

# PROBLEM-BASED LEARNING & IT TO SUPPORT AUTHENTIC TASKS IN TEACHER EDUCATION

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## **Abstract**

*Teachers take on a wide range of roles in a school, yet most teacher education courses prepare students for only the role of classroom teacher. A problem-based learning approach to teaching and learning and IT-based resources in a technology-rich learning environment have been combined to provide undergraduate education students with an exciting and innovative way to learn about IT in schools. This paper explores how problem-based learning and technologies have been utilised to provide opportunities for learning about IT in schools through: solving authentic tasks; taking on leadership roles; working as a team; and collaborating on solutions to ill-structured problems.*

## **Keywords**

*teacher education, problem-based learning, authentic tasks, leadership*

## **Introduction**

The roles of a teacher include not only teaching and classroom activities, but also many other roles such as curriculum planner, decision maker, human resources manager, technology manager, team member, and team leader. A problem-based learning (PBL) approach is applied in the subject *IT in Primary Schools* at the University of Melbourne to project undergraduate students into their future role as teachers, to enhance their learning, and to prepare them for the varied roles of a teacher through authentic tasks and scenarios. The subject is supported by a website that includes a rich description of a (fictional) primary school (and its inhabitants) in which the problems are set and the subject conducted in a technology-rich teaching space. This subject is part of the Bachelor of Education (Primary) [B.Ed.(Primary)] degree, which is a four year course of study and the principal vehicle for the education of primary (Elementary/K-6) teachers at the University of Melbourne. During the third and fourth years of the B.Ed. (Primary) degree students select one optional subject each year, allowing students flexibility to strengthen an area of interest or to broaden their knowledge. *IT in Primary Schools* is one of the optional subjects and runs over 18 weeks with a two hour block each week. The tasks students undertake are designed to develop their content knowledge, to give students experience in teamwork, and to develop skills and knowledge about being a leader in the context of decision-making about IT issues in a school.

Using a PBL approach for this subject was examined when new graduates told us that in their first year of teaching they were members of the Information Technology Committee (or equivalent) at their school. This is a large role for a new teacher and one for which little of their university studies had prepared them. This subject was developed in response to this need. It gives our students experience in tackling the kinds of IT issues that they are likely to encounter when a teacher, and to experience the roles of committee member and chair of a committee with responsibilities for developing a report with recommendations for a school council or principal. PBL allows students to develop both the content knowledge and the transferable skills required in the many roles of a teacher, with this subject having a particular focus on leadership roles.

The subject was offered for the first time in 2001 and data to evaluate the effectiveness of the subject are currently being gathered from student reflections, tutor's journal and staff reflections. Preliminary findings indicate that students respond well to this style of learning and develop skills and understandings not developed elsewhere in their studies. The first semester feedback from students in the University's 'Quality of Teaching' survey was excellent — scores ranged from 4.4 to 4.9 (out of 5). That the response to the statement 'The subject was taught well' scored 4.6 is both pleasing and interesting, as there was no 'teaching' (but lots of learning!) in the subject. Further data will allow a more substantial evaluation of this approach to teaching and learning in teacher education. This paper will discuss how PBL, web-based resources, and a technology-rich teaching space combine to give a rich learning experience for students.

## Using PBL and a Rich Subject Website to Support Learning

Finkle and Torp (1995) describe problem-based learning (PBL) as:

*"a curriculum development and instructional system that simultaneously develops both problem solving strategies and disciplinary knowledge bases and skills by placing students in the active role of problem solvers confronted with an ill-structured problem that mirrors real-world problems"* (online).

The subject employs a problem-based learning approach (see also Stover, 1998; Stepien & Gallagher, 1993) and each problem is explored in a four week cycle (see Table 1). The students work in teams of four students and tackle four problems involving IT in a fictional primary (K-6) school over the course of the academic year. The role of the team is that of a committee that respond to briefs developed by the principal or school council. The team leader is in the role of committee chair and the team members act as committee members. Teams meet in scheduled class times once each week and also meet – electronically or in person – outside scheduled classes.

### **Week 1 (of 4 week cycle)**

- An introduction to the problem and a discussion that raises general issues. This is supported on the website with notes, links to useful sites and articles, and supporting artefacts about the scenario for the problem.

### **Weeks 2 & 3 (of 4 week cycle)**

- Teams work on the problem, with staff available to mentor the teams. Experts (principals, teachers, and others) are available (via email) to team leaders.

### **Week 4 (of 4 week cycle)**

- Teams present their recommendations to the group, the style is similar to a School Council meeting and students critique and discuss the recommendations of each team.

*Table 1: Activities during the four week cycle of each problem*

The problems are all set in the same (fictional) primary school and are:

- developing curriculum plans for effective use of IT in classroom teaching;
- allocating and justifying a three year IT budget for the school;
- developing a professional development strategy for IT skills of the staff;
- developing a three year IT Strategic Plan for the school.

All subjects taught in the B.Ed. (Primary) course have a website to support the on-campus, 'face-to-face' teaching. Subject websites are routinely used by students for accessing subject materials, including topic outlines and workshop notes. It was, thus, natural that materials to support this subject would be delivered online as part of the subject's website. The technology allows us to include rich resources for the students to explore the fictional school and to host electronic discussions to support the problems. Making artefacts that support the problems available through the subject's website also allows us the opportunity to model to our students some ways of using technology to support teaching and learning.

The students access, via the subject website, a rich description of the school with artefacts, such as

budget documents, IT skill profiles of staff members, and a plan of the school. Teams of four students explore the context of the problem and tease out aspects of the issues they need to investigate and consider. The materials may be text, images, or ‘school documents’, as appropriate. In addition to the artefacts, external experts are available for team leaders to communicate with via email. These experts are teachers, principals, or others that have expertise in aspects of the problem and have experience in how their schools have approached a similar problem. The experts are drawn from the Australian educational community and are experienced educators who have volunteered to work with our students and mentor them through the problem.

In keeping with the PBL approach, the problems are not so tightly defined that there is a simple answer – there is no single ‘right’ answer to any of the problems. It is expected (but not required) that students will develop recommendations that differ from team-to-team and that students will learn much from considering and critiquing the recommendations of other teams. Each team develops recommendations that students present to the group and to academic staff members in a ‘School Council’ style of meeting and that teams prepare as documents for submission. Students take on the role of team leader on a rotating basis and are responsible for compiling and submitting the report and coordinating their team’s presentation. This allows students to gain experience in working as a team and in leading and coordinating a team to meet a deadline. These are highly valued transferable skills for students to gain, in addition to the content knowledge developed.

Four problems are explored over the year and at the conclusion of each problem students individually prepare a brief reflection on the problem, their learning, and the team process. This is an opportunity for students to consider the ways in which they learn, and how they could improve as a team member or team leader. This opportunity for reflection on learning is an important aspect of PBL (Holen, 2000).

## Technology in the Teaching and Learning Space

As the subject’s content area is ‘IT in Schools’ it is natural that we wish to model excellence in using appropriate technologies to support teaching and learning. We are fortunate to have access to a learning space equipped with technologies that facilitates collaborative teaching and learning for up to 25 students in five groups, and for whole group discussion (Arnold & Gruba, 2001). Each team is based at an oval table with one computer for each team (Figure 1). With only a little rearrangement (pushing back some chairs) the teams can join as a single group to share ideas and discussion. This is facilitated by a data projector, a touch-screen electronic whiteboard (a ‘SmartBoard’, Smart Technologies, 2001), and a data collaboration network (NetSupport, 2001). The technology in the collaborative teaching space gives the students an opportunity to use and become familiar with technologies that may not yet be available in schools, but are likely to appear there some time in the future, and experience learning in a technology-rich environment. This is important, in particular, for education students as, if they have learned in a technology-rich environment they are more likely to be comfortable teaching in one.

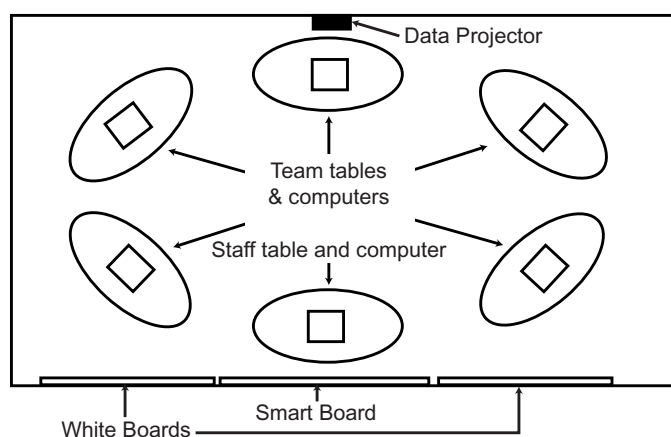


Figure 1: Physical arrangement of collaborative teaching space indicating team tables (each with one computer), staff table and computer, and projection device and ‘SmartBoard’

## Conclusions

The resources and style of teaching utilised in this subject for undergraduate teacher education at the University of Melbourne allow our students to investigate, in a technology-rich environment, authentic issues involving IT in a school and develop recommendations. These experiences in working as a team member and being relied on to contribute, in leading a team and coordinating the process and the outcomes, and in presenting the findings to peers and staff give the students invaluable opportunities to develop knowledge and skills in a way quite different to traditional university teaching styles. The effectiveness of this approach to teaching and learning is indicated by the following quote, which is from a reflective piece of work from a student in the subject:

*Working through this problem enabled me to think about the sort of teacher that I want to be and how I would like my students to learn. Constructivism and PBL model effective teaching practice about teaching and learning.*

Using problem-based learning, supported by appropriate technology and by experts, has allowed our students to analyse authentic situations at a school level and consider alternative solutions or paths of action while working in a team. Elements that strongly influence students' experiences and learning are that students do not work on these materials alone, but rather must discuss their findings with colleagues and work as a team to arrive at conclusions, and the collaborative, technology-rich environment facilitates both small team work and larger group discussions. The need to reflect on observations and share with others and develop the skills required in being a successful team member will, we believe, serve our students well in becoming leaders in the rapidly changing environment of schools of the twenty first century.

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