A Comparison of Traditional and Hybrid Online Instructional Presentation in Communication Technology

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Introduction

Online education has become a central element of the discourse on higher education (Cox, 2005). There seems to be an overall drive toward online learning given the mounting need for flexibility in scheduling and the daily emergence of communication technologies and capabilities (Hillstock, 2005). Online education is presented as a means of conveying instruction to an extensive learning community any place at any time. Cox (2005) indicates that advocates designate online learning as the driving force and model for transformation in teaching, learning, and formal schooling. Online courses have the potential to provide learners with individualized attention by the instructor, otherwise impossible in a large classroom environment (Environmental Education and Training Partnership, 2006).

With the continuing development of online instructional applications, many colleges and universities have begun to offer online courses as an alternative to traditional face-to-face instruction. Sixty-seven percent of colleges and universities agree that online education is the most logical long-term strategy for their institution (Hillstock, 2005). However, there are considerable hesitations rising, predominantly related to quality and student responsiveness to online education (Yang and Cornelius, 2004). Just as there are advantages there are also disadvantages to the online instruction delivery method. There is evidence through previous research that students feel isolated or disconnected when not engaged in traditional face-to-face instruction (Guhu, 2001; Graham, 2001), while other reports indicate large successes (Hoffman, 2002; Kaczynski and Kelly, 2004; Meyer, 2002). There remains a lack of clarity whether online courses are as effective as traditional courses (Poirier and Feldman, 2004).

While there has been a vast amount of research conducted on the advantages and disadvantages of online instruction, little is known on how assessment is used in online classrooms to monitor performance and progress (Liang and

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Creasy, 2004). Hew, Liu, Martinez, Bonk, and Lee (2004) describe the evaluation of current online education at three levels: the macro-level, the meso-level, and the micro-level. The macro-level is an online evaluation that assesses an entire online program, the meso-level evaluation assesses individual online courses, and the micro-level assesses the learning of online students.

Online courses present educational experiences very different from standard face-to-face environments (Hew, Liu, Martinez, Bonk, and Lee, 2004). When conducting a micro-level course evaluation, interest commonly lies in learner perception of the course experience pertaining to level of comfort, ability to communicate with classmates and the instructor, as well as a comparison to traditional face-to-face lecture. Many times the only means of evaluating learner perception is in the form of a questionnaire or survey. Although perception of online learning can be extremely useful information, it is usually not sufficient to conclude the evaluation without expanding it to learner understanding. The assessment of learner understanding assists in the determination of knowledge or skill acquisition at the conclusion of the course. Such information can be acquired through administering end-of-course tests or some form of cumulative final assessment. This study focuses primarily on the micro-level of online education evaluation in a technology education imaging technology course with cross group comparisons with the same course in a traditional face-to-face learning environment.

Background

The College of Education at North Carolina State University appointed a committee to assess the structuring of existing resources and energy to best position the college to address its "critical priorities and initiatives" and highlight these in a strategic plan (Moore, 2006, August). Among the critical priorities are expanding access and improving learning through technology in the K-16 system by developing more effective use of digital technologies in the foundational areas of communication, innovative technology, and online education. These priorities are subcomponents of the College of Education's initiative to strengthen teacher education in science, mathematics, and technology education. The Mathematics, Science, and Technology Education Department at North Carolina State University was highly encouraged to implement online education initiatives.

Undergraduate students majoring in Technology Education at North Carolina State University experience a range of content organized into courses based around systems such as construction, communication, manufacturing, and transportation (North Carolina State University, 2007, March 13). The communication systems courses consist of a course in imaging technology and a course in broadcast communications. Imaging Technology is a four credit hour course recommended to be taken by technology education majors with a teaching licensure concentration during their first year enrolled in the program. The course exposes students to design, layout, and composition applications

along with laboratory experiences. The purpose of the Imaging Technology course is to develop technical skills and the ability to apply knowledge and understandings of technical processes associated with graphic communications. Skill and understanding are acquired through studying content associated with and completing learning activities in finishing processes, screen printing, image development and layout, and digital photography.

The finishing process involves generating image ideas for use with a die cutter. Students take, scan, develop, or combine original images and import them into image processing or manipulation software. The image print size is modified to correspond with the chosen die, finalized, and printed. Backing is applied to the image and run through the die cutter, producing a simulated consumer product. A second idea generation process involves the generation of potential image solutions for a button design. Students again take, scan, develop, or combine original images and import them into image processing or manipulation software in which the image print size is modified to adhere to material constraints. The image is then finalized, printed, cut in a circular shape, and stamped using the overlays, facing, and backing. The screen printing process also involves an idea generation element where designs are sketched, scanned, or combined and imported into image processing or manipulation software in which the image print size is modified to correspond with the desired fabric size. The image is finalized, printed, exposed, developed, fixed to a screen, attached to the carousel, inked, and squeegeed to producing a print. The image development and layout laboratory exercise requires the development of a tri-fold layout, integrating the elements and principles of design. The topic of the layout is determined prior to the collection and generation of images and text. The completed tri-fold is burned to a CD. Additionally, a jewel case insert and CD label is designed and printed. The digital photography learning activity requires students to utilize a digital camera to take pictures using a variety of settings, movements, and techniques. Practice shots as well as required shots are specifically noted. The activity also involves image enhancement such as eliminating red-eye, cropping, merging, etc.

The introductory communications systems course was selected to initially explore online possibilities largely due to previous research in technology education concerning online education. Flowers (2001) concluded that we as technology teacher educators should "take advantage of the perceived need for online education …… [in] areas such as 'information and communication' and 'technological design'." In this study, Flowers found that interest levels for courses or workshops based on information and communication technologies were greater than any other content area included in the ITEA standards.

Methodology

The research design employed in this study is a quasi-experimental post-test only design. The structure of the study is similar to that of an experimental design, but did not use random assignment in the selection of participants. This micro-level course evaluation is used to assess the learning of hybrid online

students through the use of a post-assessment and compare their learning to students who participated in a traditional lecture course supplemented with laboratory activity.

In the fall semester of 2006, a group of 23 students were selected to participate in the study. The group was enrolled in the Imaging Technology course described earlier. The intent of the course projects was to enhance understanding of how visual art and technology principles are combined to communicate effectively. The group met twice a week for fifteen weeks in a traditional face-to-face learning environment with an instructor-directed laboratory component. After each traditional face-to-face content lecture, students were given time to ask questions concerning the newly covered content. To conclude the course, a comprehensive final examination composed of 50 assessment items was administered to the students. Items were corrected and raw scores were calculated.

In the spring semester of 2007, an additional group of 23 students were selected to participate in the research study. This particular group was chosen to serve as the treatment group based on the vast similarity in demographical breakdown with the initial group of 23 students. Equality between the initial group of 23 and this additional group of 23 was controlled by matching characteristics of the participants such as gender, age, and major. The additional group of students was enrolled in the same imaging technology course under the same instructor. The group was scheduled for an online lecture once a week, supplemented with an instructor-directed laboratory once a week for a total of fifteen weeks. The students were not informed of the course format prior to registering for the imaging technology course. The online video lectures were accessible by the students via their course website. The video lectures consisted of narrated PowerPoint files converted into compressed media files. At the conclusion of each video lecture, students were prompted to submit questions concerning the newly covered content through an electronic posting system. After the completion of the online lectures, students were administered a hybrid online survey. The willing student participants completed the survey. To conclude the course, students were administered the same 50 item comprehensive final examination as the students who participated in traditional instruction. Items were corrected and raw scores were calculated. The comprehensive examination raw scores were entered and analyzed for differences and associations. The objective of this study was to identify the level of achievement of students based on the mode of instructional presentation of course content. This study utilized a post-only assessment of the two groups of interest. Cross group comparisons were made to identify variations in attainment.

Instrumentation

Two basic instruments, developed by the researcher, were used in this study. A 50-item cumulative assessment was used to measure student achievement. The assessment was composed of 10 multiple-choice items, seven

true or false items, 19 matching items, four image matching items, and 10 image performance items. A researcher-developed hybrid online survey was used in the study to gauge perception and collect information associated with past experiences of students enrolled in the online content lecture imaging technology course. The survey consisted of items used to collect information on the following:

- if the students have taken an online course before
- if the students have taken a hybrid online course before
- student comfort in an online environment
- student perception of content covered in the hybrid online format and traditional lecture format
- student ability to effectively communicate with instructor
- student ability to effectively communicate with classmates

The survey questions were generated to establish learner perceptions pertaining to the method and structure of the hybrid-online instructional approach, while the cumulative assessment was used to collect information on learner understanding. Student perception and understanding are both central to micro-level course evaluations (Hew, Liu, Martinez, Bonk, and Lee, 2004).

Demographic Information

The two groups in this study total 46 university student participants, with 23 in each group. The two groups represent a variety of majors ranging from technology education to engineering. The majority of students in the traditional instruction group were technology education majors. Much like the traditional instruction group, the online instruction group was predominately composed of technology education majors. The 46 participants were predominately male. The study included only four female participants, three in the traditional instruction group and one in the online instruction group. The majority of the students in the traditional instruction group and the online instruction group were in the 18-20 age range, followed by the 21-23 range. Refer to Table 1 for a demographic comparison of the two groups.

Data Analysis and Findings

The hybrid online survey was used determine if students enrolled in the online content lecture imaging technology course have taken an online course before, taken a hybrid online course before, and feel comfortable in an online environment, feel the same content was covered in the hybrid online format as would have been in a traditional lecture format, feel they had the ability to effectively communicate with the instructor, and feel they had the ability to effectively communicate with their classmates. Twenty of the 23 student participants from the online instruction group completed the hybrid online survey, as it was completed on a voluntary basis. These data are reported in Table 2.

The majority of the student participants in the online instruction group had not participated in an online course (80 percent). Four of the 20 respondents (20 percent) indicated that they had participated in an online course during or prior to being enrolled in the imaging technology course. The majority of the student participants in the online instruction group had not participated in a hybrid online course (75 percent). Five of the 20 respondents (25 percent) indicated that they had participated in a hybrid online course during or prior to being enrolled in the imaging technology course.

Table 1
Demographic characteristics for the comparison groups

Characteristic	**Traditional Group** ***n*(%)**	**Online Group** ***n*(%)**
Gender		
Male	20(87)	22(95.5)
Female	3(13)	1(4.5)
Age Range		
18-20	12(52)	18(78)
21-23	9(39)	3(13)
24-26	1(4.5)	2(9)
27+	1(4.5)	0(0)
Major		
Technology Education	16(70)	16(70)
Graphic Communication	3(13)	3(13)
Engineering	2(8.5)	2(8.5)
Undeclared	2(8.5)	2(8.5)

The majority of the student participants in the online instruction group either agreed or strongly agreed (85 percent) that they felt comfortable in an online learning environment. Eighty percent of the respondents either agreed or strongly agreed that the same content was covered in the hybrid online format as would have been with the traditional lecture format. Fifty-five percent of the respondents strongly agreed that they had the ability to effectively communicate with the instructor, while 40 percent were undecided. Ninety percent of the respondents either agreed or strongly agreed that they had the ability to effectively communicate with classmates. These data are reported in Table 2.

A test of the following null hypothesis was conducted: There are no differences in overall cumulative achievement performance between the traditional instruction group and the online instruction group. The Kruskal-Wallis is designed to rank response elements from lowest to highest in the two designated samples (Hinkle, Wiersma, and Jurs, 1979) and was selected for this study. This test is an alternative to the One-Way Analysis of Variance when the measurement scale assumption is not met. This test, as with many non-parametric tests, uses the rank order of the data rather than raw values for statistical calculation. In this study, the imaging technology cumulative

Table 2
Degree of agreement: Online instruction group

Statement	Strongly Disagree n(%)	Disagree n(%)	Undecided n(%)	Agree n(%)	Strongly Agree n(%)
I feel comfortable in an online educational environment.	0(0)	1(5)	2(10)	12(60)	5(25)
The same content was covered in the hybrid online format as would have been in traditional lecture format.	1(5)	1(5)	1(5)	11(55)	6(30)
I had the ability to effectively communicate with the instructor.	0(0)	1(5)	8(40)	0(0)	11(55)
I had the ability to effectively communicate with my classmates.	0(0)	1(5)	1(5)	13(65)	5(25)

assessment raw scores were ranked. Based on the Kruskal-Wallis test, with an alpha value of .05, the calculated proportional value of 0.7313 indicated that the null hypothesis could not be rejected. Thus, there was no significant difference between the cumulative assessment scores of those enrolled in traditional instruction compared to those enrolled in the online instruction.

Discussion and Conclusions

The use of the hybrid online instructional approach presents student learning outcomes that are similar to those of traditional face-to-face instruction. The lack of learner outcome variation between the traditional instructional group and the hybrid online instructional group signals the establishment of concurrency between the two measures even though they are measures of the same construct. This investigation supports the use of a online instructional

delivery structure to broaden the instructional audiences in technology education progams.

The use of online instructional delivery systems in technology education at the university remains at minimal levels as suggested by the 80 percent of online student participants, predominately technology education majors, who report that they have not taken an online course previously. Also, 75 percent of online student participants report that they have not taken a hybrid online course previously. The online lecture format does not seem to be widely embraced by faculty members currently serving or having previously served the student sample.

Hybrid online educational approaches afford students opportunities to investigate topics through authentic learning experiences while maintaining a highly collaborative structure (Doering, 2006). Any educational environment, online or traditional, that permits highly interactive instruction supplemented with practical applications of content provides a framework for successful acquisition of knowledge. The traditional content lecture remains a preferred method of delivery, but often fails to maximize the time and resources of faculty members and universities. Although online courses present very different educational experiences compared to courses that offer instruction in a traditional face-to-face environment, they can remain effective transmitters of information as evidenced in this study.

One-way compressed video lecture files were used as an initial investigational tool to explore the hybrid online format in this study. Advances in electronic instructional tools now allow collaborative and interactive communication with live video, document posting, presentation posting, sketch screens, and many other advanced features. Future exploration of the hybrid online format should utilize more advanced instructional tools.

Rumble (2001) notes that the technological history of distance education technology underpins its pedagogic history. Distance education is generally thought of as occurring in the absence of a teacher and presents some unique challenges for the lab component of technology education and its importance. Asimopoulos, Nathanail, and Mpatzakis (2007) note that courses with laboratory-based experiences facilitate comprehension through the use of hands-on practice and application. They further indicate that laboratory subjects suffer when an online education formats is used and practical study is omitted. The precise role of the teacher in laboratory environments should also be further investigated to determine the potential of providing hands-on learning experiences as a component of online instruction. Learning not only involves interaction with instructional content, but also interpersonal interaction in traditional and online environments (Berge, 1995).

Online education and its associated technologies have significantly changed the educational setting of higher education. Corresponding to the emergence of online education have been broad efforts to ensure the quality of educational offerings. For online education to be a widespread and effective vehicle of learning in technology education, continuous evaluation and assessment must be

conducted. Measurement of educational outcomes as well as student engagement, comfort levels, and abilities to communicate must be continuously monitored to ensure quality and to maximize student achievement. Just as Ndahi (1999) concluded, online learning is not a substitute for face-to-face instruction, Rather, it should be an additional means for instructors to enhance their courses. The success of online education depends on the willingness and readiness of faculty to explore and develop online options and constantly monitor their effectiveness. The findings from this micro-level evaluation study further support the need for continued research in hybrid online instruction and delivery systems for laboratory instruction in technology education.

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