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# Using a blended learning approach to support problem-based learning with first year students in large undergraduate classes

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**Abstract.** This paper describes an exploration of the use of a technology-enabled problem-based learning approach undertaken with a group of first year students. The exploration sought to determine students' responses to the learning setting and to investigate its ability to successfully cater for the diverse needs and expectations of the subjects.

## **Introduction**

Most universities today recognise there are particular learning needs for first year students [1]. Students entering university courses often need to develop a number of skills and capabilities to achieve success. First year students come from a range of previous positions including school, the workplace and often unemployment. Students quickly need to be able to assume responsibility for their own learning, to undertake independent research and inquiry and to communicate and argue their ideas in a succinct fashion [2].

This paper describes an exploration of the use of a technology-enabled problem-based learning approach undertaken with a group of first year students. The exploration sought to determine students' responses to the approach and to investigate its ability to successfully cater for the diverse needs and expectations of the subjects.

## **1. Contextual Factors Influencing Learning Outcomes**

### *1.1 Teaching First Year Students in Large Classes*

Students in their first year of study typically find themselves in large classes as they undertake foundation and preparation for more specialised courses in subsequent years. Large classes provide institutions with economies of scale but also provide some risks. For example, there are usually higher attrition rates among students in large classes as they invariably fail to cater adequately for the individual needs of some learners. At the same time, the delivery modes within large classes tend to be impersonal and alien to many students who have come from settings where learning has been undertaken in smaller and more supportive settings [1], [2].

### *1.2 Problem-based learning*

Problem-based learning is a delivery form that that uses strong contextual elements in the learning process. In problem-based learning, learners are actively engaged in the learning

process as they seek to develop solutions to problems. The problem-solving process gives the learners ownership of the learning process and encourages the development of skills and knowledge that are transferable beyond the classroom setting [3].

In many university courses, the learning outcomes that are sought comprise skills and knowledge acquisition. Successful learning is measured by the extent of the knowledge and understanding acquired through such means as examinations and assignments [4]. In such settings the content and course information is presented to learners in such formal settings as lectures and seminars and students complete activities and tasks which are intended to consolidate their knowledge acquisition [5].

### *1.3 Blended Learning*

Blended learning describes an approach to learning where teachers use technology, usually in the form of Web-based instruction, in concert and as a supplement to, live instruction, or perhaps utilise components of a learner-centred Web course with components that require significant instructor presence and guidance [6].

The strength of a blended learning approach is that it provides a means to ensure learners are supported and guided as they undertake independent learning tasks [7]. Use of the Web in such settings provides many affordances for the teacher and students in the form of communication channels, information sources and management tools. These aspects appear to make blended learning particularly well suited to first year students, especially those in large groups where direct instructor support may be difficult to deliver [8].

## **2. The Learning Environment**

Students studying the Bachelor of Communications at Edith Cowan University are required to complete a foundation course which develops their skills and abilities to use technologies as productivity tools. The course previously involved a study of multimedia technologies and covered such topics as hardware, software, communications, the Internet, multimedia development strategies, project management, an introduction to instructional design and copyright. At the same time, students learned how to use the Web as a research tool, word processing, presentation software and Web page development. The course was very content-driven and was intended to provide a sound basis for further studies in the field.

In planning the delivery of the course a PBL and blended learning approach was developed. The delivery of the course was designed around a series of weekly problems, each of which was intended to provide a context for student learning and whose solution would provide evidence of the scope of learning. A series of capabilities was selected and the course content and activities designed to foster knowledge and skills acquisition.

### *2.1 The Course Delivery Strategy*

An online tool was developed that would support the blended learning approach for a large first year cohort. The Web-based tool was based on a PHP-MySQL database. Students in the course were divided into groups of 25 and each group allocated a tutor. Students were required to attend en-masse a weekly lecture during which the weekly problem would be introduced and discussed. In the lecture students would be exposed to the underpinning knowledge and content and shown how to delve further using the Web as an information source. Students were then required to attend a 2 hour weekly workshop in their small workshop group with their tutor where they were required to complete tasks to build their skills in such practical activities as graphic design, Web searching, graphics design, use of word processors, presentation software and Web page development. A Web site was used

to provide learners with access to all the course materials including course notes, weekly problem descriptions, workshop tasks and software instruction. At the completion of each workshop activity, students would then work individually to solve and submit the weekly problem, a task that was intended to take students up to 2 or 3 hours of independent work.

Students would login to the PBL system and submit their problems. The system would upload the file (eg. a Word or pdf file) and record the date and time of posting. Each tutor would then log into the system, download the file and mark the problem. Tutors recorded a mark for 5 pre-determined criteria common across all problems, and gave brief written feedback all of which were entered into the system. This information then showed in the students' workspace ahead of the next lecture.

This pattern repeated across the semester. Students were required to submit only 5 problems of the 10 and received an assessment based on the aggregate score received (or the aggregate of the 5 best scores if students attempted more than 5 problems). As a new approach, it was felt important to monitor student activity and progress and to seek feedback to determine the success of the approach in supporting learning for all students.

## *2.2 Research Questions*

A study was undertaken to explore students' responses to this alternative learning approach and the ways in which the course catered for the needs and expectations of the learners in their first year of study. The aim of the study was to explore students' levels of comfort with the course and the forms of problems and learner engagement that best suited this form of course delivery. The study sought to gain responses to 2 research questions:

1. How satisfied were students with this alternative approach?
2. What types of problems did students prefer to solve?

## **3. The Study**

Three hundred and twenty students enrolled in the course and it ran with 12 workshop groups supervised by nine different tutors in total. Students were presented with an online questionnaire after the course had been running for 10 weeks and feedback was sought. The feedback was a voluntary activity and 125 students responded in a timely fashion to the online questionnaire which consisted of 10 multi-choice questions and 10 short answer questions. The questionnaire asked questions about their levels of interest and engagement in the problem solving activities and their preferred problem forms and types.

### *3.1 Student satisfaction with blended PBL approach*

Student response to the questions indicated relatively high levels of satisfaction with the identified delivery issues. In relation to levels of interest, 80% of the students gave what was considered a positive response (either, medium high or very high) and the average response 2.98. The large majority of the students (61%) reported a medium level of interest being attained. Nearly 90% of the students indicated a positive level of challenge in the problems they faced. Across all areas, the positive response rate was in the range of 80%, suggesting the course was satisfying to the majority of students. It is interesting to consider the 20% of students in each case reporting low or very low levels of interest, challenge, learning and success. This represents a large number of students in a class of 320, and it is interesting to speculate how such students might better be catered for. After all this approach provided considerable scope to learners to tackle the problems at their own level, in their own way.

### 3.2 Students' problem preferences

There are many possibilities in the choice of problems for a course of this nature and problem selection was seen as an important element in influencing student satisfaction and learning outcomes. In the design of the course, problem selection was based in all instances on the desire to create a meaningful context for dealing with the course content and developing skills and abilities in use of the knowledge. Some of the problems required students to undertake research and to propose and justify the solution. These tended to be more theoretical in nature than the others. Other problems required students to design and develop a product and to provide some justification of the design decisions made.

When asked to select the problem they preferred the most, every problem received at least one nomination. The problem that was the clear leader among students was the design of a course logo. This problem was the preferred choice of 31% of the students. The problem least preferred by students was a problem which required students to research an art form and to describe the visual design principles employed in shape usage. In analysing this feedback, it was apparent that students tended to show a distinct preference for the design problems and a distinct lack of preference for the research problems.

## 4. Summary and Conclusions

The findings from this study appeared to provide strong support for the premise that a problem-based teaching approach delivered using blended learning involving Web-based tools and direct instruction could provide strong supports for first year students in large class settings. Most students demonstrated positive levels of satisfaction with the approach to learning and indicated the approach did support their learning. The form and type of problem was found to influence students' levels of satisfaction with more practical and relevant problems being preferred to those that were deemed to be theoretical and less applied. Despite the overall positive responses, there were still, however, many students who indicated some problems with learning in this fashion. Further research seems warranted to explore strategies by which such a setting might cater more broadly for all students in the large class setting.

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