

Students' Perceptions of the Technological Supports for Problem-based Learning

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Abstract This paper reports students' perceptions of the technological supports that assist problem-based learning (PBL). There are a number of tasks in the PBL processes, which can be supported by technological advances. A Web-based system has been developed to support the problem-based learning strategy. The system provides facilities to both teacher and students to facilitate learning and teaching. These include on-line teaching materials retrieval, a discussion area for problem analysis and brainstorming, a facility for project planning and monitoring, a private group area for the purposes of discussion, a facility for the submission of development work and learning resources, and a posting area to display good work to motivate students. The progress of the students can be monitored and feedback can be given to them. This paper presents a pilot study of student views of and preferences for various technological supports used to enhance learning effectiveness.

1. INTRODUCTION

The author undertook a learning and teaching project in the autumn of 1999, with the aim of promoting problem-based learning in the subject Information Systems Analysis. The PBL approach was introduced for the first time to teach Information Systems Analysis to second year students in the Higher Diploma in Information Systems programme. It was the only

subject in the programme that used the PBL approach, with which students had no prior experience. However, it was envisaged that students would learn better with the PBL approach, which is facilitated by technological advances.

Problem-based learning is a promising recent development in tertiary education, which recognises the need to develop problem-solving skills as well as the necessity of helping students to acquire necessary knowledge and skills (Boud and Feletti 1997). The amount of direct instruction is reduced in problem-based learning, as students assume greater responsibility for their own learning. Students are given ill-structured problems through which they develop high-order thinking and problem-solving skills. The shift in the teaching and learning process is more student-centred than teacher-centred. The teacher as knowledge provider becomes less important as students learn from other students, the World Wide Web (WWW), and from other information resources. The role of the teacher is to encourage student participation, provide guidance to students, offer timely feedback, and also assume the role of learner (Roblyer et al. 1997). A problem case, unlike a case study, provides less information to students and requires them to do more information searching. There can be alternative solutions to a problem, through which students learn to make evaluations and justifications. Problem cases, which require students to tackle ill-structured problems, not only develop interpersonal communication and social skills, but also stimulate critical thinking, creativity, and problem-solving skills.

Many universities around the world are using the WWW in direct support of teaching and learning, as both a primary means of information delivery and a supplement to classroom teaching (Harasim 1999). The use of the Web as a teaching resource can benefit students (Milheim and Harley 1998, Sloan 1997). Students can learn better when the pedagogical process of PBL is supported by technology to foster teaching and learning. Learning and teaching courseware is available (Blumenstyke 1999, Frederickson 1999) and the author's university has been using WebCT as the teaching platform since September 1999. Nevertheless, WebCT features are unable to support the various PBL processes, in particular project planning and controlling, and private discussion facilities for collaborative learning, which are important processes within PBL. Thus, a Web-based system has been developed to support PBL instead. The technology provides facilities for both teacher and students to facilitate learning and teaching. This paper presents a pilot study of student perceptions of the technological supports used to enhance learning effectiveness.

2. HYBRID PBL APPROACH TO EFFECTIVE LEARNING

The introduction of a hybrid approach to PBL may be more appropriate for undergraduates. A full PBL approach with less lecturing, more students working in small groups, and more self-directed learning, may not be appropriate initially for two reasons. First, most undergraduate students are accustomed to teacher-centred learning and they may need a short period to get used to the PBL setting. Another consideration is that their academic achievements may not be the best. Expecting students to be able to read well and provide answers to ill-structured problems initially may not be workable. Second, every subject is time-tabled and designated with both lecture and tutorial hours. As such, this is an institutional constraint, because teaching activities need to follow these patterns. However, there follows a gradual reduction in formal lectures for knowledge dissemination, with the replacement of more discussion activities that take place during lecture hours.

A number of PBL strategies have been tried in learning and teaching (Tang et al. 1997). The author used the hybrid problem-based learning strategy, with students working in teams of six, as follows.

- Teaching materials can be accessed on the Web and students prepare for classes
- Students are given problem cases that simulate real-life situations
- Brainstorming sessions are held to identify learning issues
- A group project plan is formulated
- Students undertake self-directed and collaborative learning
- Each group of students presents their findings (report writing and presentation)
- Exemplary work is posted on the Web for experience sharing
- Students reflect on what they have learnt through feedback.

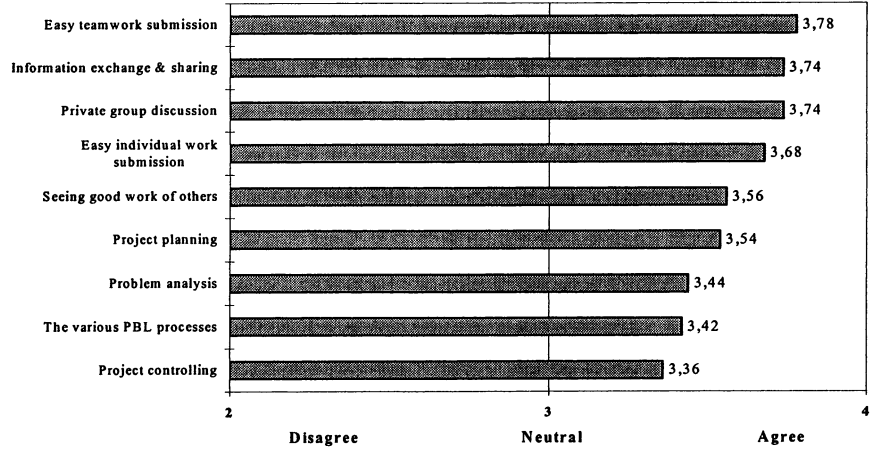
The Web-based system provides functionalities to support the various PBL processes are shown below.

PBL processes	Technological supports in the Web-based system
Problem cases	Posted on problem case area
Identifying learning issues	Problem analysis
Group project planning	Group project plan
Self-directed learning	Reading – Teaching materials are posted on the Web (Teaching materials area)
	Searching – Information search through the WWW
	Understanding – Individual work submission

Collaborative learning	Group discussion
Report writing and presentation	Teamwork submission
Reflection	Feedback, posting area (showing good student work), bulletin board

3. STUDENTS’ PREFERRED TECHNOLOGICAL SUPPORTS FOR PBL

Table 1 . Students' preferred facilities on the Web site



Student learning can be enhanced when the pedagogical process of PBL is supported by technology. A Web-based system provides functionalities to support the various PBL processes. Teaching materials, problem cases and PBL guidelines are posted on the Web. Facilities such as private group area for discussion and brainstorming, a problem analysis area for identifying learning issues, a simple table for group project planning, individual work and teamwork submission facility for on-line work submission, and a posting area for displaying the exemplary student work – are all intended to enhance better learning and teaching. Students were requested to rate their preferred facilities on a scale of 1 to 5, with 5 being the highest score and 1 the lowest. Table 1 presents students preferred facilities on the Web site. The following sections describe in detail the students’ perceptions of the technological supports.

3.1 The author's views on posting teaching materials on the Web

Students are interested in receiving the teaching materials available on a course Web site (Holmes 1999, Weible 1999). They can download subject information (subject syllabus, teaching plan) and teaching materials (lecture notes, review questions, references, problem cases and problem-based learning guidelines). Students are encouraged to develop the habit of making preparations for lectures. They are also encouraged to raise questions for discussion in class and there is little doubt that they will understand the subject better. As students participate more in class discussion, the atmosphere of a lecture session is enhanced. The usual one-way method of communication that most teachers use is dull and uninteresting. Since the teaching materials are stored in PDF format with four pages of materials printed on a page, the content is legible but paper is saved in printing. Teaching materials are useful to students and can be updated easily. The Web-based system also solves the problem of photocopying overhead projector transparencies in the production of handouts.

3.2 Students' perceptions of receiving teaching resources on the Web

Despite the tremendous efforts that have been used in preparing the teaching materials and posting them on the Web at the beginning of the semester, it is surprising to find that students do not, in general, use this facility to its best potential. Table 2 presents the students' views of receiving teaching resources on the Web. With the teaching materials available on the Web, students do not make use of the resources in making preparation for lectures. They download the lecture notes for lectures without much preparation. As such, they fail to learn how to prepare for lectures. The number of questions raised in class is the same as with the traditional teaching approach. However, some students do make preparation for lectures and posting teaching resources on the Web can improve their learning style, as they need to print the lecture handouts for lectures. They also find the supplied references useful for obtaining more information.

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