the *digitalclassroom* online learning environment was conducted to determine its suitability to deliver instruction accurately and without interruption. Once the course content had been determined based on previous offerings

of this course, each of the three selected traditional instructional methods were created and then redesigned into a technology-based online format for use in the *digitalclassroom*. The instructional content used in each of the three methods was identical for both the experimental (online instruction) and the control groups (traditional instruction).

Training in the use of computers to access the Internet and the *digitalclassroom* for retrieval of course information, content, and instruction was provided for all students during the first week of classes. During this training, students learned how to: (a) successfully access the *digitalclassroom* online learning environment, (b) select a password and login name, (c) access coursework online, (d) turn in assignments electronically, and (e) communicate electronically with instructors and other students.

Students participating in this study were pre-registered into the course. Since the two sections were considered to be intact groups, the students were randomly assigned to both online and traditional interventions by a flip of a coin.

Interventions

The instructional design focus for each intervention was based on three criteria: (a) the method's potential for presentation via the Internet, (b) the method's primary interaction needs, and (c) the method's means of evaluation. For each of the three selected traditional teaching methods, a comparable online learning environment was created using existing commercial and Web-based software and technologies generally available to university faculty.

Lecture Interventions. There were two lectures written for this study. Each lecture was presented at separate times to all students in both an online and traditional format. Lectures were developed using a computer-based presentation tool called PowerPoint (Microsoft, 1997) and were accompanied by a text presentation. In the traditional setting the text was presented orally and in the online setting the text was presented visually. The traditional presentation of the lecture was audio recorded by the researcher so that the text could be transcribed later for distribution as online instruction. The transcribed text was converted to hypertext markup language (HTML) and each slide was converted into a graphic image viewable on the Internet. The slides and text were combined into Web pages that corresponded to the pacing used in the traditional presentation. Students accessing the *digitalclassroom* and viewing the lecture in this format were able to read the lecture text and view a corresponding slide. Enhancements made possible by the technology provided enhanced opportunities to retrieve additional information, commentary, or definitions of terms through hypertext links embedded in the lecture. These same enhancements were made available to students receiving the traditional lecture.

All students were administered the same pretest, which also served as an advanced organizer, before instruction. Each student also took the same posttest following instruction. Each test contained a set of multiple choice questions ranging from 15 to 20 points covering the educational content contained in the lectures. Student performance on the pretest and posttest was used to determine if the online intervention was as effective as the traditional classroom

instruction. All tests were administered within a traditional classroom setting with instructor supervision.

Guided Instruction Interventions. There were two guided instruction interventions written for this course. Guided instruction interventions were created using a combination of available software packages. The entire intervention (instructional content) for the experimental group (online) was put on individual CD-ROMs and distributed to students.

The guided instruction interventions were based on existing teaching methods and were tutorial in nature. These interventions took students through carefully sequenced instruction on how to use an integrated software program to create a product that would enhance instruction in the classroom. The software program selected to accomplish this was ClarisWorks (Claris, 1997).

The control group received traditional instruction. The traditional instruction consisted of a lecture/demonstration by the instructor using a projection device to display the instructor's computer screen for all to see. In this type of instruction the instructor is able to take students step-by-step through the process of creating a product. Using ClarisWorks, the instructor provided a carefully sequenced set of steps that lead to the creation of a newsletter or a slide show presentation. In addition to the guided instruction that students received, each was given a printed tutorial that outlined the steps presented in class. This allowed students to return to the instruction at a later date for remedial work.

All students were administered the same pretest, which also served as an advanced organizer, before instruction. Each student also took the same posttest following instruction. Each test contained a set of multiple choice questions ranging from 15 to 20 points covering the educational content contained in the guided instruction. Student performance on the pretest and posttest was used to determine if the online intervention was as effective as the traditional classroom instruction. All tests were administered within a traditional classroom setting with instructor supervision.

For the online version of these interventions, a software program was required that would replicate the traditional approach used in this study. The programs selected to accomplish this were AppleGuide (Apple Computer, 1992) and GuideMaker (Apple Computer, 1992). AppleGuide and GuideMaker are software programs that are used widely by software designers and computer manufacturers to distribute help files, how-to files, and tutorials with their software products. GuideMaker was used to create the intervention files and AppleGuide was used to display the files within the accompanying software program. AppleGuide displayed instructions and other operational information directly on the computer screen for the user to see. The display was unique in that it remained floating over the workspace allowing the user to continue working uninterrupted in the program. Since AppleGuide displays content in a small window that only allows a small amount of text, it was necessary to break the instruction up into small units.

The compiled AppleGuide was then placed within the ClarisWorks application folder so that it would appear in the help menu built into the ClarisWorks application. The ClarisWorks application with the AppleGuide and a plain text file with instructions were transferred to CD-ROMs. The CD-ROMs included the two guided instruction interventions: newsletter tutorial and slide show tutorial as well as preliminary instructions to the student.

Using AppleGuide, the student would work through the instruction in the same way he/she would in a traditional classroom with an instructor. In this intervention, AppleGuide replaced the instructor by providing the same content in a way the instructor might in a traditional classroom. The students were instructed to access the *digitalclassroom* to receive their initial instruction.

Collaborative Discussion Interventions. The collaborative discussion interventions were essentially a discussion forum much like that of a traditional seminar. These interventions took advantage of the *digitalclassroom's* ability to manage a threaded discussion thereby establishing an online discussion arena that replicated a more traditional face-to-face environment, but in a text format. The students and the researcher were able to contribute to any previous message or add new messages to the conversation within the discussion area. The collaborative discussion interventions included discussions on current topical issues relating to technology integration.

All students were administered the same pretest, which also served as an advanced organizer, before instruction. Each student also took the same posttest following instruction. Each test contained a set of multiple choice questions ranging from 15 to 20 points covering the

educational content contained in the discussion readings. Student performance on the pretest and posttest was used to determine if the online intervention was as effective as the traditional classroom instruction. All tests were administered within a traditional classroom setting with instructor supervision.

Participation in both online and traditional discussions was required. Student participation was evaluated based upon participation. During the discussions, student participation and contribution was tallied.

Data Collection and Analysis

Data from all intervention pretests and posttests were collected and scored by the researcher. A follow up scoring of the tests was performed by an independent observer. Data were then entered in a computer-generated spreadsheet for later analysis. All statistical analyses of the data were conducted using Statistical Package for Social Sciences (SPSS, 1999).

Pretest and posttest data collected in this study were analyzed using a repeated-measures analysis of variance (ANOVA) and t tests. The independent variables in this study were the methods of instructional delivery, (online instruction and traditional instruction) and time (pretest versus posttest). The dependent variable in this study was test scores. The means and standard deviations are reported in Tables 1 and 2.

Table 1

Summary of Means and Standard Deviations – Traditional (control)

		Pre		Post	
	n	Mean	SD	Mean	SD
L1	55	10.32	2.36	12.10	1.76
L2	48	8.74	1.91	12.96	1.7
GI1	51	11.97	2.88	16.45	2.23
GI2	54	11.16	2.48	15.33	2.08
CD1	55	6.29	1.72	11.47	2.94
CD2	58	6.93	3.09	15.46	2.63

Table 2

Summary of Means and Standard Deviations – Online (experimental)

		Pre		Post	
	n	Mean	SD	Mean	SD
L1	55	10	1.92	11.93	1.94
L2	48	6.88	2.19	11.66	2.42
GI1	51	12.39	2.23	15.54	1.97
GI2	54	9.79	2.04	15.38	1.84
CD1	55	5.26	1.70	8.79	2.54
CD2	58	6.1	1.71	15	2.61

Results

In this quasi-experimental, repeated-measures design, all students received both control and experimental conditions and treatments. Data were collected in the form of pretests and posttests over the period of one semester. Students completed a total of six pretests and six posttests covering three traditional instructional methods: (a) lecture, (b) guided instruction, and (c) collaborative discussion. Each of the pretests was administered prior to instruction and each of the posttests was administered following instruction. In all cases, the time between the pretest and the posttest was a minimum of seven days. The order in which the interventions were administered was randomly determined by the flip of a coin prior to the beginning of the study. Data from pretests and posttests were analyzed by means of a 2 x 2 repeated-measures ANOVA.

The dependent variable for this study was test scores. The two independent variables for this study were method (online or traditional) and time (pretest versus posttest). The pretests and posttests were designed to measure a student's knowledge of the subject matter included in an instructional intervention. The researcher initially scored all of the pretests and posttests administered in this study and entered the data into a spreadsheet. In order to ensure these instruments were scored accurately, an adjunct faculty member who has taught this course served as an independent observer and re-scored each test to validate the accuracy of all test scores entered into the spreadsheet.

Intervention One – Lecture 1

A repeated measures ANOVA was conducted on the pretest and posttest data from this intervention. The interaction between method (traditional versus online) and time (pretest versus posttest) was not significant, [$F(1,53) < 1$, $p < .05$] (see Table 3). There were no significant differences in academic outcomes between methods of instructional delivery at pretest or posttest. That is, students receiving online instruction performed as well as students receiving traditional instruction at both pretest and posttest.

The analysis of the main effect for method (traditional versus online) on posttest scores yielded no significant differences between groups, [$t(54) > 1$, $p > .05$] (see Table 4). The traditional and online groups performed equally at posttest. The main effect for time (pretest versus posttest) was significant, [$F(1,53) = 33.71$, $p < .001$] (see Table 5). Posttest scores exceeded pretest scores by an average of 1.86 points.

Intervention Two – Lecture 2

A repeated measures ANOVA was conducted on the pretest and posttest data from this intervention. The interaction between method (traditional versus online) and time (pretest versus posttest) was not significant, [$F(1,46) < 1$, $p < .05$] (see Table 1). There were no significant differences in academic outcomes between methods of instructional delivery at pretest or posttest. That is, students receiving online instruction performed as well as students receiving traditional instruction at both pretest and posttest.

The analysis of the main effect for method (traditional versus online) on posttest scores yielded significant differences between groups, [$t(54) = 2.32$, $p < .05$] (see Table 4). The traditional group outperformed the online group by an average of 1.3 points. The main effect for time (pretest versus posttest) was significant, [$F(1,46) = 165.46$, $p < .001$] (see Table 5). Posttest scores exceeded pretest scores by an average of 4.5 points.

Intervention Three – Guided Instruction 1

A repeated measures ANOVA was conducted on the pretest and posttest data from this intervention. The interaction between method (traditional versus online) and time (pretest versus posttest) was not significant, [$F(1,49) = 1.21$, $p > .05$] (see Table 3). There were no significant differences in academic outcomes between methods of instructional delivery at pretest or posttest. That is, students receiving online instruction performed as well as students receiving traditional instruction at both pretest and posttest.

The analysis of the main effect for method (traditional versus online) on posttest scores yielded no significant differences between groups, [$t(55) = 1.63$, $p > .05$] (see Table 4). The traditional and online groups performed equally at posttest. The main effect for time (pretest versus posttest) was significant, [$F(1,49) = 81.47$, $p < .001$] (see Table 5). Posttest scores exceeded pretest scores by an average of 3.82 points.

Intervention Four – Guided Instruction 2

A repeated measures ANOVA was conducted on the pretest and posttest data from this intervention. The interaction between method (traditional versus online) and time (pretest versus posttest) was not significant, [$F(1,52) = 3.77, < .05$] (see Table 3). There were no significant differences in academic outcomes between methods of instructional delivery at pretest or posttest. That is, students receiving online instruction performed as well as students receiving traditional instruction at both pretest and posttest.

The analysis of the main effect for method (traditional versus online) on posttest scores yielded no significant differences between groups, [$t(54) > 1, p > .05$] (see Table 4). The traditional and online groups performed equally at posttest. The main effect for time (pretest versus posttest) was significant, [$F(1,52) = 200.87, p < .001$] (see Table 5). Posttest scores exceeded pretest scores by an average of 4.88 points.

Intervention Five – Collaborative Discussion 1

A repeated-measures ANOVA was conducted on the pretest and posttest data. The analysis yielded a significant interaction between time (pretest versus posttest) and method (traditional versus online), [$F(1,53) = 5.19, p < .05$] (see Table 3). To determine precisely which group means were significantly different from other group means, it was necessary to carry out a post hoc test of statistical significance. A Tukey/Kraemer post hoc follow-up test revealed no significant differences between all pair-wise comparisons of the means.

The analysis of the main effect for method (traditional versus online) on posttest scores yielded a significant difference between groups, [$t(56) = 3.70$, $p<.001$] (see Table 4). The traditional group outperformed the online group by an average of 2.68 points. The main effect for time (pretest versus posttest) was also significant, [$F(1,53) = 101.99$, $p<.001$] (see Table 5). Posttest scores exceeded pretest scores by an average of 4.35 points.

Intervention Six – Collaborative Discussion 2

A repeated measures ANOVA was conducted on the pretest and posttest data from this intervention. The interaction between method (traditional versus online) and time (pretest versus posttest) was not significant, [$F(1,56) <1$, $p>.05$] (see Table 3). There were no significant differences in academic outcomes between methods of instructional delivery at pretest or posttest. That is, students receiving online instruction performed as well as students receiving traditional instruction at both pretest and posttest.

The analysis of the main effect for method (traditional versus online) on posttest scores yielded no significant differences between groups, [$t(56) <1$, $p>.05$] (see Table 4). The traditional and online groups performed equally at posttest. The main effect for time (pretest versus posttest) was significant, [$F(1,56) = 450.2$, $p<.001$] (see Table 5). Posttest scores exceeded pretest scores by an average of 8.71 points.

Table 3

Interaction between Time (Pretest versus Posttest) and Method (Traditional versus Online)

Intervention	DF	*F*	*p*
Lecture 1	53	<1	>.05
Lecture 2	46	<1	>.05
Guided Instruction 1	49	1.21	>.05
Guided Instruction 2	52	3.77	>.05
Collaborative Discussion 1	53	5.19	<.05
Collaborative Discussion 2	56	<1	>.05

Table 4

Main Effect for Traditional versus Online Posttest

Intervention	DF	*t*	*p*
Lecture 1	54	<1	>.05
Lecture 2	54	2.32	<.05
Guided Instruction 1	55	1.63	>.05
Guided Instruction 2	54	<1	>.05
Collaborative Discussion 1	56	3.70	<.001
Collaborative Discussion 2	56	<1	>.05

Table 5

Main Effect for Time: Pretest versus Posttest

Intervention	DF	*F*	*p*
Lecture 1	53	33.71	<.001
Lecture 2	46	165.46	<.001
Guided Instruction 1	49	81.47	<.001
Guided Instruction 2	52	200.87	<.001
Collaborative Discussion 1	53	101.99	<.001
Collaborative Discussion 2	56	450.20	<.001

Discussion

The purpose of the study was to explore whether providing preservice teacher education students instruction in an online learning environment was as effective as traditional methods of instruction. Analysis of the collected data indicates that use of online learning environments is an effective instructional approach for delivering teacher preparation content to both preservice special and general education students. In addition, online instruction appears to be an effective alternative across three modes of traditional instruction: (a) lecture, (b) guided instruction and, (c) collaborative discussion. The study has a fundamental limitation in that it only assesses a limited sample size across three particular instructional methods. Nonetheless, the data constitute a comparison between three traditional methods of instruction and an alternative (online) learning environment and thus provides meaningful information for analyzing selected aspects of teacher preparation and instructional delivery.

Lecture Interventions

For the two lecture interventions, the effectiveness of a traditional lecture method used in an online learning environment was investigated. An analysis of the data supported the conclusion that lectures, when presented in an online learning environment were as effective as lectures presented in a traditional classroom environment.

The effectiveness of this instruction was measured through pretest and posttest questions based on the content of the lecture. Overall results from the pretests/posttests indicate both groups, on both tests increased their knowledge with no significant difference regardless of the instructional format. It should be noted, that the differences between groups in the second intervention suggest more practical than statistical difference. More importantly, since these differences were not replicated and are not consistent across the study, learning appears to have occurred for both groups suggesting online instruction was as effective as the traditional lecture-based format

It would appear from these results that the use of online learning environments for lecture instruction was valid compared to traditional lecture instruction. The results of this investigation into the lecture method were positive. Analysis of these data indicate that students performed as well in the online learning environment as they did in the traditional classroom environment suggesting that lectures are an effective instructional method when used in an online learning environment.

Guided Instruction Interventions

With respect to guided instruction across two instructional environments, an analysis of the data indicated that guided instruction, when used in an online learning environment was as effective as guided instruction in a traditional classroom environment. Pretest and posttest data found a significant difference in test scores indicating that students had improved performance on the posttest. There were no significant differences found between the traditional and online instructional groups that would suggest that one method of instructional delivery was superior to the other. Similarly, both groups showed similar academic improvement.

Interestingly, student requests for the CD component of the guided instruction increased after the instruction period. Findings indicate that students requested the CD in order to create other products for related assignments. Thus, students used a portion of the CD-based instruction as a procedural refresher. Students instructed via the traditional format may have relied on notes, peers or similar resources but these data are unknown.

The results of the CD component use and the continued requests for CD access may indicate that in certain learning environments ongoing access to interactive examples is imperative for learning. The results of this increase in student CD request may also suggest the importance of students having access to ongoing instruction to understand current instruction and apply this to future teacher preparation topics. Simply presenting the information in a one-shot traditional guided instruction format may not be adequate for effective ongoing learning. Of course, current results do not indicate the impact of the CD learning environment on ongoing

learning; however, increased use suggests potential impact on the creation of other products for teacher preparation course work.

Collaborative Discussion Instructional Method

In the first Collaborative Instruction intervention, significant differences were observed between the traditional (control) and online (experimental) groups. The traditional group performed slightly better on average than the online group on the pretest, possibly indicating that they had more prior knowledge. The traditional group also performed slightly better on average than the online group on the posttest. These results were not replicated in the second intervention.

When viewed in relation to the overall performance by both groups on both tests, for both interventions, the small difference indicated appeared more practically significant than statistically significant in this study. That is, since these results were not replicated in the second intervention and are not consistent throughout the study, and, that overall students in both groups had higher posttest scores, learning did occur for both groups indicating that online instruction was as effective as traditional instruction. It is possible that the slight differences in test scores observed were due to the fact that students were just beginning to understand the two learning environments as well as the expectations for each. Since the effects were only seen in the first of the two interventions, it is likely that this effect was due to the newness of the educational experiences and not due to significant differences between methods of instruction. Posttest

results for both groups indicate a high understanding of content suggesting effective instruction in both the traditional and online learning environments.

Notable differences between traditional and online instruction were observed when considering student participation in the discussion activity. It appears a significant number of students in the traditional collaborative discussion chose not to participate in classroom discussions related to the content area. As expected, this is not an unusual outcome as most face-to-face instruction yields students who are unwilling to (and have the opportunity to) participate in collaborative discussion activities. Interestingly, as the data illustrate, 100% of online participants contributed to the discussion. By contrast, only 77% of one section and 82% of the other section (traditional instruction) were actively engaged in the discussion activity. These same preservice educators participated in the collaborative discussion activity when presented in an online format. These findings are similar to previous investigations, which have found that student participation increased when instruction was presented via an online format (Hiltz, 1986; Jaeger, 1991; Riel, 1994). For example, another investigation of student online discussion by Harasim (1990) found that student participation and involvement in online discussions was as a result of increased opportunity and access providing more time for students to formulate ideas and contribute responses. Thus, opportunities to contribute come and go quickly limiting student time to process, consider, and actually contribute to an interactive discussion. Similarly, face-to-face discussion has also been found to be dominated by personalities affecting contributions and controlling the rate and input to the conversation. In the present investigation, similar constraints

were found to be present. In the online learning environment findings indicate that the dominant personality may remain, however, he or she is less likely to interfere with less dominant personalities. The level of involvement observed in this intervention is similar to that found in research related to online communication (Jaeger, 1991; Riel, 1994).

Limitations

For practical reasons related to course and instructor schedules, students participated in both the control (traditional) and experimental (online) instructional settings. It is possible findings would have been more consistent if experimental and control participants had been separate and randomly assigned across the two instructional formats. Similarly, student comfort and understanding may have been increased if one instructor had been used instead of the two employed in this study. Initial student confusion regarding the structure of the course and this study may have impacted limited discrepancies noted in the related findings. Due to these limitations, the reader is urged to exercise caution in interpreting the results of this investigation.

Implications for Practice

The narrowest implications of this study relate specifically to the effectiveness of online learning in teacher preparation curriculum. The findings suggest that selected traditional methods of instruction translate effectively into online learning. The instructional formats included can be found across most traditional teacher preparation instruction. These traits represent instructional attributes that are the core to most instructional preparation. Thus, this study indicates traditional instructional methods can be used effectively in the online learning environment. Teachers can

then create effective online instruction without altering current instructional technique or curriculum content.

Face-to-face instruction has advantages over online instruction in terms of interpersonal contact, social contact, and non-verbal communication. However, the findings in this study indicate communication advantages appeared not in the traditional setting, but in the online setting. Students, when using the online learning environment were more likely to participate in the discussion than when in the traditional setting. The implications here are that online discussion may provide the student with some level of control or comfort that results in increased levels of participation. Traditional settings, on the other hand, may still contain some stigma that prevents students from communicating. Either way, the benefits of increased participation and increased levels of communication outweigh any advantages traditional environments have to offer.

The broader implications arise from what the students did and the technology possibilities that exist in the online learning format. For example, as technology continues to progress and adapt to the needs of educators, it is likely to become easier to use. Faculty now have one fewer reason for not exploring online learning environments and the benefits this technology can offer. As for student academic outcomes, the results are clear. Academically, students performed equally as well under both conditions. As Clark (1983) reported, the choice of media may not influence learning. Instead, educational gains are most likely attributable to the instructional methods. More importantly, findings indicate that ongoing access to instruction in a flexible

accessible environment offers potential advantages to student comprehension and ongoing application across teacher preparation curricula.

Thus, the benefits of online learning environments over those of the traditional classroom environment include the ability to archive, print, or review any online conversation. This ability to work with the data after the class has ended is a powerful benefit. Faculty can gain insight into the conversation over time. Students can reflect on their responses before posting them to the discussion.

Recommendations for Further Study

Research concerning distance education, specifically in the preparation of special and general educators has focused on areas taught via instructional television. Because little research concerning distance education via an online format has been conducted there is a need to continue studies in this area. Based on the results of this study the following areas are suggested for further research.

1.Additional research into the use of traditional instructional methods used in online learning environments and not covered in this study should be investigated. Different forms of instruction such as collaborative learning and independent study are being used to present courses on the Internet. Additional research into the effectiveness of these forms of instruction would be valuable.

2.Research that looks closely at the way students accept or reject the Internet as a medium for learning should be investigated. Student satisfaction with the instruction may be a determining factor in whether or not a course will be accepted.

3.As online learning environments continue to evolve, especially with the rapid growth of technology, they need to be studied. An understanding of these environments can lead to better design of instruction and a better understanding of the learning that occurs when using online learning environments.

4.Many institutions are considering online learning environments as a sole method for the delivery of instruction, eliminating, replacing, or substituting the personal face-to-face contact provided in the traditional classroom. Research is needed to determine the longitudinal effects on learning and understanding that online learning environments will have.

5.Finally, research is needed to identify those characteristics that increase student participation in an online setting. An understanding of the effects that the instruction, the delivery, or the levels of interactivity have on the overall success of an online learning environment would be most interesting.

References

AppleGuide [Computer software]. (1994). Apple Computer, Inc.

Blackhurst, A. E., Hales, R. M., & Lahm, E. A. (1997). Using an education server software system to deliver special education coursework via the World Wide Web. Journal of Special Education Technology, 13(4), 78-98.

Brownell, M.T., & Smith, S.W. (1993). Understanding special education teacher attrition: A conceptual model and implications for teacher educators. Teacher Education and Special Education, 16(3), 270-282.

Council for Exceptional Children (Fall, 1998). Integrating technology into the standard curriculum. Research Connections in Special Education, 1-12.

ClarisWorks [Computer software]. (1997). Claris Corporation.

Clark, R. E. (1983). Reconsidering research on learning from media. Review of Educational Research, 53, 445-459.

Davis, J., Odell, M., Abbitt, J., & Amos, D. (1999). Developing online courses: A comparison of Web-based instruction with traditional instruction. Paper presented at the meeting of the Society for Information Technology and Teacher Education, San Diego, CA.

Dede, C. (1999). The transformation of distance education to distributed learning. InTRO. [http://129.7.160.78/InTRO.html].

Dunlap, J. (1999, April-June). Developing Web-based performance support systems to encourage lifelong learning in the workplace. WebNet Journal, 40-48.

Duchastel, P. (1996). Learning Interfaces. In T. Liao (Ed.) Advanced Educational Technology: Research Issues and Future Potential. New York: Springer-Verlag.

Duchastel, P. (1997). A web-based model for university instruction. Journal of Educational Technology Systems, 25, 221-228.

Gillette, D. H. (1996). Using electronic tools to promote active learning. New Directions for Teaching and Learning, 67, 59-70

GuideMaker [Computer software]. (1994). Apple Computer, Inc.

Harasim, L. (1990). Introduction to online education. In L. Harasim (Ed.), Online Education: Perspectives on a new environment. New York: Praeger.

Hiltz, S. R. (1986). The “virtual classroom”: Using computer-mediated communication for university teaching. Journal of Communication, 36(2), 95-104.

Hiltz, S. R. (1994). Virtual classroom plus video: Technology for educational excellence. Educational Multimedia and Hypermedia [ED 388215].

Jaeger, G. (1991). Description of a freshman composition class taught completely online by computer and modem hosted on a BBS Spring Fall 1990. Ed, 5, 8-13.

Khan, B. H. (1997). Web-based instruction (WBI): What is it and Why is it? In B. Khan (Ed.), Web-based instruction (pp. 5-18). Englewood Cliffs, NJ: Educational Technology Publications.

Langone, J., Malone, D. M., Stecker, P. M., & Greene, E. (1998). A comparison of traditional classroom instruction and anchored instruction. Journal of Special Education Technology, 13, 99-109.

Lauritzen, P., & Friedman, S.J. (1993). Meeting the supply/demand requirements of the individuals with disabilities education act. Teacher Education and Special Education, 16(3), 221-229.

Perkins, D. N. (1996). Foreword: Minds in the 'hood.. In B. G. Wilson (Ed.), Constructivist learning environments: Case studies in instructional design (pp. v-viii). Englewood Cliffs NJ: Educational Technology Publications.

PowerPoint [Computer Software]. (1983-1998). Microsoft Corporation.

Pregent, R. (1994). Charting your course: How to prepare to teach more effectively. Madison, WI: Magna Publications.

Riel, M. (1994). Educational change in a technology-rich environment. Journal Of Research On Computing in Education, 26(4), 452-474.

Relan, A., & Gillani, B. B. (1997). Web-based instruction and the traditional classroom: Similarities and differences. In B. A. Khan (Ed.), Web-based instruction (pp. 41-46). Englewood Cliffs NJ: Educational Technology Publications.

Romiszowski, A. J. (1998). New technologies for human resource development: What works; what makes sense? In C. de Moura Castro (Ed.), Education in the information age. New York: Inter-American Development Bank.

Schrum, L. (1997). Teaching at a distance: Strategies for successful planning and development. New York, NY: Allyn and Bacon.

Smith, S. J., & Jones, E. (1999). Technology infusion: Preparing teachers through web-based cases. Career Development for Exceptional Individuals, 22, 251-266.

Smith, S.J., & Southern, W. T. (1999). The exceptional learner: Preparing all teachers for tomorrow's classroom. Journal of Computing in Teacher Education, 15(3), 17-23.

Spooner, F., Spooner, M., Algozzine, B., & Jordan, L. (1998). Distance education and special education: Promises, practices, and potential pitfalls. Teacher Education and Special Education, 22, 121-131.

Statistical package for the social sciences 6.1.1 [Computer software]. (1999). SPSS, Inc.

Thach, E. C., & Murphy, K. L. (1995). Competencies for distance education professionals. Educational Technology Research And Development, 43(1), 57-79.