

Computer Labs and a Web-Centric Course: An Alternative Teaching Model

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Abstract

This paper presents an alternative model of teaching based on 4 years of experience using computer labs to teach political science classes. It explores the pros and cons of this model and analyzes the implication of the new approach to the traditional face-to-face classroom teaching in the context of the recent proliferation of online and Web-based courses. The study shows some positive results in improving student learning outcomes and motivation. While students attending computer-lab-based classes had slightly higher grades than students who attended traditional classes, many factors could have contributed to the variation. What I found most encouraging was the level of student satisfaction with the use of technologies was much higher among students who attended computer-assisted instruction.

Undergraduate education is undergoing rapid changes in recent years. Our abilities to deliver instructional materials have been greatly improved thanks to technological innovations. The traditional role as a teacher has also been challenged. Equipped with new technology gadgets and sophisticated computer skills, students now demand more from their teachers. As more and more students are accustomed to active learning, many faculty members feel the need to adapt their teaching style to active teaching, which requires an extensive use of non-traditional methods of communication and interaction (White, 1999).

Computers and the Internet can be of great help in assisting college teachers to

make this transition. Most classrooms today are equipped with a computer workstation and Internet connection. The high-cost and high-tech computer labs are increasingly becoming a favorite place for teaching--not just for science and technical classes, but for social science and humanities classes as well. The spread of Wi-Fi and other types of wireless networks on various campuses will soon bring Internet connectivity in every classroom. Many colleges have also required freshmen to have laptop computers as standard equipment for learning. Web-enriched courses which allow easy access to class materials have proliferated on college servers. Even if most of us do not teach online courses, the use of computers and the World Wide Web has become a part of our daily routine.

Unlike many science or engineering courses in which computer usages are essential, courses like American Government or Introduction to Political Science are still taught mostly in a conventional way, in a traditional classroom, and more often than not, using the time-honored "teaching-as-telling" style. To what extent can a non-method-related political science class benefit from the on-going communication revolution? What are the tools a teacher can use to enhance his or her teaching effectiveness? What are the pros and cons of a technology-intensive course? These were the issues of great concern to me when I started my experiments with computer-lab-based teaching in fall 2001. Computer labs seemed to be an ideal place to assess the impact of technologies on teaching and learning.

In recent years, many teachers in various fields have conducted extensive teaching experiments with using computers and the Internet, and there is considerable literature on these experiments. Overall, three types of teaching experiments on course structure have been conducted (Gizzi & Wilkerson, 1998): Web-enhanced, Web-centric, and Web-based courses. Web-enhanced courses typically use a class Web page filled with limited supplementary information such as the course syllabus, links, and other textual information. Teaching is still conducted in a traditional classroom. Some teachers experimented with Web-based tutorial quizzes (Klass & Crothers, 1999). A Web-centric course allows an instructor to integrate the Internet and computers into the learning process. In this model, the students' self-study or "asynchronous learning" is combined with instructor-led synchronous collaboration in a traditional classroom (Donovan, 2001; Jackson, 2002; Pollock, & Wilson, 2002). Finally, a Web-based course is taught entirely online with very limited or no direct teacher-student face-to-face interaction. We have seen many models being developed, such as "the self-instructional multimedia modules" or "self-paced studies" (Wilson, 1996; Cornwell & Way, 2001; Ko & Rossen, 2001). Several online universities, which offer their courses entirely online, are already in existence.

There are pros and cons for each of these teaching innovations. Web-enhanced courses utilize technologies to supplement classroom teaching by posting basic information online. It has little impact on the actual learning process, and the technology potential tends to be underutilized. Web-centric courses are moving in the right direction by integrating technology into the learning process. However, they tend to substitute classroom teaching with student research projects. It usually means that

students spend more time on data collection, research, and writing. While online courses have come a long way to expand educational access, especially in community colleges (NEA, 2000), many have doubts about their effectiveness. In 2000, Steffen Schmidt and several other scholars conducted a national survey of department chairs of political science to assess the current and future state of distance-learning in that discipline. Their findings included the low utilization of online courses, a low degree of importance, low level of knowledge and interests about distance learning, limited institutional support, and serious doubts about the appropriateness and quality of instruction at a distance (Schmidt, Shelley, Wart, Clayton, & Schreck, 2000).

Computer Labs as an Alternative

Since fall 2001, I have experimented with teaching some or all undergraduate classes in computer labs. The purpose of this paper is to explore the pros and cons of this teaching model and analyze the impact of lab-based courses on student learning, motivation, and outcomes.

The importance of using computers to facilitate the learning process is self-evident. Computers can facilitate self-paced learning, are great tools for multimedia presentations, are interactive, and can be accessed without distance limits. Because computer technologies also change constantly, it can be a double-edged sword. On the one hand, new innovations and user-friendly software make teaching and learning easier and more fun than ever before (Morrison, Lowther, & DeMeulle, 1999; Willis, 2005). On the other hand, frequent system or program failures, or the lack of technical training and support, are frustrating. Technology-assisted learning has posed far more questions than answers. For instance, how can we use technology to

advance our teaching effectiveness and, at the same time, allow us to maintain our close interactions with students? Can we combine the advantages of a Web-based course with the advantages of a traditional course? A computer-lab-based course may provide a solution to the on-going debate (Wrensford & Wrensford, 2003). A hybrid course may combine the strengths of both traditional classroom teaching and online courses while overcoming the major shortcomings associated with each of the teaching delivery methods.

Dalton State College (DSC) is a mid-size liberal arts college with a student population of 4,000. Most of our classrooms have computer workstations and Internet connections. Many teachers are already using them extensively for PowerPoint presentations or class-related Internet surfing. However, the way that students learn remains essentially the same, namely sitting passively either taking notes or observing. Although the inaction on the part of students can be remedied by adding class discussions, debates, or cooperative learning projects, the level of student involvement is still very low due to the size of the classes and the time constraints in a given class period. In recent years, while refurbishing basic computer equipment in traditional classrooms, DSC has added many computer labs on its main campus. Some labs are for general purposes and others are highly specialized. In 1996, there were only 13 computer labs with a total of 250 computers. By January 2005, DSC had a total of 31 on-campus computer labs (9 general-purpose and 22 special-purpose) and 3 off-campus labs. These computer labs contain over 1,000 computers. This rapid advancement in computer infrastructure has increased the number of computer-lab-based courses in recent years. At present, however, teachers in social science disciplines who use one of the computer labs utilize it more like an

enhanced classroom, where he or she can have a better projection system. The potential of computer labs tends to be underutilized.

Methods

In fall 2001 I taught two sections of American Government in computer labs, and two sections of the same class in regular classrooms. In spring 2002, I again taught one section of American Government in the lab, and two other sections in regular classrooms. Students in my regular classes also have access to the same class Web sites, but with much less in-class computer-based activities. This arrangement allowed me to compare class performances in different settings because the traditional classroom classes can be treated as control groups. Since fall 2002, I have taught all political science classes in computer labs.

American Government is a required core course for all undergraduate students at DSC. Though taking this course is a legislative mandate, students tend to have low motivation and expectations about the course because of the general apathy towards politics. As a result, student learning outcomes are directly affected. How to effectively stimulate student interest in this subject is a challenge to all of us who teach this course. At DSC, the size of our regular classes is limited to 30 students, but it can go up to 35 students. For classes taught in a computer lab, the class size has to be capped at 30 because of the limited lab capacity. After mid-semester, the class size can be even smaller due to student early withdrawals from the classes.

Course Design

As Moore and Kearsy (1996) noted, a good course, whether it is taught using traditional methods or online, still depends

on the soundness of its instructional design. The computer lab-based teaching relies heavily on several models (Willis, 2005).

Computer Assisted Instruction (CAI) uses the computer as a self-contained teaching machine. There are several CAI models: drill and practice, tutorials, simulations and games, and problem solving. In my classes, I used Web-based exercises and simulations, WebCT-based online testing, and Internet-based assignments.

Computer Managed Instruction (CMI) uses the computer to branch, store, and retrieve class information and organize instruction. I created a content-rich interactive Web site for American Government

[<http://www.daltonstate.edu/faculty/bguo/p1101/p1101.htm/>]. The Web site was organized into three sections. The “study guide” section contained the syllabus, lecture outlines, PowerPoint presentations, study tips, and reference links. The “learning tools” section contained practice tests, assignments, extra credit opportunities, and a chat room. The “about your teacher” section contained links to my personal Web page, a question posting page, a sign-up page for an e-mailing list, and a page for submitting student works electronically. The materials contained in this page were equivalent to a major Web-based online course. It also contained many key elements of a typical Web-enhanced or Web-centric course.

Computer-Based Multimedia (CBM) uses streaming video, voices, or PowerPoint presentations to present lecture materials. I published all my PowerPoint presentations online so that students could not only have

access to the lectures at home, but also be able to view the PowerPoint slides either at their own pace or simultaneously in the classroom. I no longer had to rush in order to finish everything on my slides. Instead, I could just focus on in-depth discussions. A VCR was used to show videos. Captured short digital video clips were also used as part of the PowerPoint presentations.

Assessment

Students who participated in these experimental classes were assessed by both objective and subjective methods. The objective tests included four non-cumulative examinations, and each accounted for 20% of the students’ final grades. The coverage of each exam was consistent every semester for all classes taught. Although the exam questions were altered periodically, they covered the same material and had the same format. The subjective assessments included assignments and surveys. The assignments involved research, essay writing, and controversial debates (20%). Students were asked to take a separate exit survey to evaluate various aspects of the computer assisted learning. In addition, the standard college student evaluations were also used to assess the effectiveness of this course.

A Sample Instruction Module

Table 1 summarizes a sample teaching module which highlights the procedure of this teaching model. The topic covered is political ideology. The objective is for students to be able to explain the four major political ideologies, and be able to identify their own ideological affiliation.

Table 1
Sample Teaching Module

Step 1. The instructor initiates some discussion on the opinions and attitudes students have toward some controversial issue (10 min).
Step 2. Students use computers to take an online self-test to find out their own ideological identification. The interactive online program used is called <i>Idealog</i> created by Mythryn, LLC, of Chicago, Illinois (http://idealog.org/index.asp) (15 min).
Step 3. The Instructor gives a short PowerPoint Presentation to explain each of the political ideologies in depth. Students can view the PowerPoint presentation simultaneously on their own computer and pose questions (15 min).
Step 4. The Instructor shows a short video clip on political ideologies (5 min)
Step 5. Students take an online interactive practice quiz to see how much they have learned about the topic (5 min).

Results

Learning Outcomes

Learning outcomes can be measured by average grades students received on exams and their final grades. All classes used the same assessment instruments. All assessments were graded using the same standards. A comparison of lab-based classes with traditional classes showed a positive relationship between student performance and the use of a computer lab. As shown in Table 2, students enrolled in the lab-based classes have slightly higher average final grades (7% for spring 2002, and 6% for fall 2001. The average score for students in the traditional classes was C, while students using the computer labs had an average letter grade of B. But statistically the differences were not significant due to

small sample sizes (less than 30 students in each class). Computer Class 2 actually has a lower average grade than Traditional Class 2. There might be other factors that were responsible for the higher grades. When I compared individual exam scores for spring 2002, the result also was somewhat mixed (see Table 3). Traditional Class 2 was taught at an extended campus and met only once a week. Its average was better than a lab-based class. There were more non-traditional students in this class than the computer-lab-based one, which might play a role in the higher than anticipated scores. In my experience, non-traditional students in general tended to have higher grades than traditional students in American Government courses. Table 4 lists average exam scores for fall 2001 classes. Again, the lab courses had slightly better scores.

Table 2
Comparison of Students' Final Grades

Spring 2002							
	Class 1	Class 2	Average		Class 1	Class 2	Average
<i>Computer</i>	84.15		84.15	<i>Traditional</i>	77.7	78.04	77.88
Fall 2001							
	Class 1	Class 2	Average		Class 1	Class 2	Average
<i>Computer</i>	85.27	78.38	81.83	<i>Traditional</i>	71.8	82.78	77.29

Table 3
Comparison of Average Spring 2002 Students' Exam Scores

Type of Classes	Exam 1 (50)	Exam 2 (50)	Exam 3 (50)	Exam 4 (50)	Average
<i>Lab</i>	39	38	37	36	37.5
<i>Traditional 1</i>	36	37	35	34	35.5
<i>Traditional 2*</i>	38	39	37	37	37.8

*Off-campus class, met once a week.

Table 4
Comparison of Average Fall 2001 Students' Exam Scores

Type of Classes	Exam 1	Exam 2	Exam 3	Exam 4	Average
<i>Lab1</i>	84	82	84	68	80
<i>Lab2</i>	85	80	84	67	79
<i>Traditional 1</i>	76	70	77	66	72

Students' Satisfaction

Learning outcomes are in many ways linked to student satisfaction with a course. A high level of satisfaction yields a positive attitude and good motivation, etc. Every semester, I conducted my own mid-term survey. Overall, I received far more positive comments than negative ones for classes taught in the labs. The following are some of the qualitative feedback I received:

- I really liked the class Web site. It was very helpful. I enjoyed doing the related assignments and using the Internet . . .
- The use of the computer lab seems to be a very effective tool to use in this class as it would be in other classes. It helps students out in understanding the curriculum a lot clearer than it would listening to a lecture throughout [the] class. Helps in assignments and practice tests are very helpful.
- I felt that this class is a “do-it-yourself” class.
- Having the class in a computer lab with Web-exercises is very effective.

- Take the computers out of the classroom.
- Continue to use a computer lab.

It was not surprising to me that a small number of students still had some negative attitudes about interactive learning. They liked to be told what they need to know. Their learning styles certainly need to be accommodated as well.

Impact of Technology

A computer lab is a technology-intensive environment. Does the use of technology have any impact on student learning-related behaviors and self-assessment of learning? This variable is measured by a class survey conducted in all classes.

In my fall 2001 class survey, 57% of all students accessed the class Web sites at home, 37% from campus computer labs, and 1% from work. Forty-four percent of the students spent at least 1-2 hours each day surfing the Internet, 44% spent 3-4 hours, and 11% spent more than 5 hours online. Thirty-three percent of the students in the

lab classes strongly agreed with the statement that "I have learned a great deal about American government and politics in this class" compared to 12% of the students in the traditional classes. Fifty percent of the students in the lab classes agreed with the statement, compared to 79% of the students in the traditional classes. On the statement that the course Web site was helpful in their study, 27% of the lab students strongly agreed compared to 45% of the traditional students. Fifty-seven percent of the lab students agreed with the statement, compared to 45% of the traditional students. Seventy percent of the lab students considered the online practical quizzes to be very useful, compared to 50% of the

traditional students. Twenty-six percent of the lab students disagreed compared to 50% of the traditional students. Forty-six percent of the lab students strongly agreed with the statement that "the PowerPoint Presentations work better than traditional presentation methods." Only 25% of the traditional students strongly agreed.

In spring 2003, after I moved all my American Government classes into computer labs, another survey was taken (see Table 5). Fifty students were given the questionnaire, and 28 answered the questions (56% response rate). The results show consistent positive attitudes among students who used the computer labs compared with previous surveys.

Table 5
Student Survey Responses to Questions Related to Computer Usage

<i>Question</i>					
4 – Any experience in computer lab?	Yes	No			
	18 (64.29%)	11 (39.29%)			
5 – Where is the computer used the most to access the Web page?	At home	At work	On campus		
	16 (57.14%)	2 (7.14%)	12 (42.86%)		
	Strongly Agree	Agree	No Opinion	Disagree	Strongly disagree
8 – The course Web site is very useful overall.	18 (64.29%)	10 (35.71%)	0 (0%)	0 (0%)	0 (0%)
9 – The course Web site helped me to do well in this class.	10 (35.71%)	14 (50%)	4 (14.29%)	0 (0%)	0 (0%)
10 – The in-class computer practice tests are very useful.	8 (28.57%)	14 (50%)	4 (14.29%)	2 (7.14%)	0 (0%)
11 – The on-line practice quizzes helped me to do well in this class.	9 (32.14%)	12 (42.86%)	5 (17.86%)	2 (7.14%)	0 (0%)
12 – The experience of learning in computer lab has been a very positive one.	8 (28.57%)	15 (53.57%)	3 (10.71%)	2 (7.14%)	0 (0%)

Table 5
Student Survey Responses to Questions Related to Computer Usage (Continued)

13 – I like the on-line exams created on WebCT.	17 (60.71%)	9 (32.14%)	1 (3.57%)	1 (3.57%)	0 (0%)
14 – Comparing with other class you are taking, I find this computer-learning environment more interesting and stimulating.	10 (35.71%)	13 (46.43%)	3 (10.71%)	3 (10.71%)	0 (0%)
15 – The on-line assignments helped me to do well in this class.	6 (21.43%)	14 (50%)	6 (21.43%)	3 (10.71%)	0 (0%)
16 – The PowerPoint presentations work better for me than traditional presentation methods.	9 (32.14%)	14 (50%)	4 (14.29%)	1 (3.57%)	0 (0%)
17 – The PowerPoint presentations helped me to do well in this class.	7 (25%)	17 (60.71%)	4 (14.29%)	0 (0%)	0 (0%)
18 – I have accessed PowerPoint presentations online frequently.	8 (28.57%)	15 (53.57%)	5 (17.86%)	1 (3.57%)	1 (3.57%)
23 – I like the idea to have my political science/American government class conducted in a computer lab.	15 (53.57%)	11 (39.29%)	0 (0%)	2 (7.14%)	0 (0%)

One major issue in this study was whether or not I should limit students' access to my class Web sites during my first 2 years of experience. The restriction would have helped me to make a clear-cut comparison between classes conducted in a purely traditional classroom and in a computer lab. However, I decided not to limit students' access because it would simply be unfair for students who took the traditional classes.

Discussion

Developing a lab-based course is more time consuming than a Web-based course. Since it is a combination of traditional teaching and modern technologies, computer-assisted teaching allows teachers to continue to enjoy the

traditional face-to-face interactions with their students, and at the same time, to utilize what the computer technologies and the Internet can offer. Despite the fact that it takes a long time to develop a good Web-centric course, it actually saves a lot of time in course preparation once everything is in place. The instructor may also find technologies to be a wonderful teaching and communication tool. To develop a lab-based class one has to be prepared to become an unsung hero because much of our work goes unrecognized. What motivated me to undertake this project was the desire to improve student learning outcomes and to stimulate student interest in a subject that could otherwise be considered dull and unstimulating.

There are many pros for using this high-tech learning environment. Within a

high-tech environment, teaching is no longer just telling, instead, it is also doing and interacting. When students can control the pace of learning, they feel less frustrated, and understand things better. Furthermore, when teaching is focusing on information processing rather than transmitting, learning will become more challenging (Johnson, & Johnson, 1991).

Although there are many advantages for using a computer lab, there are some disadvantages as well. Students do have a tendency to use computers and the Internet for unrelated activities such as e-mailing or simply surfing for fun. When an online test is used, security and cheating become a recurring issue. System crashes and technical problems can be very annoying at times. Clearly, it is also a very costly alternative. The availability of computer labs remains a luxury for many campuses. However, these obstacles are not insurmountable. As we learn more about the environment, we will feel more comfortable with it. Many technical issues can be solved by practicing patience and acquiring some basic training.

The significance of this new approach to teaching goes beyond the full utilization of computer labs. As more and more campuses install wireless networks, students who bring laptops to classrooms will want to do more with their gadgets and network connections than just note-taking. If it is left unguided, students may simply surf the Internet for fun. Once we can create an effective learning environment and guide them through with useful online sources and well-prepared learning modules, the possibilities for innovative teaching suddenly become endless.

Although this study only shows some effects the use of computer labs have on student learning, nevertheless, not all improvements are proven to be computer-use-related. But the result is still positive

based on the survey responses of the participating students. To systematically assess the impact of the use of computer labs or the incorporation of computers and the Internet into classrooms in general, there needs to be a larger scale study. This certainly is beyond the ability of individual instructors who only teach small classes. What this research has demonstrated is that a better alternative can be developed between traditional and online teaching. Moreover, a computer-assisted class can bridge the gap between traditional classroom teaching and online distance education.

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