

Evaluating the Virtual Management Information Systems (MIS) Classroom

Thomas Abraham
Management and Marketing Department
Kean University
1000 Morris Avenue
Union, NJ 07083
mtabraham@kean.edu

ABSTRACT

This paper outlines techniques for an active learning environment in a virtual MIS classroom, as well as a comparison of outcomes in that distance learning class with a regular, live, MIS class. These techniques included discussions, small group projects and cooperative work supported by technology such as chat sessions, e-mail and bulletin boards. Feedback to students was improved through the use of an online grade book and e-mail. Outcomes were measured in terms of grades for participation, exercises, assignments, tests and the overall grade. There were no significant differences in outcomes. The paper also presents the results of a survey measuring students' experiences with the virtual class. Students were generally very positive about the quality of the learning experience. Teaching a distance learning class using active learning techniques is a difficult and time-consuming enterprise.

Keywords: Distance learning, Active learning, MIS Education, Virtual Learning Environments, Evaluating distance learning

1. INTRODUCTION

Distance Learning has become an established learning/teaching methodology. Students can earn a degree without setting foot on a campus. There are obvious benefits to this anytime, anywhere approach to learning. Students have easier access to a wide range of college classes, faculty and schedules. On the other hand, quality control is a major potential problem. This paper describes a set of approaches and tools based on WebCT, a web container developed by the University of British Columbia, which can be used to address this quality issue with an active learning environment within a fully web-based virtual class. The paper also compares the results of this virtual class with a regular live class with some web enrichment and provides the results of a survey of student experiences and attitudes in the distance learning (DL) class.

2. LITERATURE REVIEW

Learning theories (Kolb 1984, Gagne 1985) have clearly established that learning programs should consider the needs and learning styles of learners, and be geared to

achieve maximum motivation of learners to accept responsibility for their own learning. Gray and Palmer (Gray & Palmer 2001) review the 4MAT learning styles model, which extends Kolb's model. Courses developed on this model take a learner through a sequence that includes creating a concrete experience, reflecting on it, integrating this into concepts, defining a theory, practicing the concepts, experimenting and adding to them, refining the theory and applying the learning. These concepts have many implications for business schools. First, the student bodies are increasingly diverse and their learning styles are very likely to be proportionately diverse since age, gender, and cultural factors affect them. It would appear that, to effectively meet their needs, these students must be offered more than one learning method. Second, if a key objective of education is to produce well-rounded, fully developed individuals, it is important to help students become integrated learners. Third, the marketplace demands creative and adaptive employees and this appears to also require an integrated learning style. Finally, competition among business schools calls for continuing improvement in class offerings

A large number of practical tools and strategies have been, and continue to be developed which allow students to emphasize their own learning styles and actively pursue knowledge rather than passively receive it. Meyers and Jones (Meyers & Jones 1993) describe the structure of active learning as combining the key elements of talking and listening, writing, reading, and reflecting. Students do not passively receive knowledge but must actively construct their own conceptual frameworks. Active learning strategies attempt to provide an environment in which students have some flexibility to direct their own knowledge acquisition and can combine more than one learning element to suit their learning style. These strategies typically include one or more of small group discussion and projects, cooperative work, case studies, simulations, discussion, teaching, problem solving, and journal writing. Teaching resources include readings, homework assignments, outside speakers, teaching technology, and television. Gray and Palmer (Gray & Palmer 2001) reviewed a number of web-based classes and did not find any evidence of a formal learning styles model informing the class. Most classes tended to support a single learning style.

Interaction among participants is often cited as an important aspect of distance learning. Bulletin boards, e-mail and chat rooms are some of the services available to create such interaction. However, Wagner (Wagner 1997) stressed that focus should be on the outcomes of interaction rather than the agents. She identifies several of these outcomes including increased participation, improved team building and interaction for exploration.

DL classes should attempt to achieve these outcomes through interactive agents such as dynamic web pages, bulletin boards, etc. Paloff and Pratt (Paloff and Pratt 2001) also stress the importance of interactivity and of establishing online learning communities.

An important recent paper (Piccoli et al 2001) indicates that, while the number of web-based classes is increasing exponentially, there has not been a lot of research conducted about their effectiveness. The paper looked at the effectiveness of a web-based virtual learning environment (VLE) in the context of basic information technology skills training. It proposes a framework of VLE effectiveness. A key construct in their framework is learner control, which is described as "the degree of discretion that students can exert over the pace, sequence and content of instruction in a learning environment." This variable corresponds closely to a measure of active learning in the environment. Another construct in the framework is interaction. The paper uses the framework to generate hypotheses and tests them using a longitudinal field experiment. The experiment compares a web-based VLE to a traditional classroom. The study found no significant differences in performance between students in the two

environments.

In a more anecdotal study, (Mariola & Manley 2002) describe their experience teaching a graduate finance course using Blackboard, which is a web container similar to WebCT. They conclude that distance learning appears to facilitate and enhance student learning. They make several recommendations including establishing protocols for the chat room, using group projects, monitoring participation, and providing very detailed explanations and examples. In a study comparing live, hybrid and virtual classes in microeconomics (Brown & Liedholm 2002), a significant difference was found between the live and virtual classes. The virtual class did worse than the live class, especially on more complex topics. As the complexity increased the virtual class performed worse compared to the regular class.

The content of the undergraduate MIS core course typically involves introducing students to information technology, business applications, information ethics and computer security. Abraham (1995, 1998) discussed the introduction of an active learning component into the MIS course through the use of small groups and cooperative work, supported by electronic communication and presentation software.

3. THE VIRTUAL MIS CLASSROOM

The introductory MIS course has traditionally provided undergraduate business students with an overview of management information systems. Students are introduced to information technology (IT) and its application to business. In addition students are also expected to acquire some computer skills. The course has been broken down into eight learning units. These are (i) Introduction to MIS (ii) Hardware (iii) Software (iv) Data Management (v) Business Applications of IT (vi) Telecommunications & Networks (vii) Internet and (viii) Social Impacts of IT. Students are also expected to learn to use a graphics package such as PowerPoint, become very comfortable surfing the Web, use E-mail, use a file transfer package such as WS-FTP, and learn to create their own Web pages.

The course, which used to be taught in a traditional classroom/lab format, was redesigned by creating a virtual classroom. The intent was to give students more flexibility as to when and where they learn. This flexibility is particularly useful for students who work part-time, as do most of the students in that class. Together with the introduction of the virtual classroom came increased interactivity - an active learning environment in which students interact with the materials, with the instructor and with peers. As some of the research discussed in the earlier section of this paper

indicates, active learning improves the quality of the learning experience. The Web provides valuable tools for creating an interactive environment. Links to related Web pages allow students to follow a path of their choice. JavaScript and other programming tools make it possible to transform Web pages into dynamic, interactive learning tools. E-mail lets students communicate with the instructor and with classmates in an asynchronous mode. Many of the specific design elements applied in the course follow the recommendations listed in Schweizer (Schweizer 1997, pp. 6-7).

The Web-based courseware package used in the course is WebCT. It provides most of the tools, Tests, Grade Book, E-mail, a Bulletin Board, Chat Rooms and a White Board, in a single container (Figure 1). Students use a login id and a password to ensure a secure environment where grades can be posted. The grade book is easy to use and allows for computed columns. Tests are delivered online and the results posted instantly. This speeds up feedback to students. WebCT meets the criteria that Palloff and Pratt (Palloff and Pratt, 2001, p. 69) specify for course authoring software - it is functional, supports both faculty and students, and is user-friendly.

The package provides an E-mail tool which allows the user to obtain addresses for all students and the instructor, by browsing from a list. This eliminates the need for maintaining an E-mail address book. The graphical user interface is also easier to use than a Unix-based package such as Pine. Attaching files and downloading attachments no longer requires the use of FTP packages.

Students formed small teams of three to work on exercises and on a final project. The Chat Room tool was used to review assigned class materials and to support team-based exercises and the final project. There were four rooms available along with a general chat room. The rooms maintain logs, so the instructor could verify that students were using the rooms, and could determine whether all members of a team contributed to a project. This helped to reduce the free-rider problem.

4. METHODOLOGY

Students registering for an undergraduate MIS course were given the option whether to sign up for the Distance Learning (Internet-based) section of the course or the traditional (classroom-based) section. Twenty students completed the traditional class while twenty

two completed the distance learning (DL) class. Paired t-tests were used to compare the two sections on the average grades obtained on assignments, tests and

TABLE 1: Comparing Outcomes

	Regular (n = 20)		DL (n = 22)		t-value	P (2 Tail)
	Mean	S.D.	Mean	S.D.		
Participation	89.0	9.8	93.4	6.3	-1.73	0.09
Exercises	81.5	26.2	76.9	24.5	0.59	0.55
PowerPoint	98.5	4.6	91.1	22.5	1.43	0.15
Test I	80.1	12.3	78.4	8.9	0.52	0.60
Test II	81.3	9.5	80.0	9.3	-0.43	0.67
Overall Grade	83.1	9.8	81.8	6.9	-0.50	0.61

exercises. The DL class was also surveyed with the questionnaire in Appendix 1. Fifteen students responded to the questionnaire. The questions are organized around five issues of interest: (1) faculty-student interaction, (2) course material delivery, (3) student projects, (4) the relative usefulness of some of the Internet tools, and (5) grading of student performance. In a sixth section of the questionnaire, students were asked for general comments on the class.

Even though there was self-selection, the results still provide some measure of the effectiveness of distance learning as well as some direction for designing DL classes. The methodology is consistent with the approaches outlined in Simonson (Simonson 1997). As anticipated by Schweizer (Schweizer 1999), specific techniques for improvement of future classes were identified.

5. RESULTS

Table 1 presents the data comparing the regular and DL sections of the MIS class based on grades and other evaluation by the instructor. There are no significant differences between the two groups. This indicates that the students in the DL class were able to perform at a similar level to students in the regular class. However, there are some areas where the differences are noteworthy, if not significant. Class participation was higher in the DL class. This may be because students had to come to class better prepared if they wanted to get any participation credit. There were no formal lectures – only chat sessions with questions and answers relating to assigned class materials. Students could not lay back and let the instructor do the work. On the other hand, DL students did not do as well on computer assignments. The variability in the DL group was also higher. That probably is due to the greater access that regular students had to help from classmates and the instructor. If the latter encountered difficulties with some aspect of

an assignment, they were able to talk in person with a support group. It was much harder to walk the DL students through a problem over the phone. And members of the class were naturally reluctant to travel to the campus for a consultation with the instructor.

	Mean	S.D.
In Person	3.3	1.16
Via Technology	4.1	0.83
Quality	3.8	0.68

Table 2 presents the results of the responses to the survey questions on interaction with the instructor. Clearly, by the nature of the class, person-to-person interaction was very limited. While interaction through E-mail and other technologies was rated quite high, overall, the quality of interaction with the instructor was not considered excellent. A simple exchange that might take a few seconds face to face sometimes requires several days and many mail messages.

Table 3 presents the results of the responses to the survey questions on delivery of course materials. Students considered them easy to access and use. However, they did not appear to enjoy the learning environment, apparently because they seemed to feel somewhat isolated. It may also be that adapting to a new learning experience caused some concerns.

	Mean	S.D.
Access to materials	4.2	0.68
Quality of Materials	4.2	0.68
Ease of Use	4.1	0.59
Learning Environment	3.7	1.22

Table 4 presents the results of the responses to the survey questions on Student Deliverables. Students appeared to feel they successfully acquired the skills and knowledge they expected from the class. They were less happy with the help and support available to them. As previously discussed, it is harder to troubleshoot a problem on a remote basis. Also, students were less sure that their efforts were visible to the instructor.

Creating a distance learning class with an active learning emphasis was a time consuming enterprise. Setting up the course took months of preparation. Becoming familiar with the web container (WebCT) and other software took time. Course materials had to be rewritten for the Web. Pictures had to be found and included with the text. Useful web sites had to be identified and linked to the material. These images and

sites also needed to be kept up-to-date.

	Mean	S.D.
Quality of assignments	4.0	0.76
Skill Development	4.1	0.64
Knowledge Acquisition	4.1	0.64
Help/Support	3.5	0.74
Evaluation by Instructor	3.9	0.64

Table 5 presents the results of the responses to the survey questions on Web tools. Bulletin boards with threaded discussions were the most popular. Students

could post problems and have their peers respond with solutions. E-mail was also considered very useful. In addition to messages, students could send their work to the instructor and to classmates via E-mail attachments.

	Mean	S.D.
Web Notes	4.1	0.70
Chat Rooms	4.1	1.03
E-mail	4.3	0.81
Bulletin Boards	4.5	0.51

Early versions of WebCT had a number of problems. The chat room crashed on several occasions. Students and the instructor had no way of knowing whether this was due to the server or their own client machines. When these server crashes occurred, the synchronous class was canceled and review questions were posted on the bulletin board instead. The grade book sometimes locked and did not allow the instructor to edit it. The only solution to this was to have the computer services staff restart the server. As there was no round-the-clock support, this problem often took days to be corrected.

Some students had problems getting started with the course. They did not know how to connect to the class or how to use the WebCT software. Sometimes their computers were too old or their connections too slow. Administering the course was also very time intensive. The volume of mail messages was usually large. Often, the same question was asked by several students in separate mail messages. Postings on the bulletin board had to be monitored and to be answered. Assignments attached to mail messages had to be scanned for viruses and downloaded. The instructor's computer was infected with a virus and had to have all the software reinstalled.

6. SUMMARY

The fully web-based MIS class described in this paper is an extension of the previous class which was only web-

supported. It was designed with emphasis on active-learning to address the quality concerns about distance-learning classes that appear in the literature. Lectures, team exercises and projects were supported by groupware such as E-mail and Chat rooms. A container called WebCT was used as a single entry point for delivering course materials, grades, tests, E-mail, chat rooms and other distance education tools.

The outcomes of tests, assignments and participation from the Distance Learning (DL) class were compared with the regular class, which served as the control group. There were no significant differences in outcomes. This indicates that students in a DL MIS class can perform as well as students in a regular MIS class. It was also found that participation was higher, though not significantly in the DL class. This is probably because students came to each class better prepared because their work is more visible to the instructor. Also, students who are usually intimidated by the prospect of raising their hands in a regular class, seem much more forthcoming in a chat room or on a bulletin board. However, DL students did not score as well on their assignments. This may be because it is harder to walk a student through an assignment over the phone, or via e-mail, than in a live class.

A survey instrument was distributed at the end of the semester to students from the DL class. The survey attempted to determine student opinions on issues such as the quality of faculty-student interaction and the relative worth of each of the tools used. Bulletin Boards were rated the most useful DL tool. As would be expected, In-person interaction and Help/support were the lowest rated areas. Still, as the comments in Appendix 2 show, most of the students had favorable feelings towards the DL experience.

There were difficulties in several areas. First, the preparation for the class required a lot of work. Setting up the course took months of preparation. Learning to use WebCT and other software took time. Second, the software used in the early part of the preparation had a number of bugs. The chat room crashed on several occasions and the grade book often locked. Third, some students were not ready for distance learning. Their computer skills were limited. Sometimes their computers were too old. Fourth, the administrative effort was daunting. The tasks include responding to E-mail, monitoring the bulletin board, uploading and downloading files and attachments and updating links. There is also the potential for infection by a virus, as happened on one occasion with a particularly virulent virus, causing extensive damage

To address some of the above problems, instructors planning to use a DL class may be well advised to:

- Seek the assistance of Instructional Design specialists before creating the materials.
- Have students attend a primer class, which addresses the technical requirements of distance learning.
- Establish clear protocols for chat room discussions, including one for responding to server crashes.
- Restrict class size to 20 students unless a Teaching Assistant is available.
- Tests may have to be planned for live classes so they can be proctored

The Distance Learning approach was generally successful in the undergraduate MIS class with an active-learning focus. Student outcomes appear to be similar to outcomes from a regular class except that students learn techniques and have to take greater responsibility for their own learning. There probably are long-range benefits from this acceptance of responsibility for the students' future.

7. CONCLUSIONS

In light of the limited size of the research study, no firm conclusions can be drawn. Nevertheless, the findings support other studies that have found no significant difference between distance learning and regular classes. However, the success of the study raises a number of challenges:

1. Will future DL classes confirm the findings of this study?
2. Will the recommendations for changes bring increasingly better results in terms of learning outcomes and student and instructor satisfaction?
3. Will repeat classes significantly reduce instructor work requirements?
4. Are there other possible designs that will bring all of the benefits and none, or fewer, of the undesirable features?
5. What, if any long-term benefits for students can be identified, possibly in terms of self-sufficiency, responsibility and motivation for learning and stimulation of life-long learning?

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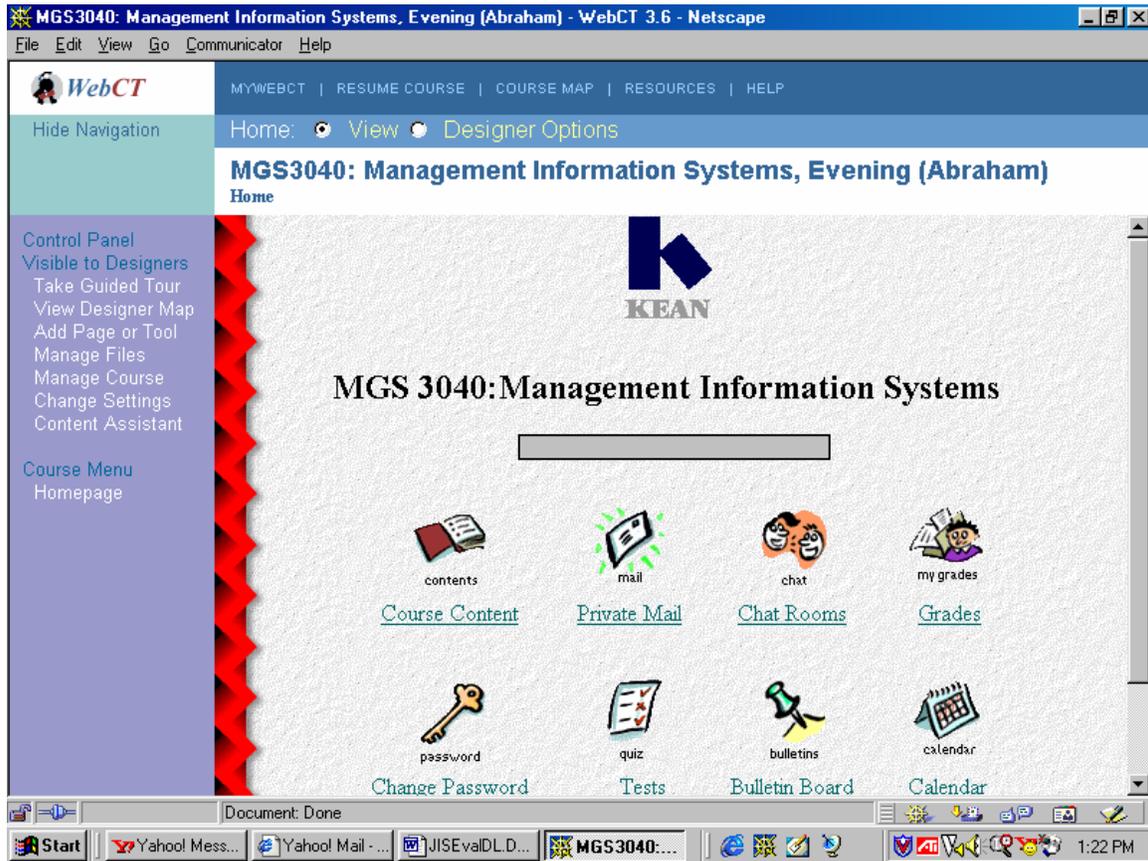
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AUTHOR BIOGRAPHY

Thomas Abraham is an Associate Professor in the Department of Management and Marketing at Kean University. He is also Coordinator of the Master of Science in Management Information Systems program. He received his Ph.D. in Information Systems from the University of Massachusetts, Amherst. He has published his work in several refereed journals including *Decision Support Systems*, *Creativity Research Journal* and *Journal of Information Systems Education*. He teaches courses in Management Information Systems and Systems Development.



Figure 1: WebCT Home Page for MIS Class.



Appendix 1: Survey Instrument

I. How do you rate your interaction with the instructor in the following areas?

Time available to interact in person
Time available to interact through technology
Quality of interaction through technology

II. How do you rate the delivery of course materials over the Internet on the following?

Access to course materials
Quality of course materials
Ease of use of the technology
Learning environment relative to a classroom

III. How do you rate the student projects/deliverables on the following?

Quality of assignments
Development of relevant skills
Development of relevant knowledge
Availability of help and support facilities

IV. How do you rate each of the following as tools for distance learning?

Web-based Lecture Notes
Chat Rooms
E-Mail
Online Tests
White Boards

V. Based on the limited contact hours, how do you rate the ability of your instructor to judge the following aspects of your performance?

Level of Effort
Development of relevant skills
Development of relevant knowledge
Obstacles overcome

VI. Overall Learning Experience

Overall, how does this class compare to other classes with regular schedules.
What were the best features of the class?
What were the problems you faced in this class?

Appendix 2: Selected responses to Section VI – Overall Learning Experience

Q1	How does this class compare with regular (classroom) courses?
	This class was a good experiment...but I would rather have a regular classroom where the instructor is one on one...it's a lot easier when u need help with something or have questions.
	I actually like this internet course better than I do the classroom environment. There is more interaction.
	This class is as good as a regular classroom course, however, it requires the student make an extra effort because of the very nature of the class. It requires a mature student with some computer knowledge because it is very easy to fall behind.
	I prefer a lecture course, but this course makes you work harder to learn.
	It is a very good class because it pushes a student to do almost everything on their own.
	I think it is equivalent to a regular course.
	It is a little harder because you have to study yourself first, but it is a good class.
	This class has the advantage that you can practice what you are learning at the same time.
	I enjoy independent study, so distance learning is no problem for me so far. I hope that courses like this will be offered in the future.
	This class is very hands on and requires an extra amount of time when compared to other classes. It is impossible to keep up with the class if you don't do the work.
	The distance learning class was conducted very professionally by the instructor. It was a little hectic at times but we got through it. Not only was it fun but it kept me on my toes. It made me want to be part of the class. I don't think I would have been so prepared every week in a regular classroom.
	This class is the best class I have taken to date in my college life. I would definitely like to take another class through distance learning via the internet.
	It is a little confusing in the beginning, maybe because it's different. It may work better if many courses were offered this way and students get used to it.
	I had concerns at first, but with distance learning, if I missed any part, I can review the chat room discussion.
	It's a very different learning environment and that's what makes this class interesting.

Q2	What were the best features of the class?
	There is more interaction.
	No babysitter needed!
	The use of bulletin boards.
	I like the chat rooms because you can get an answer if you are not sure you have the right one.
	Learning over the internet is very interesting. I have learned a lot about technology.
	The best feature was that it made me do homework and answer questions in the chat room.
	Using the computer, the chat rooms and being able to move ahead at your own pace.
	Being able to communicate in a live chat room. The team projects were also very interesting. I've met some truly great people in this class.
	Having everything available on the web.
	It is an excellent way to enhance our computer skills.

Q3	What problems did you face?
	Using the E-mail.
	Adjustment from traditional classroom setting.
	Connecting to the chat room.
	Chat server problems.
	I didn't like the teams thing.
	Not seeing my teammates on a regular basis.
	Missed the free flow of conversation.
	The server being down at the most inconvenient times.
	I was confused at the beginning.
	I type very slowly so when I get called on to answer a question in less than a minute, some one else gets called on.
	I felt very lost at the beginning and sometimes I did not know what I was supposed to do.



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