

PROBLEM BASED LEARNING ASSESEMENT ENHANCED THROUGH THE INTEGRATION OF TECHNOLOGY

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Abstract

This paper explores the development of assessment to support a Problem Based Learning (PBL) approach to delivering two Masters Units at the University of Tasmania (UTAS). Australian universities have become more focussed on increasing their student numbers by marketing to, and recruiting students from, other countries. At UTAS, international students predominately undertake postgraduate coursework programs. Many international students enrol in Australian university courses with low level English language skills. Additionally, their previous educational experiences have embedded culturally based approaches to pedagogy adopted within their home countries. In particular, an emphasis on rote learning does not prepare international students with skills for developing graduate attributes such as problem solving, communication and critical analytic thinking skills. Australian universities, particularly those with large numbers of international students, thus face considerable challenges in effectively delivering their programs.

In 2009 a PBL approach was adopted for one unit in a Masters program in order to address the issue of poor participation and engagement by students [1]. In 2010 a new unit was developed that also adopted a PBL approach. The staff responsible for these units have worked in collaboration and identified a need to redesign the assessment in the PBL units to focus on the student learning journey rather than the problem solution.

An integrated approach to assessment was developed providing both the student and the staff with multiple pieces of evidence to demonstrate the student learning journey. Technology was a key element in the development of the assessment with the inclusion of eportfolios (PebblePad) and UTAS Wikis (Confluence by Atlassian) in addition to the UTAS education platform MyLo (Blackboard). For students the PebblePad technology provided a tool to document their individual learning journey by creating assets that were drawn upon as evidence of engagement and participation in the learning journey. A variety of assets were created over several weeks and then used to create an ePortfolio, which was assessed. For the unit instructors, Confluence is a wiki technology that provides the opportunity to monitor, comment and give feedback to student teams using the wiki to collaborate on group-based assessment items.

The PebblePad and wiki technologies have been included for use in the two units to provide students with an integrated learning experience in which each piece of assessment is related to and supports the others. Thus everything the students do and learn can be repackaged as a PebblePad asset that is in turn available as evidence for assessment via the construction of their eportfolio. The wiki technology supports student collaborating with each other and can be drawn on for evidence of the learning journey. It also supports the two instructors in discussing and evaluating the students' progress.

Keywords: Problem Based Learning, technology, assessment, Higher Education.

1. INTRODUCTION

In Australian universities continue to receive public funding from the Federal government this funding is linked to meeting local enrolment allocation targets. For regional Universities, especially, the pressure on meeting these growing targets has continued to increase given the limited size of the local Australian market. International students, while not filling the void of low local enrolments, provide an opportunity for Universities to increase any short fall in revenue as these students are full fee paying. As a result, Universities have been very active in turning their attention to offshore enrolments with a view of marketing and recruiting substantial numbers of international students

At the University of Tasmania (UTAS), international students predominately undertake postgraduate coursework programs. Many international students enrol in Australian university courses with low level English language skills. Additionally, their previous educational experiences have embedded culturally based approaches to pedagogy adopted within their home countries. In particular, an emphasis on rote learning does not prepare international students with skills for developing graduate attributes such as problem solving, communication and critical analytic thinking skills. Australian universities, particularly those with large numbers of international students, thus face considerable challenges in effectively delivering their programs.

Stepien et al [4] broadly defines problem based learning as an apprenticeship for real life problem solving where student are faced with a situation with undefined problems, incomplete information and unasked questions. This paper is the second paper in a series of papers that explores the development of a Problem Based Learning (PBL) approach to delivering masters units at UTAS. The first paper "Engaging International Students through PBL" [1] described and evaluated the restructuring of a single unit in the Master of Information Systems using a PBL approach. This approach was initially introduced in an attempt to overcome issues of poor attendance and lack of engagement on behalf of the students observed in delivered using the more traditional approach of lectures and workshops.

The redesigning of the masters unit achieved the aims of engagement and moving the unit to the next level on Kirkpatrick's [2] teaching evaluation framework. Students actively engaged with both the material and the problem and in the majority of cases produced quality solutions. Generally the students enjoyed and engaged well with the PBL approach. There were improved attendance and participation rates in the unit when compared with the comparison unit. Overall the results provide evidence of significant improvement in attendance and engagement for students. More importantly the PBL approach overcame the recognised difficulties of engaging international students in new styles of learning.

In 2010 a further Masters level unit was developed that also adopted a PBL approach. The staff member assigned to develop the new unit was relatively inexperienced in learning and teaching and was looking for a mentor to assist with the design and delivery of the new unit. The staff member had also commenced working with the university "Centre for Advancement of Teaching and Learning" (CALT) and was keen to be innovative with the design and delivery of the new unit. The two staff members responsible for these units worked in collaboration to design the new unit and redesign the existing unit with a better alignment to the student journey.

Associate Professor Alex Stojcevski at Victoria University, Australia implemented a PBL approach [5] that has been extremely successful in the School of Electrical Engineering. During a visit to Victoria University the author was made aware of issues that may arise if a PBL approach was implemented singularly over a number of units within the one program. For example if 3 units in a semester opted to use a PBL approach in isolation of each other then the students involved in those unit would be faced with solving three separate problems, possible in different groups, during the last few weeks of semester. To overcome this issue the staff involved recognised the opportunity to use a single overarching problem within both units, thereby bring both the units together in the last few weeks of delivery.

Units within the Master of Information Systems have traditionally been taught in a nine week block with a three hour intensive workshop that would consist of theory and practice without offering separate lectures and tutorials. In addition, these units normally would not have an official exam and in the past have opted for an approach to assessment that more closely aligns with the business world by setting an 8 hour exam where the students are provided with a problem and then are given 8 hours to come up with a solution. This type of assessment is usually based on a published case study rather than a real immediate problem. Recently some of the Information Systems units have reverted to the more traditional approach of lectures and tutorials along with an official exam held in the universities official exam period. The justification for such change has been to counter acts of plagiarism amongst the students.

2. REFLECTING AND REDESIGNING OF THE EXISTING UNIT

Formal and informal feedback was gathered from the students enrolled in the PBL unit in 2009. Both a unit and teaching "Student Evaluation of Teaching and Learning" (SETL) was conducted at the end of the delivery of the 2009 unit. Additional questions were added to the survey to gain feedback on student perception of adopting a PBL approach to the unit. Questions such as "I found the PBL

approach helped me understand the unit content” and “I enjoyed the PBL approach taken in this unit” were added to the SETL. In addition the qualitative component of the SETL’s was also carefully examined. The student feedback identified that the majority (26 of 26 students surveyed) of the students helped understanding of the content in the unit.

In addition feedback was also gathered from the participants at 2nd International Research Symposium on PBL 2009 where the paper on “Engaging international students through PBL” [1] was delivered. The feedback from the symposium drew attention to the fact that while the redesign of the unit had indeed achieve the objectives of increased attendance and involvement and also raising the level of the unit to align with Kilpatrick’s [2] third level of the teaching evaluation framework, the focus of the assessment was aligned with the end product of the solution rather than being used to support the students learning journey.

In 2009 the unit adopted four pieces of assessment with the following loading: Leaders report 20%; Case study Analysis 30%; Solution to the problem 40%; and Active Participation 10%. Students worked in groups during the workshops and to design a solution to the problem. The assessment however was focussed on the students as individuals with only one assessment piece based on a group mark, that being the solution to the problem.

In 2010 the existing unit was redesigned to realign the assessment to the student journey and offer the students more opportunity to reflect on their learning journey rather than focus on the problem solution. An integrated approach to assessment was developed providing both the student and the staff with multiple pieces of evidence to demonstrate the student learning journey. The first stage of development was to decide on the assessment types and their weightings. Three of the original assessment pieces were kept in the redesign, the Case Study Analysis was removed as it did not link to the problem. In evaluating the role of the leader’s report where each week one student would lead the group and be responsible for reporting back on the group’s activity as it related to the workshop, a need was identified to ensure that the members of group actively participated each week as opposed to leaving the work to the leader. Each student was required to lead a group once during the time in the unit. The discussion regarding the role of the leader and the role of the group members during the workshop led to identifying the need for peer and self assessment and how as a piece of assessment it could be used to support the active participation of group members.

Lin et al [3] experimented with a web based peer evaluation system for problem based collaborative learning. Lin and his colleagues had the students rank themselves and their group peers using a 5 point Likert scale rating except that the students could only using a ranking once. For example, in conducting an evaluation if a student ranked themselves as a 4 then no other student in the group could be ranked 4. This approach was designed to overcome the desire of students to rank their peers with a high rating. So when designing the peer and self assessment instrument for the two units a dual approach was used. The Unit Coordinator asked the students to firstly rank themselves and their peers on a scale of 0 to 5. In this first ranking duplication of numbers was allowed. A second ranking was also required where the students conducted the ranking and could not duplicate the rank within the group. The second ranking had to be supported by qualitative comments. This assessment piece was also be used to evaluate active participation in the class. Participation in the past had been based on attendance and the lecturer’s observations during the workshop. It was also decided that the peer and self review would be administer manually at the end of each workshop to ensure full participation.

The Leader’s Report was submitted to MyLo, the university education platform designed by Blackboard, on the Friday of each week for marking. All marking was done based upon Criterion Reference Assessment provided to the student with the Unit Outline at the beginning of the course. The leader’s report collated the group answers to question posed in the weekly workshop.

In addition students were assigned to different groups each week to present on an allocated topic. The student could decide for themselves who would do the actual presentation but each student had to contribute to the research and development of the presentation.

The most appropriate presentation method for the solution to the problem was open for the students to determine. With PBL approaches it is common that there are few guidelines provided to the students in how to develop and present the solution. However, most groups tend to produce a report that outlines the problem, the analysis and then the solution/s. The choice of a report may be embedded in the student’s perceived requirements of university assessment standards.

The assessment discussed above is not totally reliant on the use of technology. The technology was used to support the development and submission of those pieces of assessment. MyLo provides the students with a platform that facilitates delivery of material, communication and submission of assessment pieces as a part of the core functionality.

In reviewing the five assessment pieces discussed above it became clear that there still was no transparent mechanism to support the student learning journey. As this was one of the main objectives with the redesign the sixth assessment piece was developed, ePortfolios (discussed further later in this paper). This resulted in the following final assessment items and their corresponding weightings.

Participation 10%

Presentation 10%

Peer/self review 10%

Leaders report 20%

Solution 30%

ePortfolio 20%

3. THE NEW UNIT

The approach to the development of the new unit was based on the redesigned existing unit while taking into account the material being delivered and the different personalities of the staff involved. The structure of the two units was different in two aspects. Firstly, there was a requirement within the new unit to include an exam weighted at 20% to test the theoretical material being delivered. To accommodate this aspect of the new unit it was decided to remove the participation and presentation assessment and replace that with a multiple choice exam administered through MyLo in week 7 of delivery.

Secondly, the new unit required the students to work in groups prior to the three hour workshop researching a preset topic each week. To facilitate this, the unit adopted the UTAS Wikis (Confluence by Atlassian). Confluence is a wiki technology that provides a mechanism for group collaboration and the opportunity for staff to monitor, comment and give feedback to student teams.

The wiki provided a communication medium for staff to correspond easily with students and student groups. A page dedicated to communicating with the teams was set up and provided feedback for each item of assessment; identified upcoming requirements; inform students of additional resources found to help with items of assessment. Each time a page was created or edited the tools/email function emailed that page to students. The comment function provided the mechanism for monitoring team work. Students could easily see that their work was being monitored. Student comments would also be monitored and intervention made if the staff deemed it necessary. The wiki posts combined with the peer and self reviews were integral to the marking of the leader's weekly report. The unit coordinator could easily monitor the level of activity of each of the group members and reconcile that with the comments and weightings made on the peer and self review.

The wiki provided reassurance for hard working students as the monitoring and feedback provided them with evidence that their hard work was not going unnoticed. Students were provided with examples of good contributions along with what was a non acceptable level of contribution thus allowing the students to learn and make the appropriate changes. The students seem to welcome the level of staff monitoring with the wiki. Students who were not performing to the required level were constantly being motivated to improve their contribution and engage with their group and the unit.

Students found the wiki a useful tool for intra team communication.

"This is the new study pattern being introduced in this unit. Wiki was very useful in communication between the team member's and also for developing the leader report as well. My group members used Wiki as a source of communication for the research work posting done by each member. Comments can also be added for the work other person has done. Files can be attached regarding as a resource of research analysis. Hence, usage of Wiki was very helpful for this unit because Wiki makes team members stay

connected with each other. I recommend Wiki usage for further group related units so that it might be very helpful for the team members to pass on there research work, communicate between themselves and make comments onto there postings.” (Student posting in the workshop ePortfolio)

The wiki increased the confidence in the assessment process for peer and self review by removing the subjectivity and replacing it with evidence of claimed contribution to group work.

The table below details the assessment for both the existing unit and the new unit. A focus was placed on individual assessment rather than group assessment. Students gained the benefit of working in groups while having the opportunity of earning marks that directly related to their individual performance.

Existing Unit	New Unit
Participation 10%	
Presentation 10%	Exam 20%
Leaders Report 20%	Leaders Report 20%
Peer/Self Review 10%	Peer/Self Review 10%
Workshop ePortfolio 10%	Workshop ePortfolio 10%
Combined	
*Solution ePortfolio 10%	
*Solution to problem 30%	
* Group mark	

Table 1: Assessment and weighting for both units

4. EPORTFOLIOS

Technology was a key element in the development of this assessment piece by the inclusion of PebblePad. “PebblePad is unusual because it is a generic system; it has been developed to support and celebrate all forms of learning; to facilitate transition between stages of learning, and transition to employment: it places control of the ePortfolio firmly in the hands of the learner - whilst allowing for authentic and reliable assessment by the teacher.” [6]. The University had purchased a licence for PebblePad with a view of providing this resource to students to allow them to capture evidence of the learning journey throughout their time at the University with the aim of providing authentic evidence of that learning to a potential employer via an ePortfolio.

The technology offered the units the opportunity for the students to not only capture but reflect on their learning journey both as individuals and as a part of a group. For students the PebblePad technology provides a tool to document their individual learning journey by creating assets that can be drawn upon as evidence of engagement and participation in the learning journey. Students were required to create a variety of assets such as action plans, meetings or thoughts over several weeks which are then used to create an ePortfolio. The ePortfolios were then assessed.

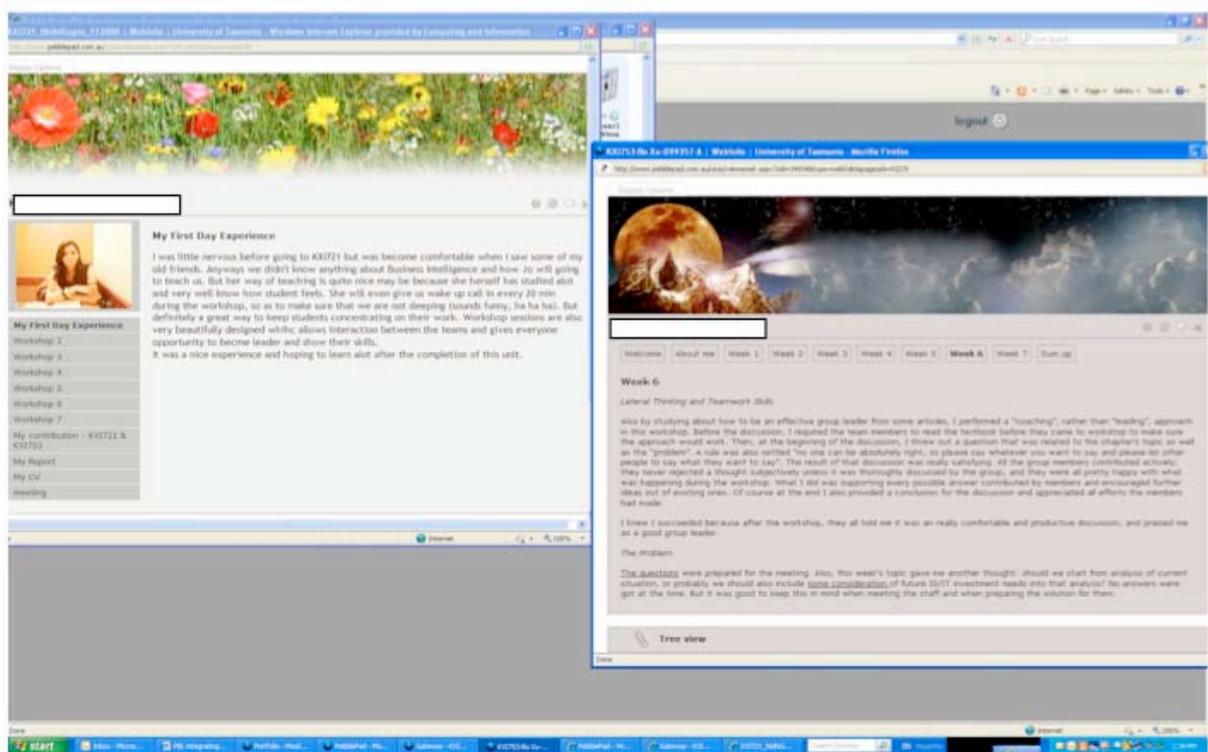


Figure 1: Student ePortfolios

Students were required to prepare two ePortfolios, one based on the workshops conducted from workshop 1 to 7 and the other in workshop 8 to 9. The students worked in assigned groups to explore the theoretical content of each of the units separately in workshop 1 through to 7. The first ePortfolio provided a mechanism for the students to reflect on the theoretical content, their group and their own individual performance. The students were then assigned to new groups for workshops 8 and 9. These last workshops included the combined students from both units and so the groups consisted of students from the new unit, the existing unit and students enrolled in both units. The second ePortfolio provided the students an opportunity to document and reflect on their new group and their individual contribution towards the solution of the assigned problem.

The staff in each unit introduced PebblePad to their class differently. In both units a presentation of PebblePad was provided to the student along with some information sheets and a URL for the United Kingdom website for PebblePad. This site provides short training videos that would assist the students in how to create assets and produce the ePortfolio. In addition the staff member new unit provided scaffolding to the skills development for the students by including as a component of the workshop a set of short exercises for the students to complete. This ensured the students were exposed to a variety of assets within PebblePad. The existing unit was less structured in its approach and required the students to proactively reflect on their learning journey and create assets on a weekly basis while working towards completing the ePortfolio.

Initial reaction expressed by the students was one of confusion. These students, based on their previous educational background, were unprepared for units using a PBL approach to teaching let alone units that required them to reflect on their own performance and comment on their peers. It was evident early in the delivery of the units that the more structured approach to the introduction of PebblePad clarified what was expected of the students. Fortunately a significant number of students were enrolled in both units and therefore the existing unit also benefited from the structured approach of the new unit.

A common question that was asked in the existing unit was “what am I supposed to record?” This could be answered easily by discussing the first workshop where 50 international and 1 local student, in the existing unit, arrived expecting the normal lecture/tutorial combination and for the first workshop to outline the unit content and assessment. In the first workshop students were provided with an overview of the unit which was followed by a presentation on PBL and the presentation of the problem that they were required to solve.

“This organisation has issues with their data and information. Data is not easily transferred from one system to another and some of the data is collected manually. The large quantity of data collected by this organisation is not readily available to managers in a form that facilitates and informs decision-making and reporting.”

To support the exploration of the problem a session on Lateral Thinking was delivered to provide the students with a number of strategies to explore and evaluate the problem at a broader and deeper level. The workshop concluded with a demonstration of PebblePad. In trying to provide an answer to the questions the students they were asked to reflect on three things. Firstly to reflect on the amount of information that was presented in the first workshop. Secondly, to reflect on their original expectations of the unit. Thirdly, to reflect on the level of confusion that would have been created from students having to work in two or three separate groups during the 9 workshops. These reflections should then be documented as a thought asset in PebblePad. One would expect the students to be slightly confused and overwhelmed at the end of the first workshop with what might have been seen as information overload.

5. INSIGHT FROM THE FIRST EPORTFOLIO

At the time of writing this paper the students had submitted both ePortfolios for marking. Initial analysis has revealed that the students used the full range of assets available to them in PebblePad. Students seem to have favoured the thought asset when reflecting on the workshops and on their interaction with their group. Other assets such as the meeting asset provided evidence of group interaction.

This ePortfolio is about my learning journey during the [existing] unit. It will provide all the information about my group contribution during the week 2-6. I worked in group of 5 members. I created some assets which include thought, action plan, achievements and meeting. It will help to provide evidence of my active contribution and research and also how I felt and improved my learning skill in the workshops. (Student posting in the workshop ePortfolio)

In reviewing the ePortfolios student have not taken advantage of linking the text to the relevant asset in the asset store. Instead students have chosen to copy the asset and replicate it in the ePortfolio thus not utilising the full potential of PebblePad.

6. REFLECTING

The PebblePad and wiki technologies were included for use in these units to provide students with an integrated learning experience in which each piece of assessment is related to and supports the others. This integrated approach provided the change that was required to address the issues students and peers had identified with the existing unit. The use of PebblePad not only supported other pieces of assessment but it also provided evidence of involvement and contribution by each student. Participation in a group was documented; evidence of research or communication with other members captured and shared as apart of the ePortfolio. Learning is a journey and one that needs to have more focus than just the final outcome. Lifelong learning is an aim of teaching, teaching the students how to learn and how to communicate and share is an integral part of the learning journey.

It was possible for everything the students did and learned to be repackaged as a PebblePad asset that was in turn available as evidence for assessment via the construction of their ePortfolio. On reflection the first ePortfolio may require some modification with the creation of assets adopting a scaffolding approach thus providing the students with more guidance while teaching them how to use the technology. To compensate the weighting of the first ePortfolio could be changed to support the more structured approach. This would ensure that the student were well trained and competent to produce the second ePortfolio more effectively.

The wiki technology used in the new unit supported student collaborating with each other and was drawn on for evidence of the learning journey. The new unit integrated the wiki as an integral component for each group to document and communicate the research required prior to attending the workshop each week. The unit coordinator also used the wiki as the main device to communicate with the students. Detailed and timely feedback was provided to the students in the new unit. It is clear that by using the wiki there was an increase on the time the staff member spent on monitoring and

providing feedback to the students. Further investigation may reveal if this time added sufficient benefits to the student learning or if the time in fact was viewed more as “hand holding” and therefore cannot be justified especially when adopting a PBL approach.

Both these technologies have provided the units with the opportunity to effectively realign the assessment so the focus was on the student learning journey. Marks associated with most pieces of assessment are supported by evidence provided from these technologies. When finalising the marks for these units the unit coordinators can do so with the confidence that the marks are not based on a subjective allocation but rather grounded in multiple pieces of evidence. As a closing comment the unit coordinators will be exploring the outcomes of both of these units and how they related to the realignment of the assessment along with the dual problem approach by adopting PBL. In addition the unit coordinators have also taken the opportunity to used a modified version of the “Australian Graduate Survey” (the national survey sent to graduates) to collect data from the units discussed above along with one unit delivered by distance and a traditionally delivered unit all within the Master of Information Systems. It is intended that the results of both of these investigations will be published later in 2010.

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