

Students' Satisfaction and Perceived Learning with a Web-based Course

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ABSTRACT

This paper describes a study, which explored students' responses and reactions to a Web-based tertiary statistics course supporting problem-based learning. The study was undertaken among postgraduate students in a Malaysian university. The findings revealed that the majority of the students were satisfied with their learning experience and achieved comparable learning outcomes to students in the face-to-face version of the course. Students appreciated the flexibility of anytime, anywhere learning. The majority of the students was motivated to learn and had adequate technical support to complete the course. Improvement in computer skills was an incidental learning outcome from the course. The student-student and student-teacher communication was satisfactory but a few students felt isolated learning in the Web environment. These students expressed a need for some face-to-face lectures. While the majority of the students saw value in learning in a problem-based setting, around a third of the students expressed no opinion on, or were dissatisfied with, the problem-based environment. They were satisfied with the group facilitators and learning materials but were unhappy with the group dynamics. Some of the students felt unable to contribute to or learn from the asynchronous Web-based conferences using problem-based approach. Some of the students were not punctual and were not prepared to take part in the Web-based conferences. The findings have suggested a need to explicitly design an organising strategy in the asynchronous Web-based conferences using problem-based approach to aid students in completing the problem-based learning process.

Keywords

Web-based course, Problem-based learning, Satisfaction, Achievement

Introduction

Many developers of educational Web materials have a tendency to use the Web in traditional ways (e.g. Dehoney & Reeves, 1999; Kearsley, 1998). The resulting learning environments often appear as electronic versions of traditional courses. Many researchers have been arguing the need for Web-based learning environments that extend the opportunities they afford the students (e.g. Collis, 1997; Duschatel, 1997). These researchers have been guided in their thinking by learning theories, which stressed the need for, and value of, learning environments that provide active and engaging activities for students. Students should have the opportunities to construct knowledge rather than just being exposed to the transmission of knowledge.

But what of such learning environments? There is always the prospect of a significant gap between what is intended and what is achieved. Are these learning environments what the students expect and want from their teachers? Are these learning environments able to provide the levels of motivation needed to master the course content? These are some of the questions confronting teachers seeking to employ a Web-based learning setting

with students as a means to enhance the access and flexibility of a course. This paper describes a study to assess students' perceptions of a Web-based learning environment using the problem-based approach and attempts to determine the level of success achieved by the students.

Adopting Web-based learning

The educational technology literature abounds with arguments for and against the value afforded by technology. Research on the impact of technology on learning has produced mixed results. Meta analyses by Kulik and Kulik (1991) reported significant achievement gains among students using computers compared to students in conventional settings. However, some researchers have disputed these findings in terms of its generalisation to mainstream practice (Stoll, 1996). Hattie (1992) has also suggest that the size and nature of the achievement gained from technology-supported learning, are no more than those achieved in classrooms using alternative strategies such as teamwork, collaboration, and self-directed learning. Educators are beginning to question much of this early research as being inappropriate, inaccurate and misguided in its aims and method (Reeves, 1993). The successful use of new technologies such as the Web would require teachers to be sensitive to the various impacts on the students and their learning processes. The research described in this paper was motivated by a desire to observe firsthand the impact of the new environment on students, and to make the necessary changes in the future to maximise the advantages from the Web for learning gains.

Problem-based learning: A Web-based solution for student-centred and flexibility in course delivery

Previous researches suggested the value to be gained from contextualising learning within settings which reflect the purpose of learning and how students might ultimately apply this learning beyond the classroom (Brown, Collins, & Duguid, 1989; Herrington & Oliver, 1999). Situated learning, rooted in constructivist learning principles encourages students to construct their own meaning for knowledge and information. Moreover, situated learning values the importance of interaction and socialisation among students in the learning process.

Problem-based learning was selected as the means to implement the situated learning setting in this study. Problem-based learning is a curriculum approach, which helps students frame experiences through a series of problem-solving activities. Learning occurs through the application of knowledge and skills to the solution of authentic problems, often in the context of real practice (Bligh, 1995). Problem-based learning uses problems to encourage the students to acquire knowledge rather than through the exposition of discipline knowledge (Boud & Feletti, 1991). Problem-based learning is a form of situated learning, learning through goal-directed activity situated in circumstances that are authentic in terms of intended application of the learnt knowledge.

Problem-based learning has been reported to increase students' motivation, to develop their critical thinking skills, and to deepen their understanding of content (Sage & Torp, 1997). But research has also shown that successful learning is not always guaranteed with problem-based learning or in fact with any new teaching method. For example, Wilhelm (1997) reported students often experience difficulties and discomfort with collaborative and self-directed learning which are essential elements of problem-based learning. Piling-Cormick (1997) also commented that inexperienced students could experience significant difficulties with self-directed learning activities. Success in student-centred learning depends on students' abilities for self-monitoring and self-regulation (Lan, 1996).

Findings from research on Web-based learning

Research on asynchronous Web-based learning in general reported high levels of students' satisfaction with the courses (Collins, 2000; Fredericksen, Pickett, Pelz, Shea, & Swan, 2000; Jiang & Ting, 1998; Motiwalla & Tello, 2000; Oliver & Omari, 2001; Swan, Shea, Fredericksen, Pickett, Pelz, & Maher, 2000). Additionally, Swan et al. (2000) and Fredericksen et al. (2000) also reported that students have perceived a high level of learning with their Web-based courses. However, most studies reported no difference in learning achievement between students taking Web-based courses and students enrolled in traditional face-to-face classes (Carswell, 2000; Collins, 2000; Kearsley, 2000; Wegner, Holloway, & Gordon, 1999).

In their studies of 31 Web-based courses, Motiwalla and Tello (2000) found that the students appreciated the flexibility of accessing the courses anytime and anywhere. Likewise Wegner et al. (1999) reported that 21% of

the students in their study on a problem-based Web-course stated that the convenience of not having to travel and having flexible study hours was an added advantage.

Results from a study using a team-based instructional design in a Web-based undergraduate educational psychological course found that students felt a need to learn to motivate themselves differently for an online class (Matuga, 2001). Strategies used within regular classroom environments did not appear to work in Web-based courses. One student exclaimed:

"I have learned that self-motivation is something that I really have to work on when I am really busy with lots of things. It is really easy to say that I will do this stuff tomorrow, and then never do it tomorrow because I do not have a classroom to go to. I think I will focus on why I want to learn this stuff, rather than just getting it over with because it is a requirement for my major."

Carswell (2000) compared a traditional Open University course and another version of the course using the Internet for communication. The students felt that they gained valuable experience in using the Internet and its associated tools. While such learning was not an objective of the course it was a welcome by-product. Collins (2000) likewise reported that students enrolled in a Web-assisted non-major biology course also commented that they had gained experience with the Internet and email.

In general, students were tolerant of technical problems, as long as they are solved. Although students did experience problems with modems, lost lines and servers but they accepted this as a fact of life (Carswell, 2000). However, Horvath and Teles (1999) in their study with mature students who were computer-naïve, reported that initial encounter with computer-mediated Web-assisted courses, generated high levels of anxiety. They concluded that the presence of peers and instructor is no substitute for an intuitive interface design. Problems with the computers generated high levels of frustration and anxiety. Students' difficulties were caused not only by the lack of requisite skills to diagnose the problem or the lack of computer knowledge and skills to solve the problem but, more importantly, by the elevated level of anxiety which blocked rational, as opposed to effectively motivated, behaviour. Students tend to feel embarrassed in response to these problems (Carswell, 2000; Horvath & Teles, 1999).

Hislop (2000) noted that students vary substantially in their approach to a Web-based class just as they do to a traditional class. A student's behaviour may change over time due to external factors, such as, how busy they are at work, their interest in a particular course, or their level of relevant experience. Nonetheless, at a given time, there is some typical behaviour patterns that seem common to all students. Hislop (2000) named these behaviours as leading, lucid, lively, lurking, listless, lagging, and lost. Carswell (2000) reported that the Internet-based conferences in his study attracted a high number of "lurkers". Reasons given for lack of participation included confusion as to their roles, unclear expectations, and not wanting to participate.

While students generally felt that the instructor provided answers and feedback promptly, Matuga (2001) reported that some students felt that they were not receiving individual attention. Motiwalla and Tello (2000) reported that approximately a quarter of their students were dissatisfied with the computer-mediated component and a further 36% were neutral. Around 67% of the students agreed that the computer-mediated communication tools facilitated student-instructor interaction. Another 47% of the students agreed that the communication tools facilitated student-student interaction. Bourne, McMaster, Rieger, and Campbell (1997) in a study involving computer conferencing and Web-based course reported that 30% of the students were uncomfortable with the learning environment and expressed preference for face-to-face lectures. Students also procrastinated more than in traditional courses. Matuga (2001) discovered that even though students were randomly assigned to groups, the group dynamics was more effective in some groups than others. The inefficient use of asynchronous discussion time for data giving rather than for discussion and idea generation, meant that the resulting dialogue was unsatisfactory to the learning outcomes expected (Corrent-Agostinho, Hedberg, & Lefoe, 1998).

Nonetheless, there were reports that students perceived the electronic group-based discussions as forcing them to look at the opinions of others as a way to get new information, and to reflect and learn from their peers (Carswell, 2000; Matuga, 2001). Corrent-Agostinho et al. (1998) in a study with a non-compulsory computer-mediated communication component within a Web course, reported that due to the asynchronosity of the discussion forum, students had time to reflect on the material and on comments made, before making comments themselves. They suggested that this might aid metacognition.

In a study of problem-based Web learning environment, Oliver and Omari (2001) found that the majority of students saw value to be gained from, and appeared satisfied with, their learning experience. However, for nearly

50% of the students, this was not their preferred form of learning. Similarly, the majority of students stated a level of enjoyment in the collaborative problem-based computer-mediated learning but nearly 50% again said they would prefer to work alone rather than in group. Wegner et al. (1999) found that around 29% of the students in a problem-based approach Web course, expressed a lack of content background as a concern of studying in the course. The lack of instructional direction was expected as the basic nature of Web learning creates barriers to the type of interaction experienced in traditional classrooms. Additionally, the problem-based learning instructional approach features a more student-centred approach to learning. The instructor is not expected to give answers and directions, but assumes a supportive and more passive role. Students, not used to this method of inquiry, experience some discomfort in making the transition from teacher-centred to student-centred learning

The Web-based environment

The Web-based environment for this study and its functional elements, based on the problem-based learning approach, have been described in an earlier paper (Hong, Lai, & Holton, 2001). In summary, the Web-based learning environment has the following forms:

- The course content is broken into weekly topics and for each topic students are provided with access to online resources. Student activities each week involve reading and completing tutorials in the area to develop a general idea of the scope and extent of the topic and problem solving activity;
- The two problem-based tasks require students to work in-group through asynchronous Web-based conferences to explore the given problem and to develop a written response. The problems are ill-defined and open-ended and represent authentic tasks representative of the way in which students will use the materials in their field of study;
- Each group has to post their solution to an asynchronous Web-based conference forum for others to read and discuss. Students are required to assess the work of their peers;
- Assessment in the course was based on the tutorials submitted, students' participation in the asynchronous Web-based conferences, completed written responses, and peers' assessments of the problem-based tasks.

Methodology

This Web-based learning environment was implemented with 26 part-time students (15 males and 11 females) studying the Master of Science degree in Human Resource Development Program at Universiti Malaysia Sarawak. The Web-based course "Statistics for Social Sciences" was conducted for 14 weeks between November 2000 and March 2001, without any face-to-face lectures. There was an initial face-to-face session for the students to get to know each other and the instructor, the structure of the course, and to be familiar with the key features of the course Web site. Subsequently there were three face-to-face sessions to familiarise the students with the statistics software (Statistics for Social Sciences Package, SPSS). These sessions also enabled the instructor to obtain feedback and provide the students with assistance and moral support.

Data was gathered from the students through open-ended interviews and questionnaires at the end of the course. The questionnaires consisted of statements probing the students' perceptions of the course, student-student and student-teacher interactions, asynchronous Web-based conferences, and group dynamics during the conferences. For each of the statement, the students had five choices of response: "Strongly Agree", "Agree", "No Opinion", "Disagree", and "Strongly Disagree".

Findings and Discussions

Consistent with the findings of the majority of studies of Web-based courses in the literature (Collins, 2000; Fredericksen et al., 2000; Jiang & Ting, 1998; Motiwalla & Tello, 2000; Swan et al., 2000; Oliver & Omari, 2001), students in this study reported high levels of satisfaction with the Web-based course. More than two thirds perceived the course positively, with only three students viewing the course negatively (Table 1).

I felt that the Web-based course had helped me to learn statistics.					
	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
N	5	13	5	3	0

Table 1. Students' perceptions of the course

Similar to findings reported by Motiwalla and Tello (2000) and Wegner et al. (1999), the students in this study appreciated the flexibility of accessing the Web-based course at anytime and from anywhere. One student commented, "I could access the course from anywhere. I didn't have to be present in class. I was not tied down by time constraint and could learn at my convenience. I could discuss and interact with my friends and teacher, although not face-to-face."

Students who actively seek support from the teacher and fellow students, or have support within the family to cope with the Web, were generally satisfied with their learning experience. A student who expressed satisfaction with the course commented during the interview:

"I was interested and motivated to learn at the beginning of the course because it was Web-based. Then I have some problems with my computer. I felt lost. However, my friends and the instructor helped me to adapt to the learning environment."

On the other hand, during the interview, another participation that was less satisfied with the learning experiences in the Web-based course had the following observations:

"It was a new learning experience. I was eager to try the course. However, when I faced problems, I could not get immediate support. Email was quite troublesome. I had to wait for reply from the instructor and friends. Though the response from the instructor was fast, sometimes I would like an immediate answer."

This finding concurs with Eastmond and Ziegahn's (1995) conclusion that adult students must be technologically proficient or have someone in their immediate support system who is competent in using technology, in order to be successful in Web-based courses. The students who were less proficient and did not seek assistance with the learning environment expressed either no opinion (N=5) or dissatisfaction (N=3) with the course. The Web-based learning environment did not motivate these students. Matuga (2001) suggests that students may have to motivate themselves in different ways for Web-based courses since strategies used within the regular classroom do not work. It is not easy to complete certain readings or assignments because students do not have a classroom to go to.

Thirteen of the students in this course also reported improvement in attitudes toward the computer, and to computer knowledge and skills, unintentional learning outcomes also reported by Carswell (2000) and Collins (2000). One student commented: "Before this course, I used the computer only for email and typing test paper. Now I can use the SPSS, the Web and online discussions. I became more familiar with handling the computer. Most of us have come out of from our shell and were less nervous. Now we spend most of our time in front of the computer."

The students were generally satisfied with the student-student and student-teacher interactions in the Web-based course. This finding concurs with Swan et al. (2000), Fredericksen et al. (2000), and Motiwalla & Tello (2000)'s findings that students generally perceived the asynchronous format of the Web-based course as supporting interactivity and involvement. However, a few of the students were not sure (N=7) or felt that the course did not facilitate interaction with the teacher (N=1) (refer Table 2). A few of the students were also not sure (N=5) or felt that the course did not facilitate interaction between the students (N=3) (refer Table 2). It is possible that some virtual students could be frustrated from the inability to ask questions of the teacher and fellow students in a face-to-face environment. One participant commented, "... when I faced problems, I could not ask the instructor immediately. Email was quite troublesome. I had to wait for the reply from the instructor. Though the response was fast, sometimes I would like an immediate answer."

Statements	Responses				
	SA	A	N	D	SD
The Web-based course facilitated communication with the teacher.	7	11	7	1	0
The Web-based course facilitated communication with fellow students.	8	10	5	3	0

Note: SA = Strongly Agree, A = Agree, N = No Opinion, D = Disagree, and SD = Strongly Disagree

Table 2. Students' perceptions on interactions in the course

The students were divided on their opinions regarding the asynchronous Web-based conference using problem-based approach. While the students felt the discussion during computer conferences enhanced their learning, about one third of the students were undecided or disagreed (refer Table 3). This finding is similar to those reported by Motiwalla and Tello (2000) and Oliver and Omari (2001). Oliver and Omari (2001) in their study on

problem-based learning found that half of the students indicated that it was not their preferred form of learning and they would prefer to work alone rather than in a group. Similarly, Motiwalla and Tello (2000) reported that 25% of the students in their study were dissatisfied with the computer-mediated communication component and further 36% were neutral.

The Web-based conference using problem-based approach could enhance my learning.					
	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
N	5	11	7	3	0

Table 3. Students' perceptions of the asynchronous Web-based conferences

For the students who felt that the Web-based conferences were useful, learning was a collaborative endeavour of sharing knowledge and experiences. One student observed: "Exchanging ideas and thoughts with friends that were more knowledgeable helped improve our understanding. The conferences also promoted closer relations among the students." Students could reflect on their own, and fellow students', ideas and contributions to the conferences. Another student commented: "The conferences were interesting compared to the face-to-face discussions, lectures and examination. I could slowly understand, interpret, and analyse the postings." Similarly, students in Carswell's (2000), Corrent-Agostinho et al. (1998), and Matuga's (2001) studies commented that Web-based discussions forced them to look at the opinions of others as a way to get new information, take another point of view and learn from peers. Explaining to other students, helps in the student's own understanding and serves to maintain interest and motivation.

As can be seen from Table 4, the students were satisfied with the facilitators and learning material used in the Web-based conferences. However, the students were not happy with the group dynamics during the asynchronous Web-based conferences using problem-based approach. Four of the students were not sure if they had contributed to the discussions in the Web-based conferences while another four felt that they had not contributed. Likewise five students were undecided as to whether they had learned from the discussions in the Web-based conferences. Another five students commented that they had not learned from the conferences. Eight of the student felt that their group members were not punctual and did not came prepared for the conferences. This finding agrees with Matuga's (2001) discovery that some groups had better group dynamics and interacted more than other groups.

Statements	Responses				
	SA	A	N	D	SD
<u>Small-group dynamics</u>					
Overall, my discussion group worked effectively.	3	14	3	6	0
Group discussion increased my understanding of the underlying basic statistics.	4	17	1	3	1
I was able to contribute to the group discussion.	2	16	4	3	1
I was able to learn from other students during the group discussions.	2	14	5	4	1
Students were on time and prepared for problem discussions.	1	6	8	8	3
<u>Facilitators</u>					
Overall, the facilitator was an effective tutor.	8	10	6	1	1
The facilitator met with the group at the agreed upon times.	4	15	3	3	1
The facilitator helped the group relate the problem to underlying basic statistics information.	6	16	2	1	1
The facilitator encouraged group learning through questioning, challenging and critiques.	5	19	1	1	0
The facilitator promoted a comfortable group learning environment.	4	17	3	1	1
<u>Learning material</u>					
I found that working through the problems increased my understanding of the basic statistics information.	6	16	4	0	0
I found that the sample solutions enhanced my ability to work through the problems.	4	17	4	1	0
I could identify gaps in my knowledge base and address these as learning issues.	4	14	6	2	0
I found that using the resources (online texts, instructional demonstrations etc) increased my understanding of statistics.	7	13	4	1	1

Note: SA = Strongly Agree, A = Agree, N = No Opinion, D = Disagree, and SD = Strongly Disagree

Table 4. Students' perceptions on the small-group dynamics, role of the facilitators, and learning material

There were some students who read the postings in the conferences but seldom participated. They blamed their lack of participation on inadequate mathematical and computer knowledge, anxiety about using computers, fear of embarrassment and the discomfort felt when their peers commented their work on. Some students felt that the more able students were not willing to share their knowledge. On the other hand, the more able students perceived these students as not having prepared for the conferences and as relying on others for answers. Some students did not actively take part in the conferences. Some quotes that illustrated these findings were,

“Sometimes I did not post messages but I was actively looking at the posting. I also e-mailed to my friends and the teacher. I was afraid I might ask questions that looked stupid. E-mails to individuals were not so embarrassing.”

“Most of us had a phobia of using the computer, especially to discuss online. When we looked at the discussion, we do not know what we could contribute, so we just browsed. But after the first assignment, we improved a little bit. We could handle the discussion better.”

“We need both individual and group learning. Individual learning is difficult but it trains oneself to be self-reliant. Learning in a group, some members tend to do nothing and depend on others to complete the group tasks.”

Hislop (2000) characterised these behaviours as lurking, listless, lagging, and lost. The lurking students are present but invisible. They follow class activities, but do not participate. The listless students participate, but not very much. They are not very motivated, and seem immune to efforts to encourage more class participation. Like lurking students, the listless students do not have much negative impact on the class as long as there are not very many of them. The lagging students are always a few steps behind the rest of the class. They may not contribute at all since they are too far behind in their reading or other independent work. When they participate, they tend to contribute at the last minute. The lost students are missing in action. They come in two distinct groups. The first group includes students who are not participating in the class at all. The second group includes students who are contributing, but whose contributions are generally off the topic or erroneous.

Lastly some of the students felt isolated during the course and prefer the more complex part of the course to be conducted face-to-face. Students acknowledged that the teacher provided prompt feedback and answers but some still felt that they did not receive individual attention. One student remarked: "However, when I faced problems, I could not ask the teacher immediately. Email was quite troublesome. I had to wait for the reply from the teacher. Though the response was fast, sometimes I would like an immediate answer. Our friends were also busy with their own work. Sometimes I felt helpless at home." Similarly, Bourne et al. (1997) reported that 30% of their students were uncomfortable with the use of asynchronous computer conferencing and Web-based learning environment and expressed preferences for face-to-face lectures.

This current study concludes that students in the Web-based statistics course using a problem-based approach achieved comparable achievement with two previous versions of the face-to-face course (refer Table 5). However, the results of the comparisons should be interpreted with care. The face-to-face courses were lecture-based and were not taught using the problem-based learning approach. The students for the courses were also not tested for equivalence in mathematics and scholastic aptitude entry level. The finding on learning achievement in this course was in agreement with results from the majority of studies in the literature. Carswell (2000), Collins (2000), Kearsley (2000), Wegner et al. (1999) reported no difference in learning outcomes between students in Web-based courses and students in face-to-face courses. Use of technology in any capacity does not guarantee academic success, but indications from this study suggest that it does not necessarily have any significant negative effects.

Grade	(Web-Based)	(Face-to-face)
A & A-	4	5
B+, B & B-	14	17
C+ & C	8	3
No of students	26	25

Note: The researcher taught the first and third cohorts of students while another teacher taught the second cohort students.

Table 5. Final grades for the Web-based and the face-to-face courses

Conclusions

This paper described a research undertaken in a Malaysian university, which explored students' perceptions and successes in a Web-based learning environment designed to support problem-based learning. The students' achievement in the Web-based course was comparable to a face-to-face version of the course. The students' feedback from the interviews and questionnaires indicated a general level of satisfaction and contentment with a student-centred and flexible form of learning involving problem-based learning in a group setting and Web-based delivery. Although the students agreed that learning was enhanced through the interaction in the asynchronous Web-based conferences, and reflecting on the postings of the conferences, problem-based learning and asynchronous Web-based conference was not their preferred form of learning. Some groups had better group dynamics than others did. Some students were lurking, listless, lagging, and lost.

The findings suggest that the tasks ahead will be to improve the Web learning environment to provide more structure and guidance to students in learning from asynchronous interaction and group activities. There is also a need to explore strategies to guide students in a problem-based learning environment. Further research and development are needed to refine the Web-based environment to support and enhance students' learning using a problem-based model.

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