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Web based learning environments: Observations from a Web based course in a Malaysian context

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The Faculty of Cognitive Sciences and Human Development (FSKPM), Universiti Malaysia Sarawak, experimented with a Web based course, conducted completely on the Web. This paper discusses the theoretical considerations in designing the Web based course, its key features, and students' and instructor's feedback on the course. Initial observations indicate that it is possible to have quality learning experiences through a Web based course. Students found the course challenging and the learning experience beneficial. Sharing of knowledge through online discussions was an integral part of the course. The instructors and students learnt together as they extended learning beyond the requirements of the course. Students need to change from passive learners to active learners who explore, acquire and share knowledge. Initial problems encountered include ensuring a stable connection to the course Web site, the reluctance of students in using ICTs and students' anxiety toward statistics.

Introduction

Over the past few years, the application of advanced computer technology to educational activities has expanded. The dominant technological focus at present is the use of the World Wide Web (also known as the WWW or the Web) (Bragg, 1999; Shih, 1998). This innovation, a part of the more encompassing "Internet", is expanding almost exponentially, and its popularity as well as its potential to facilitate quality learning experiences have caused a flurry of activities in academic institutions (Schutte, 1997).

Web based learning is a unique learning and instructional delivery system with which educators are experimenting (Khan, 1997). The resulting potential for change and innovation in approaches to delivery of

instruction are astounding and continually expanding (Collis, 1996; Schutte, 1997). Schools from elementary levels to universities are using the Web and Internet to supplement classroom instruction, to give learners the ability to connect to information (instructional and other resources) and to deliver learning experiences. The Internet is reorganising our approaches to education and altering communication patterns in society, affecting our educational system.

In higher education, there are two common methods of using the Web for educational purposes: Web assisted or Web based (Lai, 1998). Web assisted courses use the Web to supplement face to face teaching. The World Lecture Hall (http://wwwhost.utexas.edu/world/lecture/) set up by the University of Texas at Austin hosts many such Web assisted courses. Lecture notes, examination scripts, and course related materials are archived on the course Web site, providing students with easier access to course related materials. Another mode of delivery, Web based courses, utilises the Web as the sole delivery system. In this mode of delivery, students are not able to complete the course without having regular access to the Web. No face to face meeting is required. Examples of this type of course are available at the School of Education, University of Otago, http://www.otago.ac.nz/education (Lai, 1998) and at Iowa State University (Shih, 1998):

http://project.bio.iostate.edu/Courses/About.htm
or http://project.bio.iostate/About/About.htm

Bonk and Dennan (1999) proposed an alternative classification of Web integration in higher education. They proposed a ten level continuum of Web integration. Clarification of the continuum is available from http://php.indiana.edu/~cjbonk. In this classification, Levels 1-7 of the continuum are equivalent to Web assisted learning while Levels 8-10 referred to Web based learning.

Purpose of the paper

This paper will focus on efforts of the Faculty of Cognitive Sciences and Human Development (FSKPM) at Universiti Malaysia Sarawak, Malaysia (UNIMAS), using the Web for conducting its courses. Specifically, it will describe the theoretical considerations for building a Web based learning environment. Characteristics and features of the Web based learning environment based on the constructivist approach will be highlighted. This paper will also discuss preliminary observations of the Web based course offered as a pilot project at FSKPM, UNIMAS, between November 2000 and March 2001.

Constructivism as the basis for designing a Web based learning environment

A constructivist approach to learning has several characteristics that can be easily adopted for Web based learning. Some of these characteristics include: learner construction of meaning, social interaction to help students learn, and problem solving in "real world" contexts.

Von Glaserfeld (1989) states that learners construct their own meaning based on their experiences. Each individual has a unique mental structure which allows the individual to make meaning from his or her experiences. Instructors can help students understand their structures and connect their experiences by making the process of connecting what they are learning a conscious one. This can be achieved by setting up learning activities that require students to create their own graphic organisers, Webs or outlines in a Web based lesson. Since students are unique learners, they should be allowed to choose the form this activity will take. Some students may create a Web, others an outline. The critical point is that students are encouraged to participate in activities that allow them to create an external structure that reflects their internal conceptualisation of the topic. With authoring programs available for Web design, instructors can now provide students with online tools for using geometric shapes, lines, text, and even colour to structure their work. This allows students the responsibility to organise their own learning.

Social interaction during the learning process will encourage active construction of knowledge. Social interaction provides mediated interpretations of experiences and much of what is learned about the world is dependent upon communication among individuals (Vygotsky, 1981). In Web based learning this can be achieved through the use of chat rooms, email, listservs and threaded discussions. Students can be given questions and activities that must be completed in groups rather than individually. The Web is an improvement over normal group based activities because what each student does is published in some way. An instructor can actually see who has taken an active part in the process. Within Web group work it is obvious which students are not participating and the instructor can address the problem individually. The instructor must monitor interactions and intervene to make sure that the students are accomplishing a suitable depth of discussion and exploration. Otherwise, students will often discuss the topic superficially. Thus just as instructors use Socratic questioning in a classroom, instructors need to do the same during online learning.

For meaningful learning to occur, students must address "real world" problems (Duffy & Jonassen, 1991). "Real world" problems have many contexts and are more easily addressed if multiple viewpoints are

explored. When students deal with authentic problems, it helps them to construct highly developed schema that contribute to an increased ability to solve problems (Bedner, Cunningham, Duffy & Perry, 1992; Brown, Collins, Duguid, 1989). Students can gain experience and address problems in different ways during Web based learning. Web based learning, if used properly, lends itself well to involving students in "real world" problem solving.

One approach to involve students in "real world" problem solving is to assign a choice of problems for students within the content area addressed. Once students choose a problem, the Web offers a variety of tools for students to use to research their problem. Students can access databases and other kinds of Web sites. Students can also contact experts within a field. Tools, such as databases, can help individuals construct their knowledge in authentic ways (Jonassen, 1990). Using these tools, students have the opportunity to explore a variety of viewpoints and obtain different kinds of information related to their problem. The social interaction aspect of constructivist theory can be incorporated using chat rooms, email, listservs or threaded discussions. Using this approach to authentic problem solving, students will need to be able to use the Web tools available. This might require instruction on how to conduct searches on the Web, how to evaluate information on Web sites, and how to access online databases. Students are encouraged to use additional resources, which may not be available on the World Wide Web.

A case study of a Web based course

The Faculty of Cognitive Sciences and Human Development, Universiti Malaysia Sarawak, conducted a trial of the first Web based course from November 2000 to March 2001. The course was KMF6013 Statistics for the Social Sciences, a compulsory course for the Master of Science in Human Resource Development conducted by the Faculty. The Master of Science (Human Resource) program is a flexi-time program. Courses are usually taught at night during weekdays.

Students taking KMF6013 are required to complete the course through the Web with only four face to face sessions. The first face to face session was conducted to enable students to get to know the lecturer, the structure of the course, and to familiarise with the key features of the course Website. The three other face to face sessions were held in the third, eight and eleventh week of the course. The face to face sessions were conducted mainly to familiarise the students with the statistical software (Statistical Packages for Social Sciences - SPSS version 10.05). These sessions also enabled the instructor and students to exchange ideas and solve problems encountered during the course.

All the students taking this course were 'local' students, with the most distant living in Sri Aman, a town approximately 250 km from the university's campus. Students used the Web as a primary means of course participation. However, this course could have been offered entirely on the Web to any students anywhere in Malaysia.

There were 26 students enrolled for the course. 15 (57.7%) of the students were male while 11 (42.3%) students were female. Most of the students were in 25-29, 35-39, and 40-44 age groups, with eight (30.8%), six (23.1%) and seven (26.9%) students, respectively. There were two students (7.7%) each in the age group of 20-24 and 30-34. Only one (3.8%) student was in the 45-49 age group.

Five (19.2%) of the students have participated in Web assisted courses offered by UNIMAS during their undergraduates studies. These courses have face to face lectures with some reading materials available on the Web. Two (7.7%) students rated themselves as expert computer and Web users. 17 (65.4%) students considered themselves as having intermediate skills in using computer and the Web. Seven (26.9%) perceived themselves as novice users of computer and the Web.

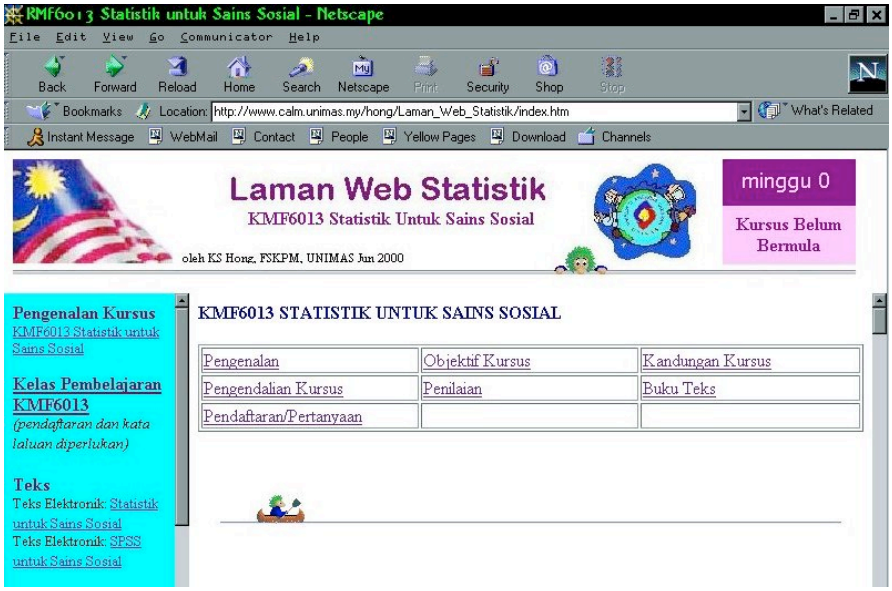

Figure 1: The main page of the KMF6013 Web site

Description of the course

The course KMF6013 was designed to equip students with the skills and knowledge to carry out statistical analyses, communicate statistical analysis results and discuss statistical analyses reported in research journals and theses. Students were also actively encouraged to use a statistical software package (SPSS) in their study and data analyses.

Description of the Web based learning environment

When students key in the following URL:
http://www.unimas.calm/hong/Laman_Web_Statistik/index.htm
they access the main page of the course Web site, shown in Figure 1.

This page contains the course information for all intending students. Among other things this page lists the course introduction, course objectives, course content, implementation of the course, assessment procedures, lists of reference books and queries or registration contacts.

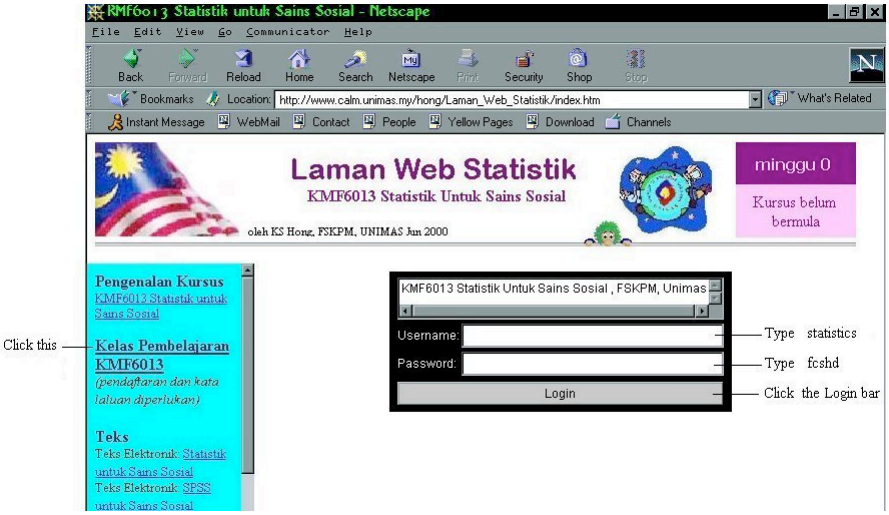

Figure 2: Dialog box for registered students to key in the username and keyword

In the left hand frame of the page, some facilities of the course are featured. Two online statistical tools are provided free for any students who accessed this main page. They are Statistical Packages for Social Sciences (SPSS version 10.05 in PDF, Portable Document Format) and Statistics for the Social Sciences (in HTML pages). Both tools are in Bahasa Melayu (Malaysian language).

Registered students were given a username and password to enter the course Web site after clicking at Kelas Pembelajaran KMF6013 in the left hand frame (Figure 2).

Once the registered students have keyed in the appropriate username and password, they are able to access the classroom pages with all the learning materials, details and activities arranged in weekly fixtures (see Figure 3).

The key features of the main classroom page are (a) a dynamic message box, (b) weekly buttons, (c) links to general information, (d) links to classroom resources, and (e) links to learning resources (Figure 3).

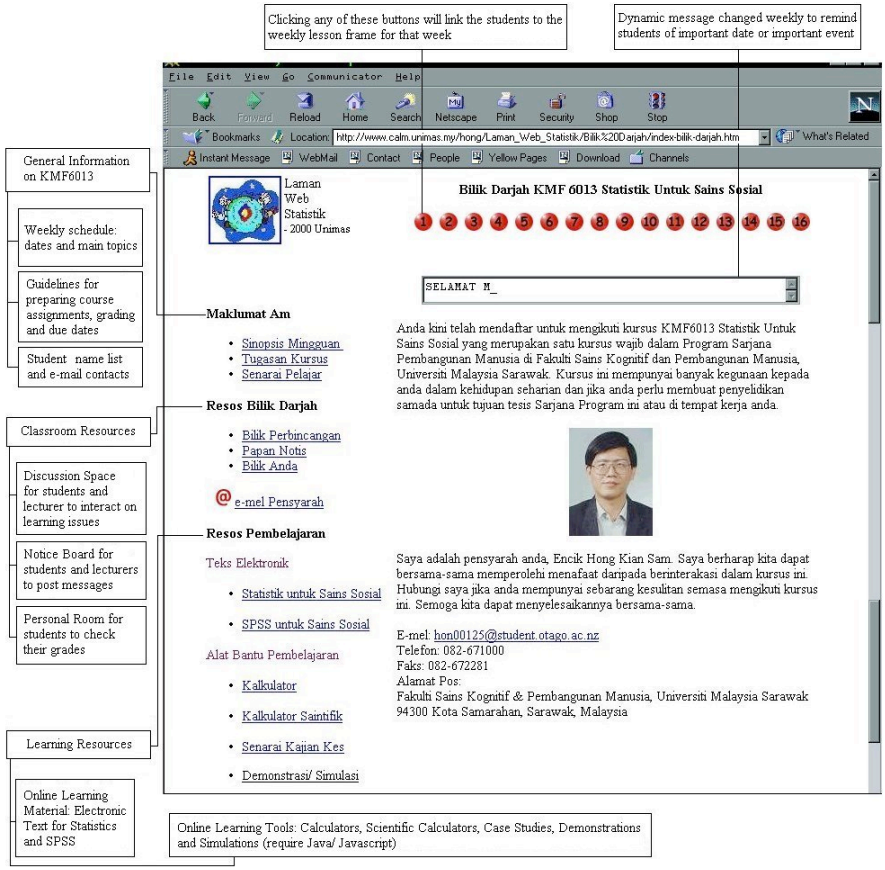

Figure 3: Main classroom page for KMF6013

The dynamic message box was updated weekly to highlight important messages to students. Examples of messages highlighted in the dynamic message box were reminders on readings, discussion dates, due dates for assignments, and presentation dates. Weekly buttons were linked to detailed weekly learning objectives, content, readings and activities. General information links were related to a summary of weekly topics, guidelines for preparing course assignments, grading criteria and due dates, and students' name list and email addresses.

Classroom resources included a discussion space for students and lecturers to interact on learning issues in asynchronous mode and a personal room (password protected) for students to check their course grades online. Learning resources consisted of online statistical tools (Statistics for Social Sciences Textbook and SPSS version 10.05 for Social Sciences Textbook), and other tools such as calculators, real world problems and statistical simulations or demonstrations (required Java/ JavaScript enabled browser).

The weekly learning pages (Figure 4) contained four main parts. The students were provided with a list of weekly learning objectives, expected learning outcomes, required readings and activities to complete for the week. This format provided some structure to an otherwise constructivist based approach in the design of the Web based learning environment.

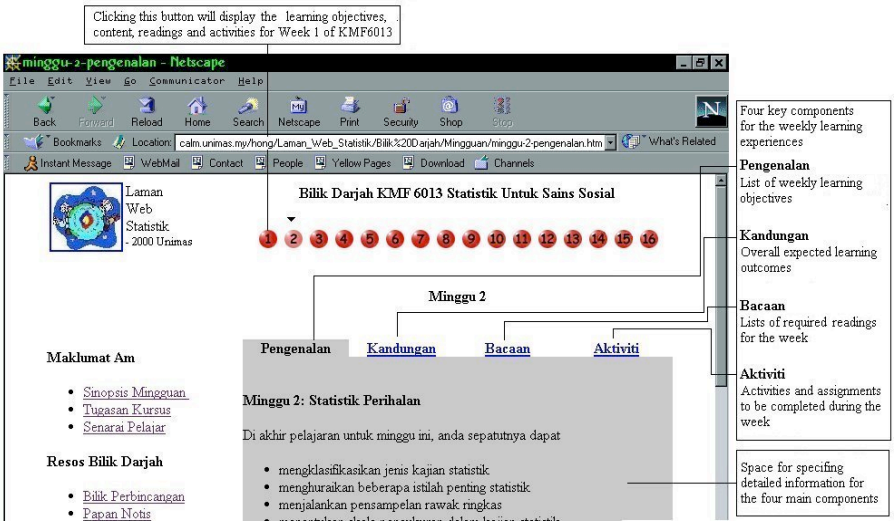

Figure 4: Weekly learning objectives, content, readings and activities

The Web based learning environment

The various suggested features for supporting constructivist learning were integrated in this learning environment. They included: organisers or outlines, group and individual assignments, mediated social interaction and monitoring of interaction, real world problems with links to databases, Web resources and other cognitive tools both on the Web or otherwise, and postings of students' work.

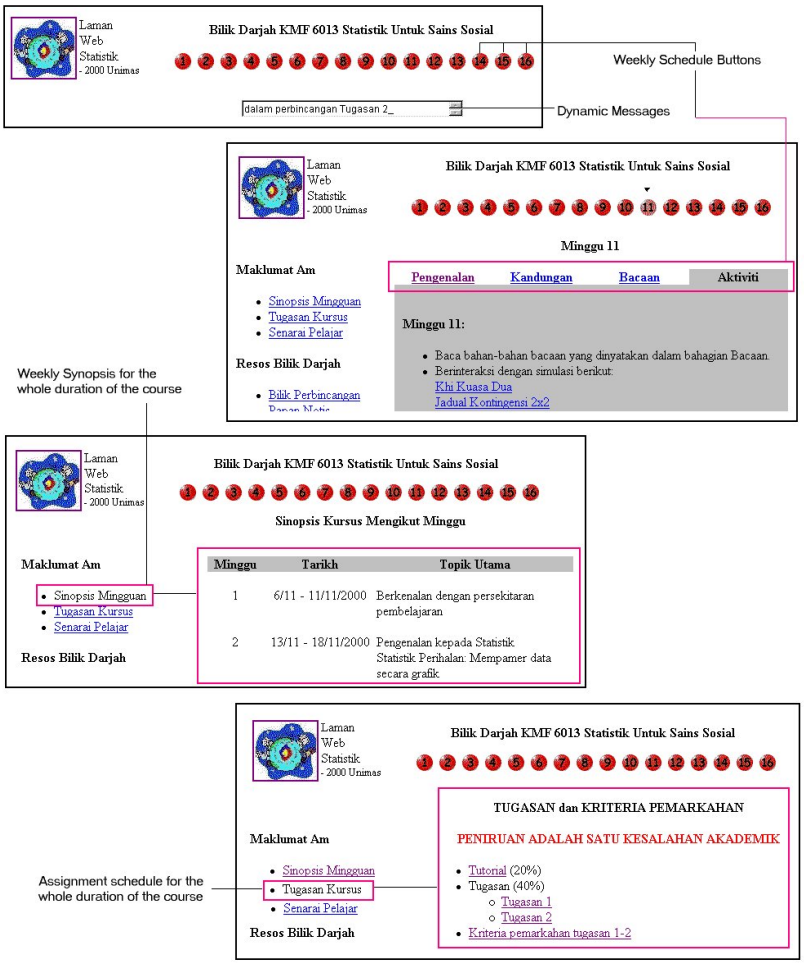

Figure 5: Organisers and outlines in the Web based course

Proponents of the constructivist approach suggested that students create their own graphic organisers, Webs or outlines to enable them to create an external structure that reflect their internal conceptualisation of the topic. However due to the diverse information technology background of students enrolled for this course, the instructor provided the organisers and outlines for the students (refer Figure 5). This was to ensure that students acquired the minimum requisite learning outcomes.

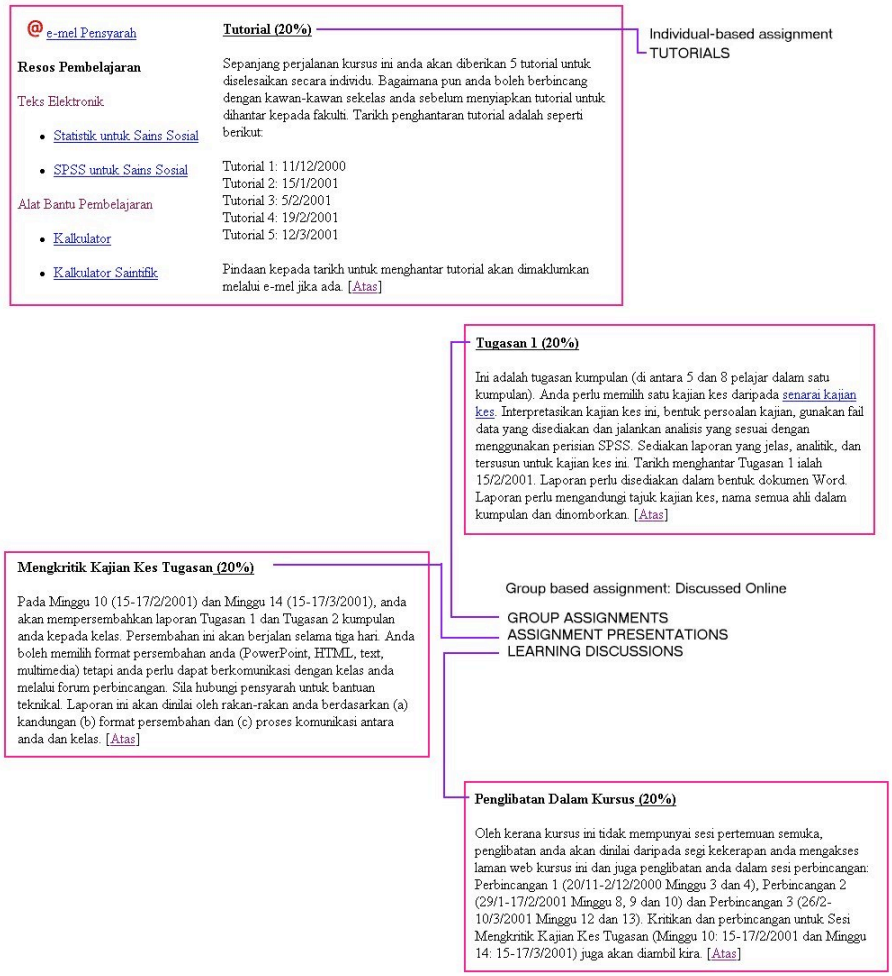

Figure 6: Group and individual assignments

One type of organiser provided was weekly schedule buttons, linking to weekly lesson objectives, expected learning outcomes, required readings and activities. However, this weekly schedule was not strictly enforced. Students could progress at a faster rate if their ability and time schedule permitted. Alternatively, students were also presented with a weekly synopsis of main topics for the whole duration of the course. The assignment schedule also served as an outline for the course.

In this Web based course, there were two types of assignments to be completed individually or in groups (Figure 6). Individual assignments refer to the five tutorials that students had to complete. The tutorials were spaced out to cover a few topics within two to three weeks for the duration of the 14 weeks. The individually completed tutorials need to be submitted at the end of the related weeks. Prompt feedback within two working days was provided for the tutorial works submitted to ensure that students could gauge their progress in the course and do remedial work based on the feedback. The main function of the tutorials was evaluative in nature.

Group assignments had to be completed in groups of six to seven students. Group assignments supported the constructivist approach that learning is a social process. Social interaction provides mediated interpretations of experiences and can promote a commonality of understanding for a given concept.

Some educators proposed that the use of real world problems can be well-supported through the Web by virtue of the information access and cognitive support which they can provide. Use of the Web provides access to a raft of information and resources that can be used in the problem solution. The conferencing capabilities of the Web also add considerably to its capacity to support using real world problems in the learning environment (Oliver & Herrington, 2000).

In this course, the group assignments required students to solve real world problems. There were two group assignments in this course. Students had to discuss and plan, using a Web based threaded discussion, how to solve the problem. They had to combine what they had learned in the research methods and the statistics courses. Sample solutions to similar real world problems were provided in the course Web site. Students were also encouraged to share any related Web sites or online materials they come across with their friends. A member of the group will function as the group facilitator. Students' discussions were monitored to ensure that students did not free ride during the group assignments. The instructor did not intervene in the discussion unless necessary and most prompts and advice were given through individual emails to avoid an autocratic approach or instructor-student divide. The instructor also monitored the

depth and scope of the interactions and intervened to ensure students were accomplishing a suitable depth and breadth of discussion. Some examples of these ideas are shown in Figure 7.

Figure 7: Social interactions during a group assignment discussion

Real world problems for the group assignments were adapted from data sets and sample problem solutions listed in statistics textbooks. However the instructor attempted to provide a scenario that was identifiable with local conditions, i.e. by using local entities such as Lembaga Hasil Dalam Negeri logos to the adapted real world problem (refer Figure 8).

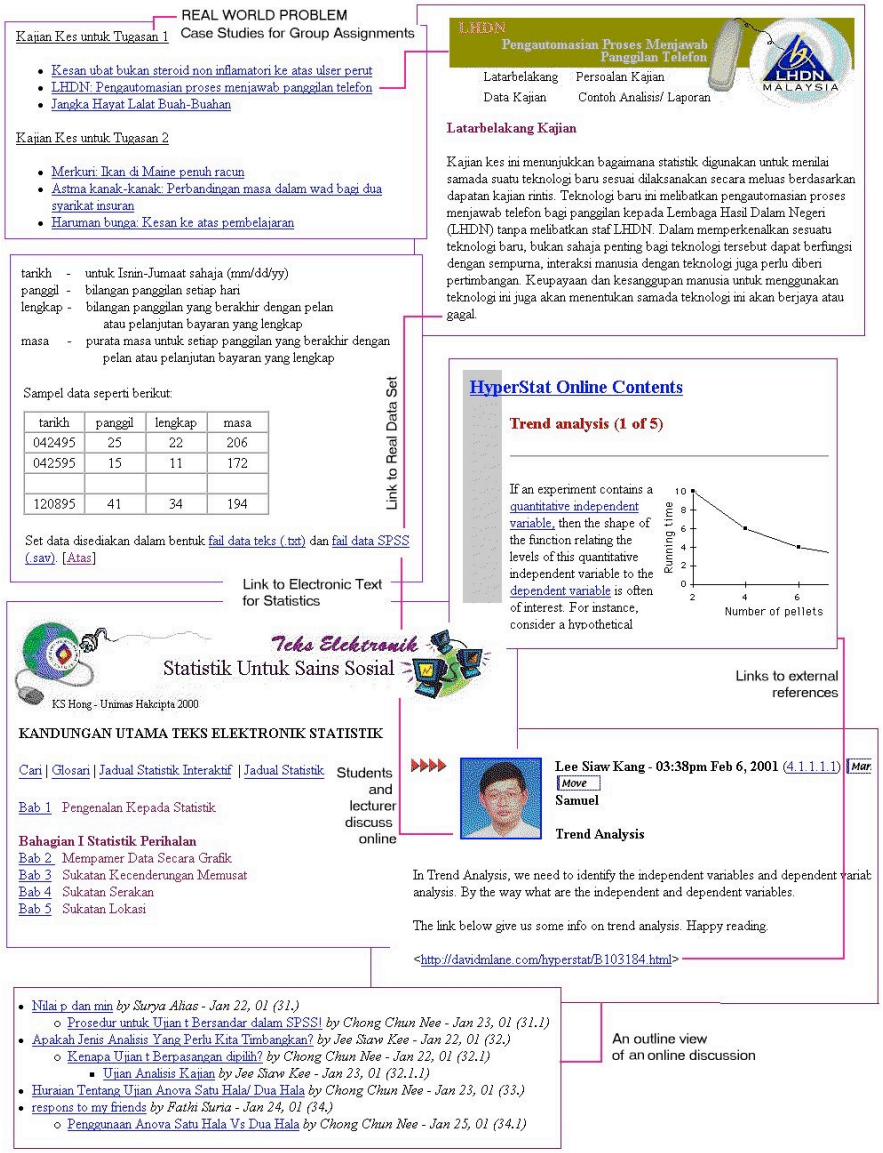

Figure 8: Real world problems and related links

The real world problems provided data sets for students to practise the statistical analyses. These problems were also linked to sample solutions of other related problems, related online reference material available within

the course Web site and external reference material provided by the instructor or the students during their discussions (refer to Figure 8).

Another key feature of the learning environment was the facility for students to present their work. Discussions centred on their presentation enabled them to articulate and defend the understanding they had formed through their group interactions.

This was achieved in this Web based course by requiring students to present their group assignments online to be discussed and commented upon by their peers. This exercise of online presentation of students' assignments was a crucial part of their learning experience. Students assimilated and accommodated their own group mediated learning with ideas from peers through the exchange of ideas and reflection on their own group's work (Figure 9).

Initial findings of the Web based learning environment

Data collected for this study has not been fully analysed. This paper only reports some observations and reflections of the course instructor as well as some informal online communications between the instructor and students.

From the instructor's perspective there were some positive aspects of the Web based environment that benefited both the students and the instructor. The instructor has enriched his own learning experience during the asynchronous discussions with the students. The asynchronous discussions were not constrained by time and space, enabling students to raise diverse learning issues. These learning issues were of greater depth than those generally raised in face to face interactions and on occasions did overlap with other courses such as the research methods' course. The instructor has also widened his scope of expertise, not only within the boundaries of his course, but also in related areas.

The tools available online freed the instructor from the usual tasks of preparing and presenting notes using overhead transparencies or other means. This enabled the instructor to focus on guiding the students through monitoring the asynchronous online discussions, and providing feedback to tutorials and students' queries through email messages. For example, from Week 7 to Week 9 of the course, there were 31 incoming email messages and 59 outgoing email messages. During the same period, there were four group discussions with a total of 300 messages for the three weeks period (Figure 10).

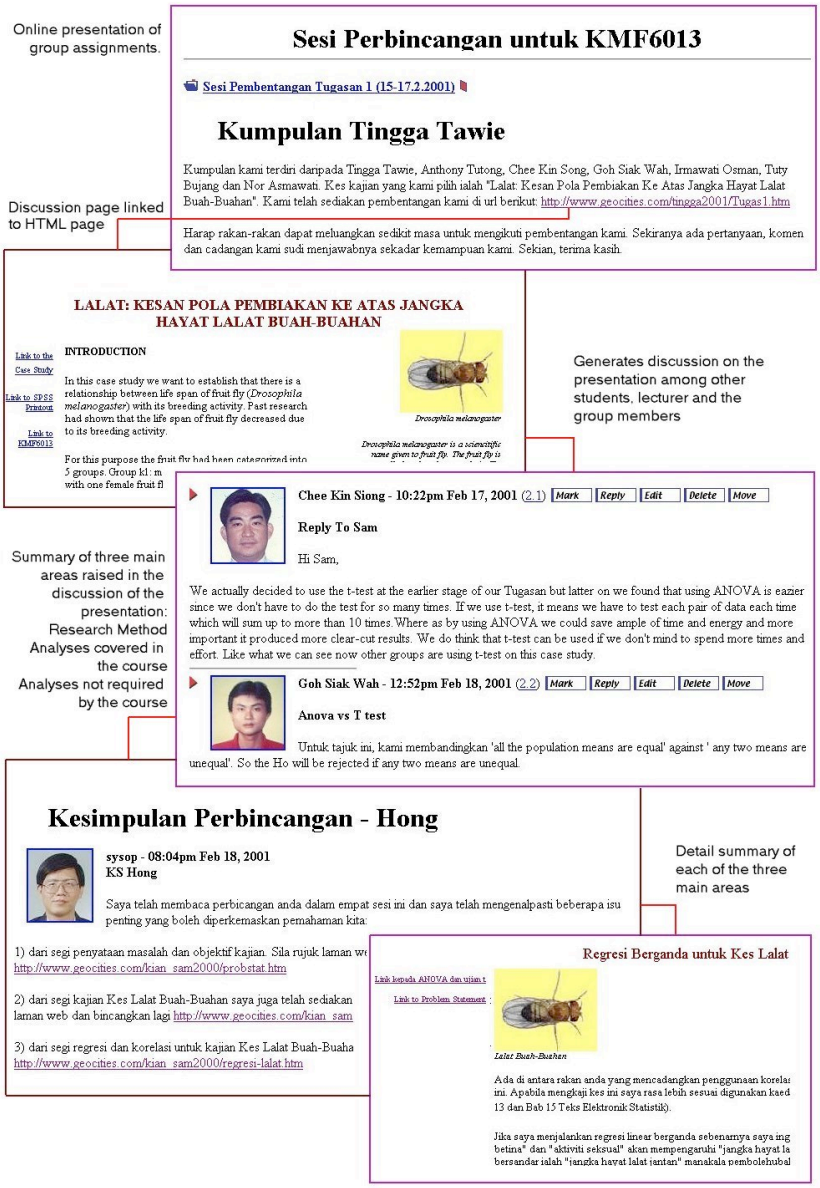

Figure 9: Students' presentations of group assignments and subsequent interactions

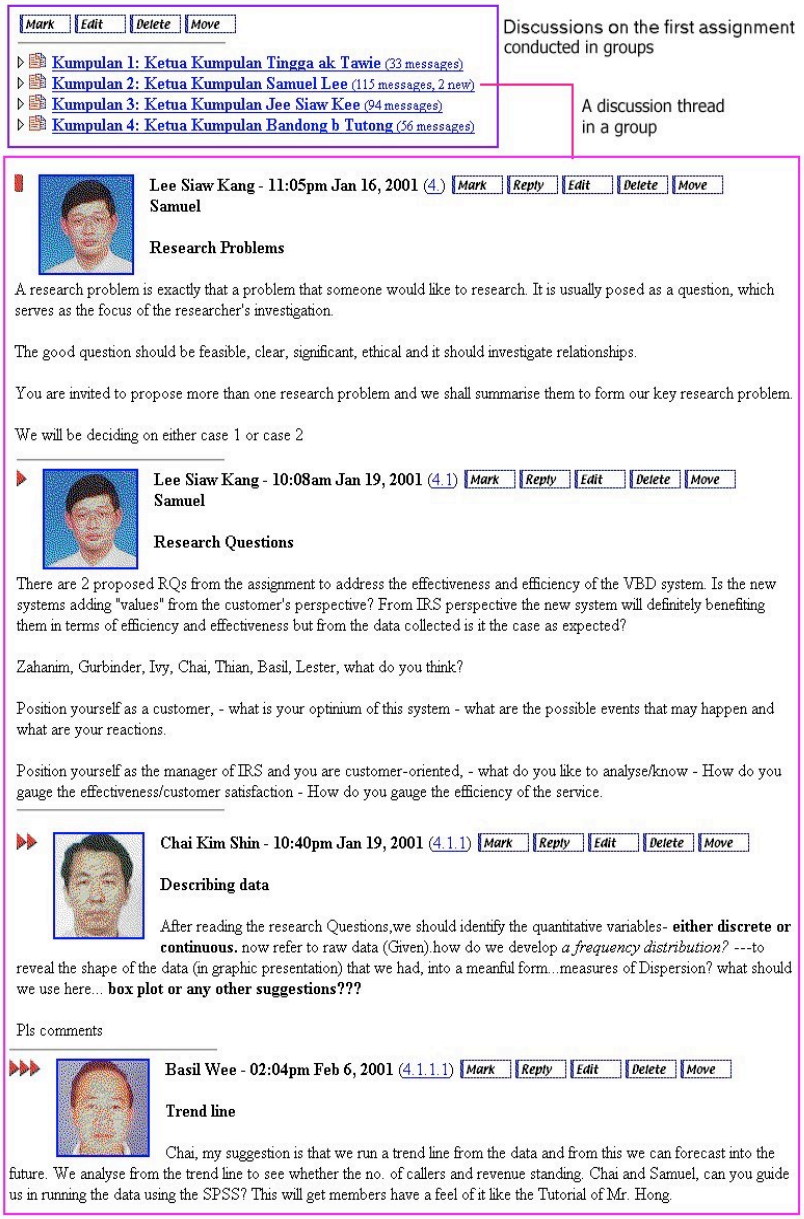

Figure 10: Excerpts of a discussion thread during an online group discussions

The instructor was also able to identify those students who has not been active in the group online discussions (Figure 10). This was an improvement on the regular face to face group work where students tend to work unsupervised. In regular face to face group work, the instructor cannot identify students who are free riding on others' efforts. Free riding defeats the purpose of acquiring learning through group activities.

The instructor redirected and helped the students by monitoring online discussions using email messages to respective individual and group leaders or by posting messages to the discussions. Thus misconceptions and errors were corrected earlier in the course and not just realised during the summative assessment stages.

The instructor felt that he had spent more time conducting this course online than he would have done through the regular face to face sessions. Although there were no lectures, a considerable amount of time was spent monitoring, providing hints and advice during the asynchronous discussions. The two-day time period for providing feedback to the tutorials also took up a substantial part of the instructor's time. However the effort was worthwhile as the instructor felt that he was able to provide a wider coverage for the able students and achieved a comparable, if not a slightly better, learning experience for the average students on the course.

Some extracts from informal conversations and email messages between the instructor and students are listed below:

> "An interesting and challenging way to learn"
> "Forced us to learn and use computers and the Internet regularly"
> "The tutorials forced us to learn"
> "An interesting approach that can be used as a model in my work environment"
> "This course is challenging and compels us to learn independently and in groups. We also need to apply what we learn not only from this course but from other courses while completing the group assignments"

These extracts indicated that some of the students were enthusiastic with the Web based learning environment. They were also pleased that they had an opportunity to learn and practise using computers and the Internet during the course. For example, the comment that "the course was conducted in an interesting way that could be used as a model in my work place" was made by a student who worked as a Human Development Officer in an Information Technology related firm. The student was comfortable using the Web based learning environment and thought that it could be adopted as a means of providing training to staff in his workplace.

The student who made the comment that the course was challenging and forced the students to apply what they had learnt in this and related course was involved in making decisions on carrying out surveys for his department. The course learning environment provided the student with the experience of actually going through the process of conducting research and doing statistical analyses. Another student was happy with the Web based learning experience because it enabled study without having to travel to UNIMAS. The student could learn at his own pace and time and was able to complete most of the assignments on schedule.

However, there were some negative reactions to the course. Some representative comments are listed below.

"I am computer illiterate"
"I don't have confidence to learn alone"
"I am afraid of mathematics"
"The tutorials grades are too low"
"My computer is not operational"

The student who claimed that "I am computer illiterate" was a teacher training college lecturer who had attended various computer courses. She had been well exposed to the basic skills and knowledge of computers and the Internet. However she was reluctant to accept the technology fully for the course and in her work. Nevertheless after two informal face to face sessions during the first two weeks of the course, the student was able to surf, download and print the necessary files and use the other features on the course Web site. In general, the student was still hesitant in using the Web based learning environment. However from the instructor's observations, the student was able to gain the necessary knowledge and skills from the Web site and obtained an above average grade.

The remark "The tutorials grades are too low" revealed that some of the students in this course were more interested in getting good grades rather than learning from the course. It had been stressed during the first face to face briefing session that the function of the tutorials was to guide and help the learning process. The tendency was also for students to wait for the instructor to provide model answers and notes.

The instructor had previously taught the same course five times for the Master of Science in Human Resource Development program over a period of three years. The quality of tutorials and assignments submitted did not differ. In fact there was improvement in the quality of work submitted from those who worked hard in the course as the instructor could provide immediate and detailed feedback for all the tutorials and group assignments during and after the activities had been completed.

Accessibility to Internet ready computers should not be an issue in this course. All the students have access to computers that could access the Internet either at work place or at home. The computer laboratory was also open for the students if they informed the instructor in advance. Furthermore, the university has Internet connected computers at the Centre for Academic and Information Services (CAIS). A few students who occasionally faced problems with their computers utilised these facilities. However there were two students who persistently used the excuse of "My computer is not operational" as a reason for late submission of tutorials or a lack of participation in the group online discussions.

From the perspective of the computer software and hardware, the instructor did not encounter major problems. All the HTML pages were developed using Microsoft FrontPage and the graphics used were scanned and modified using Paint Shop Pro (a shareware program). The asynchronous online discussions used an evaluation copy of Web Crossing (http://www.webcrossing.com), a computer conferencing program. The Web Crossing software was stable and provided an efficient, effective and simple discussion forum for the course. During the first two weeks of the course there were some problems with the server shutting down during a thunderstorm and erratic services from the Internet Service providers. However by the third week of the course, the system stabilised and there were few disruptions to the learning process.

Conclusion

In conclusion, initial observations indicate that it is possible to have quality learning experiences through a Web based course. Most of the students in this study found the course challenging and the learning experience beneficial. Students needed to use the knowledge obtained from the course in practical situations and to communicate their learning to their peers. Sharing of knowledge and thoughts through online discussions was an integral part of the course. The instructor found that he had to have a better understanding of the student and related students to answer the various practical questions raised by the students during the online discussions. The instructor also learnt together with the students as they explored and extended beyond the depth required by the course. However, students should be proactive rather than reactive in learning using a Web based course.

Nevertheless to obtain a better understanding of the pilot Web based course, there is a need for further in depth analysis of the data obtained. The results will serve as an important stepping stone to further improve the quality of this course in the future.

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