Examining Students Performance and Attitudes Towards the Use of Information Technology in a Virtual and Conventional Setting

Ahmed Ali & Abdulaziz Elfessi
University of Wisconsin-La Crosse

Abstract

This paper reports findings of a study that examined student performance and attitudes towards the use of information technology in virtual and conventional settings. Students were preservice undergraduate and graduate students enrolled in an educational media and technology course. All were fulltime, on-campus students, but one group completed the course entirely online. A Web-based survey was administered. The two groups completed pre and posttests on student performance, and a Likert-type attitude assessment. Analysis of covariance (ANCOVA) was conducted to determine if there were significant differences in attitude and performances. The findings revealed that there were no significant performance and attitude differences between the two groups.

Within the last decade, there was widespread application of the Internet as an instructional tool and medium of communication because of its potential to facilitate and improve learning (Wang & Bagaka's 2002). The Internet is used to supplement traditional classroom practices while it has become an important instructional medium in long distance learning. However, research findings are mixed about the effectiveness of the Web in learning. For example, some studies (Redding & Rotzien, 2001) reveal that the Web improves learning and that critics (Gifford, 1998; Kincannon, 2002) downplay its effectiveness. In a comparison of two groups of students who completed a course online and in class, Redding and Rotzien found that online instruction was more effective than classroom instruction as course examinations revealed the online group performed better than their classroom counterparts. However, in an investigation of time spent to complete a course, Gifford found online learning requires more time than traditional classroom learning. In a study on faculty transition from classroom to Web-based instruction, Kincannon reported faculty were less satisfied with their teaching in the Web-based environment.

In a comparison of Web-based and classroom learning in higher education institutions, Hofman (2002) found that Web-based learning courses enable students to more effectively understand course content. Hofman attributes the significance of Web-based learning to better collaborative learning environment provided by the Web, increased learning resources, and convenience. In the following section, we will provide the unique features of the Internet and online learning in the educational context.

The Internet

The potential of the Internet for facilitating communication and research encouraged educators to utilize it in creating new learning environments (Bento & Bento, 2000). The Internet's communication tools such as e-mail, conferencing, and Internet Relay Chat enable teachers and students to communicate easily in real or delayed time, while its unique capabilities of information generation, transmission, and publishing make it an important instructional tool (Mioduser, Nachmias, Lahav, & Oven, 2000). The abundance and availability of materials and information in different formats such as text, audio, video, simulations, graphics, and animations, and the ease with which these materials can be accessed, increases the use of the Internet.

The Internet provides learning opportunities outside the classrooms and facilitates communication making it ideal for long distance education (Web-based instruction or WBI) (Wang & Bagaka's, 2002). According to Michau, Gentil, and Barrault (2001), Web-based instruction provides all-time access to learning at anytime and from any location, is cost effective and has wide reach. Vrasidas and McIsaac (2000) add that the synchronous and asynchronous communication allows for self-paced learning. Nevertheless, the Internet has its limitations such as safety and security problems, limited access for many people, and need for technical skills (Michau et al., 2001).

One common mistake made in use of the Web is the focus on technology at the expense of pedagogy. Many Web-based learning developers disregard pedagogical considerations in Web-based learning environments (Mioduser et al., 2000), assuming traditional classroom learning practices will work online.

Online learning

According to Vrasidas and McIsaac (2000), online learning varies greatly in terms of goals, content, pedagogical practices, and audience. Michau and colleagues (2001) contend that for online learning to be effective in the face of this variation, it should be available on demand, support self-paced learning, be combined with high-quality tutor support in distance learning settings, facilitate collaboration and interaction, and be learner centered and not teacher directed.

Pedagogy in online learning changes from a structured knowledge transmission strategy to a pedagogy that promotes problem solving and interactive collaborative styles. The roles of the teacher and students change in a technology-supported and mediated-learning environment. The teacher changes from one who transmits content and directs students to a mentor and a guide. The teacher helps students develop skills (Michau et al, 2001).

To have successful online instruction in the face of these multiple challenges, Vrasidas and McIsaac (2000) suggest the instructor should provide frequent, immediate, and adequate feedback, and should participate in discussions. Vrasidas and McIsaac add that learners should move at the same pace, and diverse evaluation strategies should be applied.

Online learning is flexible in that the instructional styles can take a classroom learning style where content is delivered to students at the same pace. For example, weekly class attendance can be replicated in an online environment by weekly online

postings and presentation of materials. On the other hand, to cater to individual interests and styles, students should be allowed access to course materials and content all the time. Instructors should interact and communicate with students at any time. For example, working students that require communication in the evenings and weekends should obtain the same instructional support as their weekday counterparts. Online students have independence and convenience that scheduled classroom learning students do not have.

Description of the Study

This paper reports findings of a study that examined student attitudes towards the use of technology and comparison of student performance in a virtual (online) and conventional (classroom) setting. Two groups of students, enrolled in classroom and online sections of the same course, were compared. In the online learning section, the Web was used as the medium of instruction. Both groups were on campus and had access to all resources such as computers, printers, network, and the Internet, except that the online group did not receive instruction in a face-to-face classroom environment.

The students were enrolled in an educational media and technology course that all preservice teacher education students are required to complete. The course content covered several computer applications, including common productivity applications (Microsoft Word, PowerPoint, Excel, Access, Publisher), the Internet, Web design (Microsoft FrontPage, Macromedia Dreamweaver), multimedia design (HyperStudio, Kid Pix), concept mapping (Inspiration) and video production (Apple iMovie). The course also required students to conduct research, make presentations, and complete a final exam. Each student presented a library research report on technology use in teaching and learning. Instructional styles included individual and group collaboration. As this was an introductory educational technology course, the students were taught basic but essential features of the software programs. Most of the instructional time however was used to integrate the new technology skills in teaching and learning. Students completed assignments every two weeks that involved such activities as creating PowerPoint preseentations, Web sites, and multimedia, and were required to incorporate each activity into their respective content areas.

At least four classroom-based sections of the course are taught by one of the researchers in this study every semester. During the semester of this study, the instructor offered one section of the course online. Though students were on campus, the instructor met face-to-face with the students only three times throughout the semester. At the beginning of the semester, the instructor introduced the course and discussed with students course requirements and expectations, and students completed a pretest assessment. In the middle of the semester, the class met to discuss progress and experiences during the previous seven weeks. During the last week of the semester, there was a classroom meeting to complete online exams and course evaluation; students completed a posttest assessment and submitted electronic portfolios (CDs).

Since this was a required course, the instructor offered the online section as a pilot to find out if students would be interested to complete the course online. One of the sections was entered in the university course catalogue as an online section before students were allowed to enroll for courses. Students had the freedom to decide the course section that they selected.

The online section was administered using Blackboard, an online course management tool. Blackboard is designed to present a traditional classroom in a virtual environment. In this study, "traditional classroom" is used to describe conventional face-to-face classroom learning. Blackboard was used to supplement and not replace the long-established classroom teaching and learning styles. Blackboard is divided into different sections that include course content (e.g., course documents, book listings, course information, assignments), communication tools (e.g., e-mail, virtual chat, discussion forum, document transfer, calendar), assessment (online assessment, grade book) and administrative control for instructor (add and remove students, management groups).

The instructor insured that the classroom and online sections progressed at the same pace. For example, the same presentations were scheduled for both sections each week, although delivery format differed. While classroom students were lectured, content was presented to online students using Microsoft PowerPoint, Microsoft Word, and video. Face-to-face discussion and collaborations in the classroom were replaced by virtual discussions using chat, forums, and e-mail. While classroom students used Iomega Zip disks to submit their assignments, online students used Blackboard's digital drop box. However, all tests were administered using Blackboard's online assessment tool as all groups were introduced to Blackboard at the beginning of the semester, and because of the convenience and immediate feedback Blackboard provides. The same test was given to both groups. Students were tested on their knowledge of technology and its integration into teaching and learning.

Data Collection

A survey questionnaire was utilized to investigate student attitude towards the use of technology in classroom and online learning environments. To measure the initial student performance, a Web-based pretest was administered to the online and classroom groups during the first day of the semester. A similar Web-based posttest was administered to both groups at the end of the semester. Both tests were executed and scored automatically using Blackboard's online assessment tool.

Overall, the data collection was performed for the study to address the following research questions:

1. Is there any significant difference between students' performance in online and classroom learning?

2. What are students' attitudes towards use of information technology in teaching and learning?

3. What are students' attitudes towards the use of information technology in teaching and learning?

4. Is there any significant difference in student's attitudes towards the use of technology in classroom and online environments?

Participants

Two groups of 47 students were the focus of this study. The students in this study were enrolled in an introductory educational technology course in a mid-sized public university. One group consisting of 24 students was enrolled in the classroom section of the course, while the other group of 23 students completed the course online. While the online group did not receive classroom instruction, all the participants, traditional and online, were full-time on-campus students.

The participants were preservice teacher education students. The students were mainly undergraduate students of junior standing. The course is one of the core courses in the teacher education program, designed to introduce students to the field of educational technology. There were 16 female and 8 male students in the classroom section, while the online section had 1 male and 22 female students.

Data Analysis

The primary purpose of this study was to compare the performances of students in the two classes, traditional (with online supplements) and online. Blackboard was used to supplement classroom learning. A pretest was administered to the two classes at the beginning of the semester. A similar test was given as a posttest at the end of the semester. Analysis of covariance (ANCOVA) was conducted to determine if there was a statistically significant difference between the mean posttest scores of the two groups using the pretest scores as the covariate.

The additional purpose of the study was to assess and compare attitudes towards the use of information technology among the two groups. A Likert-type attitude assessment instrument (1 = *very positive*; 5 = *very negative*) was completed by the students at the beginning and the end of the semester. ANCOVA was conducted to determine the difference in the mean posttest scores among the two groups for each individual attitude statement, as well as for the mean of the combined statements. Level of significance alpha was set at the 0.05 level to achieve statistical significance for all analyses.

Results

Forty-seven students completed the pretest, posttest, and attitude assessment at the beginning and at the end of the semester in the two classes. The data on sex, age, and degree program are presented in Table 1.

Table 1.

Student Demographics (Sex, Age, and Degree)

Variable	*n*	%
Age		
<20	2	4.3
21–29	44	93.6
30–39	0	0
>40	1	2.1
Sex		
Male	9	19.1
Female	38	80.9
Degree	45 (2 missing)	
Bachelor's	42	89.3
Master's	1	2.1
Other	2	4.3

Normality plots revealed that the normality assumptions were valid. Leven's test for homogeneity of variance indicated that the assumption of equality of variance was not violated. ANCOVA (adjusting for pretest scores) indicated no significant difference ($F = .392$, $p = .535$) in the mean score of the posttest among the two classes. The mean score of the pretest, posttest, and ANCOVA results are presented in Table 2.

Table 2

Means ± Standard Deviation of Pre and Posttest of Student Performance

Groups	*n*	Pretest	Posttest
Traditional	24	51.8 ± 9.3	74.1 ± 6.1
Online	23	48.9 ± 7.1	72.8 ± 7.5

Note. ANCOVA, $F(1, 44) = .392$, $p = .535$.

The traditional (classroom) group scored slightly higher than the online group on both the pre and posttest, but the mean change from pre to post was almost the same for both groups.

The results of the pre and posttest attitude assessment are presented in Table 3. ANCOVA indicated no significant difference ($p > .05$) in the mean attitudes for the two groups for the mean of the individual statements, as well as the mean of the combined statements.

Table 3

Means ± Standard Deviation for Pre and Posttest of Attitudes

Statement	Traditional		Online		F	p
	Pre	Post	Pre	Post		
1. I want to improve my skill in using computers and the Internet.	1.21±.42	1.62±.77	1.30±.56	1.73±.77	.06	.811
2. I expect to increase my use of computers and Internet technology in the future.	1.33±.56	1.54±.59	1.43±.59	1.50±.51	.26	.613
3. I enjoy using computers and Internet technology.	1.71±.70	1.71±.63	1.78±.67	1.59±.67	.51	.481
4. I feel comfortable using computers and Internet technology on my own.	2.04±.81	1.83±.64	1.91±.99	2.00±.70	1.03	.315
5. The use of computers and Internet technology will enhance my effectiveness in learning.	1.50±.60	1.83±.76	1.70±.56	1.64±.50	1.56	.217
6. I feel that Internet/ Web technology will be useful for my learning.	1.42±.58	1.67±.64	1.65±.47	1.67±.48	.04	.845
Total	9.2±2.7	10.2±3.3	9.7±2.6	10.0±2.7	.16	.69

Discussion and Conclusion

This study provides an additional insight into prior research conducted in online and classroom learning. The findings reveal that learning environments and the instructional medium have minimal impact on student learning. Lack of significant difference in student performance among the two groups indicates the effectiveness of the Web as a medium of instruction. As traditional methods have long been used and their instructional roles studied, the focus in this paper was more on the significance of the Web as an instructional medium. The assumption was that traditional methods are also effective. The slight score improvement the classroom group gained over their online counterparts might be attributed to the use of the Web as a supplement to classroom instruction because the classroom group had the added advantage of combined face-to-face and Web-supported instruction.

There was no significant difference in students' perceptions about technology use in teaching and learning. Both groups maintained positive attitudes towards technology both at the beginning and the end of the semester. It should be noted that, although students recognized the potential of technology, particularly the Internet, they expressed mixed opinions about the significance of technology in learning. The online group was more appreciative of technology's role as an important learning tool (Table 3, Item 5).

The online group had demonstrated decreased comfort level in using technology (Table 3, Item 4) and this can be attributed to the technical problems they experienced in using Blackboard, such as downloading documents, submitting assignments and using the virtual communication features. Students registered for the online section confident that they would be able to handle the technology medium but the technical challenges they experienced, though they always received technical support, was a cause of concern. For the classroom group, since many of them were introduced to technology in this class (Blackboard was used to supplement classroom instruction), their expectations that technology will help them in learning were not realized. They had high expectations that technology will facilitate and enhance learning. Realizing that technology is just a tool, they changed their perception about technology as a significant aid that can enhance learning. The students high regard for technology prior to using it can be based on the fuss in society about the "wonders" technology can do.

In summary, the different learning environments did not produce significant difference in students' attitudes towards technology. Students' positive attitudes toward technology reveal that technology plays a role in students' learning, albeit a secondary role. Although students recognized the potential and significant role of technology in teaching and learning, the recognition is limited to the use of technology as an instructional medium, and not a key determinant of learning. The Web is an important instructional delivery medium that can rival, but not replace, classroom learning. Nevertheless, the use of the Web as a supplement to classroom learning and as a long-distance instructional medium is an ideal way to improve learning and increase access to education.

References

Bento, R., & Bento, A. (2000). Using the Web to extend and support classroom learning. *College Student Journal, 34*(4), 603-608.

Gifford, L. J. (1998, November). *Graduate students perceptions of time spent in taking a course by Internet versus taking a course in a regular classroom.* Paper presented at the annual Mid-South Educational Research Association Conference, New Orleans.

Hofman, D. W. (2002). Internet-based distance education learning in higher education. *TechDirections, 62*(1), 28-32.

Kincannon, J. (2002, April). *From the classroom to the Web: A study of faculty change.* Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Michau, F., Gentil, S., & Barrault, M. (2001). Expected benefits of Web-based learning for engineering education: Examples in control engineering. *European Journal of Engineering Education, 26*(2), 151-169.

Mioduser, D., Nachmias, R., Lahav, O., & Oven, A. (2000). Web-based learning environments: Current pedagogical and technological state. *Journal Research on Computing in Education*, *33*(1), 55-77.

Redding, T. R., & Rotzien, J. (2001). Comparative analysis of online learning vs. classroom learning. *Journal of Interactive Instruction Development, 13*(4), 3-12.

Vrasidas, C., & McIsaac, M. S. (2000). Principles of pedagogy and evaluation for Web-based learning. *Educational Media International, 37*(2), 105-112.

Wang, L. C., & Bagaka's, J. G. (2002). Understanding the dimensions of self exploration in Web-based learning environments. *Journal of Research on Technology in Education, 34*(3), 364-375.