

# A comparison of the use of Wikis and ePortfolios to facilitate group project work

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***Abstract:** For three years the first year civil and infrastructure engineering students have used Wikis to facilitate the project management and design process of their environmental design exercise and the Engineers Without Borders project. This process has proven successful, with many students requesting access to Wikis to support their group interaction in subsequent years. More recently ePortfolios have been introduced and the opportunity has been taken to trial their suitability to facilitate group work. This paper describes and compares the main characteristics of the Campus Pack/TeamsLX Wiki extension to Blackboard and the PebblePad electronic portfolio. Student feedback is reported to support observations by facilitators.*

## Introduction

### General

Encouraged by Engineers Australia and industry the School has adopted problem (and project) based learning as an effective means of delivering the range of graduate capabilities required by industry, eg teamwork and communication, problem solving, autonomous learning, as well as technical skills. Consequently, group-based work forms a major component in the programs. With a view to assisting students to work collaboratively in a way that reflects professional practice several online techniques have been explored - these include Wikis and ePortfolios – the focus of this paper.

Wikis were first introduced in 2007 to the first year students (Molyneaux & Brumley, 2007) and have this year been requested by these students during their second and third year since then. The first year students this year have also been introduced to an ePortfolio and as a trial several groups have been using this to work collaboratively.

### First year courses

Environmental Principles for Sustainable Design is a first year (first semester) course in which students engage in the profession with a theme of sustainability. It evolved from courses designed in the early 1990s to meet the need for environmental and sustainability literacy in undergraduate environmental engineering students (Brumley & Horan, 1995; Brumley et al, 2006). It now embraces a broader range of capabilities modelled on current engineering practice and is a core course for first year Civil Infrastructure and Environmental Engineering programs. It is also taken as an elective by other engineering and science students across the university. This diverse cohort of students has increased from 175 in 2006 to as high as 240 in subsequent years. Students gain experience in

conceptual design in a sustainability context through lectures, tutorials, field classes and a group project.

The project logistics involves group-work in 7 tutorials with 240 students and requires a mechanism for facilitating strong communication between staff and students and within and between student groups for efficient sharing and optimisation of knowledge gained through the project. In 2007 the Wiki was seen as an ideal medium for achieving this and a successful trial was conducted (Molyneux & Brumley, 2007). Wikis were subsequently used (in 2008) for this course and the second semester first year Engineering Practice course.

This year a trial of an ePortfolio (PebblePad, 2009) has been undertaken with a view to implementation across the university in the future. This created an opportunity within the first year to investigate the potential for students to use their ePortfolio to collaborate on their project work. Consequently all first year students in the Civil and Environmental disciplines (240) were given access to a PebblePad ePortfolio and required (in the first two weeks of semester) to undertake a capabilities audit using this facility and to express these with reference to the Engineers Australia Stage 1 competencies (Engineers Australia, 2009). In addition and following this exercise students in key tutorials were encouraged to use the ePortfolios for group collaboration.

First year Chemical Engineering students take Sustainable Engineering, a project based design course. For the past three years, the group project was focussed on the Engineers Without Borders (EWB) challenge project. The course consists of tutorials (workshops) and lectures on topics such as presentation skills, report writing skills, project management, etc. Assessment for the course consists of a combination of report writing and presentations. Wikis have been used for this course for the last two years.

### **Third year courses**

Two groups of third year students have been studied – Environmental Engineering students and Chemical Engineering students. The Environmental Engineering students have used Wikis since their first year while the Chemical Engineering students have had previous exposure through their second year courses.

In 2009, Environmental Engineering students undertaking a major group project in the Land Contamination course, proactively asked for Wikis to be established for their groups – this included all students in the class. The course (now in its sixteenth year of operation) has developed in parallel with the evolving professional practice of the assessment and management of land contaminated from past industrial, agricultural and mining activities. When it is proposed to re-develop such land, planning legislation requires that the land be remediated to a state suitable for that use. The process is scientifically rigorous, multidisciplinary and professionally challenging. In regards to the nature of professional practice in this area, graduates need to be multi-skilled, technically competent and excellent team players.

In Chemical Engineering third year students take a project based course - Engineering Experimental Investigations. The students work in groups on a major project such as Biodiesel production or sugar refining for example. However the major difference from earlier design projects is that they carry out experiments within the laboratories focussed around the unit operations and stages of the process, in order to refine and develop their overall design of the process. Wiki sites were created for each group.

### **The Wiki in education**

It is the potential for collaboration that has driven the educational use of Wikis - a thorough bibliography of Wiki pedagogy is provided by Renee Fountain (2005). Wiki functionality may be summarized as offering a facility for members to change/create web-style content from anywhere. In addition, the content is non-sequential and can become anonymous as a result of multiple edits. However, facilities/capabilities vary and there have been adaptations to suit a wide range of fields of work. In particular there have been developments in Wikis to improve their suitability for group work and project management. EPS Software Corp. developed such a system in 1999 (EPS, 1999) to manage product development and consultancy contracts. A more widespread tool is the popular and freely available web-based project management tool Trac (Trac, 2009). Trac is an enhanced Wiki and

issue tracking system for software development projects. The system tracks tasks through timelines facilitating control and management of the project progress. The University of Sydney has adopted the system to assist student group work and developed a facility to provide feedback to the instructor on individual activity (Kay, 2006).

### **The ePortfolio in education**

An ePortfolio (electronic portfolio) is a collection of electronic evidence assembled and managed by a user. Evidence may include text, electronic files, images, multimedia, blog entries, and hyperlinks – typically the same material that may be viewed on a web site. An ePortfolio can be used as a record of learning with evidence of achievement. They are developmental, reflective and a showcase of achievement. Developmental content comprises a record of activities over a period of time, and may be directly related to outcomes/capabilities. The ePortfolio facilitates the creation of personal reflection on the content and what it means for the owner's development. Content can be prepared and made visible to others as a showcase of the owner's achievements in relation to particular work or developmental goals. They have been used widely in education as they offer a structured environment that encourages student centred learning, self reflection, goal setting, and offer the ability to provide evidence based representation of competencies. This latter point resulting in them finding favour with professional bodies (used in accreditation and Continued Professional Development) and Employers.

### **The Wiki implementation**

The Wiki adopted is part of the Campus Pack LX Suite (Learning Objects, Inc., 2007) – this is an add-on to Blackboard. The Wiki facility within CampusLX (the Campus Pack LX Suite) called TeamsLX has been the focus of the study reported here. The Wiki has been used as a tool for the students to manage the process of project management and for the instructor to manage the learning process.

There are particular challenges for students and staff involved in group work on engineering projects in an education/student environment. In the workplace these issues are less challenging as there would be an office-centred environment and consequently there would be more personal contact. In addition, there would be a design file (or electronic equivalent) containing all meeting notes, technical data etc. All group members would have easy access to this file or management system. Consequently, a decision was made to provide the students with a Wiki that contained an initial structure that supports a typical engineering design office activity/process. It was stressed throughout the workshops that this initial structure was just a suggestion and that they were free to change it as required to fit their working methods.

### **The ePortfolio implementation**

EPortfolios are being trialled in strategic areas across the University, including Engineering as they are perceived to provide opportunities for the ongoing compilation of learning achievements and experiences that can be used for authentic, evidenced-based assessment and demonstration of career readiness. Following a trial and evaluation of various ePortfolios systems in 2007, it was decided to trial PebblePad, an ePortfolio system.

Civil and Environmental students on the Environmental Principles for Sustainable Design course (240 students) used the ePortfolio to submit coursework and self assess that work using inbuilt rubrics. They also received feedback through the ePortfolio. In addition they were encouraged to use the ePortfolio as a means to collaborate.

### **Student surveys**

The following surveys were conducted using an anonymous Likert response scale questionnaire:

- First year: All students were surveyed to assess their opinion of the ePortfolio. These surveys were conducted in their tutorials and were processed separately.
- First year: Chemical Engineering: Groups were surveyed on their collaborative experiences using Wikis
- Third year: Environmental Engineering: Surveyed on their collaborative experiences using Wikis
- Third year: Chemical Engineering: Surveyed on their collaborative experiences using Wikis

- First year 2007, Civil and Environmental students: Key results from surveys conducted in the original Wiki trial were accessed for comparison.

## Results

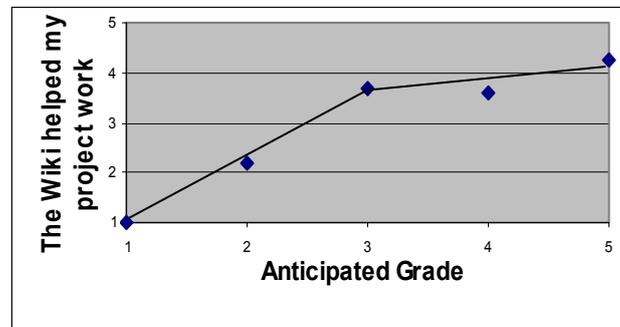
Table 1 below gives results for the various surveys. The values are mean scores for the returns based on a value of 1 for disagree strongly through to 5 for agree strongly. Hence a number greater than 3 indicates a positive response to the question. Key results are included for the first year in 2007 – the initial pilot study of Wikis at the university (Molyneaux & Brumley, 2007). The participants were Civil and Environmental Engineering students – the same cohort that appear in column 3 but are currently in year 3 of their studies. In addition results are included for two of the seven ePortfolio groups (indicated “!” in the table) that produced significantly more encouraging responses than the others. Blank cells are as a result of the surveys in the various classes containing different questions.

**Table 1: Results of student surveys**

DISCIPLINE	Chem.		Civil/Enviro			
	1	3	3	1*	1	1!
YEAR OF STUDY (* 2007 study, ! subset of tutorials)	Wiki				ePortfolio	
FACILITY STUDIED	Wiki				ePortfolio	
NUMBER OF RETURNS	71	63	28	63	54	26
1. I will do very well on the overall mark for this course	4.2	4.0			3.7	3.9
2. The role of my eP/Wiki has been clearly communicated	4.1	4.1	4.2		3.1	3.6
3. My eP/Wiki was easy to create	4.0	4.3	4.4	4.0	3.2	3.3
4. I found the eP/Wiki User Guides useful	3.4	3.2	3.2		2.9	3.0
5. Creating my eP/Wiki improved my information literacy.	3.2	3.2			2.6	3.0
6. My eP/Wiki has increased my skills of reflection	3.2	3.0			2.7	3.0
7. I have received enough support and direction on the construction of my ePortfolio/Wiki in my course	3.6	3.2	3.8		3.3	3.4
8. My eP/Wiki demonstrates development of my understanding and learning	3.6	3.5			3.0	3.1
9. I was given constructive feedback on my eP/Wiki	3.2	2.7	2.0		3.0	2.9
12. My eP/Wiki allows me to display my competence as a graduate to future employers	3.4	3.3			3.0	3.0
14. I have used my eP/Wiki to document my learning experiences and achievements in areas other than those directly related to assessment in my course	3.2	3.4			2.5	2.6
15. I would NOT use eP/Wiki if it was not assessed.	3.1	3.0			3.4	3.6
16. In my future career, my eP/Wiki is a tool I may use to document my professional development	3.6	3.3	4.8		3.0	3.2
17. The eP/Wiki helped us communicate as a group	3.8	3.6	4.6	4.2	3.0	3.5
18. The eP/Wiki helped us produce a better project report	3.9	3.6	4.4	3.7	2.9	3.3

Comparing the Chemical Engineering results it appears that the first years are slightly more positive than the third years. Further inspection of the returns indicates that there were a group of students in the third year who responded strongly negatively. The results suggest that this was approximately 5% of the class (3 or 4 students). Comparison with the third year Civil/Environmental students shows that their responses are significantly more positive. This cohort had requested Wikis to be provided. These Wikis were not assessed and the additional feedback from the comments strongly supported the opinion that they would prefer the Wikis to be exclusively for their own use, not also as a means of academic monitoring of group dynamics as occurs more appropriately in first year. These views were

expressed in the Course Evaluation Survey and reasonably reflect the students' wish to be considered as responsible, mature team participants without the need for "big brother" academic monitoring. In the other surveys of the Wikis where they were used as a means of assessment, several students commented that using Wiki content to assess individual contribution was unfair. The 2007 data was examined and the results for the students' assessment of how well they anticipated doing in the course were compared with whether or not the Wiki was perceived to have helped in their project work. The result (Figure 1) suggests that weaker students may not feel comfortable with the use of Wiki in assessing their individual contribution to the group effort.



**Figure 1: The influence of expected grade on perceived advantage of using the Wiki**

Comparing the third year Civil and Chemical Engineering cohorts on the question of whether the Wiki helped them communicate as a group then the Civil cohort who all elected to use the Wiki returned a mean of 4.6 compared with 3.6 mean for the Chemical Engineering cohort. Closer examination reveals that not one Civil Engineering student marked below 3 (neutral) compared to 28% of the third year Chemical Engineers and 10% of the first year Chemical Engineers. Very similar results were observed for the question of whether the Wiki helped them produce a better project report. It would appear to be that offering a Wiki to groups on an opt-in non-assessed basis produces a better working environment than adopting the compulsory and assessed route. However without the exposure to Wikis in the first year the more mature third year would not have appreciated the benefit on offer.

When comparing results for the ePortfolio and the Wiki it is clear that the ePortfolio results are less encouraging than the Wiki. There is however a great difference from tutor to tutor for the ePortfolio results. Two of the seven tutorials yielded well above average results for the ePortfolio survey (marked "!" in the table) – this more encouraging response is attributable to the enthusiasm of the facilitator in championing the technique. The difference is particularly noticeable for the question of whether the ePortfolio helped them communicate as a group – where the mean returns differ from 3.5 to 3.0 (neutral). The ePortfolio responses are also less positive than the first Wiki pilot study in 2007 – suggesting it is not attributable to being an issue with the introduction of a new technique/concept.

Students were given guidance on how to use the Wikis and ePortfolios. This included tutorial sessions, movies and help notes. In general the responses suggest that the students received enough support and direction on the construction of their ePortfolio/Wiki but that the role of their ePortfolio was less well explained/understood than for the Wikis. In addition it is clear that they found the Wikis easy to create but not the ePortfolios (3.2 compared with 4.0 for the first years). This may well be due to the students being familiar with the concepts and terminology of Wikis as these are so similar to those of web pages unlike those of ePortfolios where new concepts and terminology have been introduced. Again, the difference that buy-in by the facilitator makes is apparent in the responses for whether the role of the ePortfolio has been adequately explained – with mean returns of 3.1 for the whole first year comparing to 3.6 for the two best tutorials run by a 'champion' of the technology.

Comparing results for all surveys and considering the highest scores reveals that the ease of creation and the communication of the role are ranked highly in each survey - suggesting that the technology is not a real barrier in either case. The Wiki surveys all exhibit highly ranked responses to the improvement in group communication and to improving the project deliverables (report). Regarding the future, the surveys suggest that there would be significantly less desire to use an ePortfolio than a Wiki unless it was a requirement of assessed coursework.

## Conclusions

1. Wikis significantly improve student collaboration in group-based project work
2. The perceived usefulness of Wikis does not change significantly as students progress through their undergraduate program.
3. The use of individual assessment of contribution to the group through a Wiki creates opposition to their use in a small minority of students. These students may be the weaker students in the cohort.
4. An opt-in non-assessed approach to Wiki use for group-based project work results in a greatly improved working environment for the students.
5. Buy-in by all facilitators is vital for the success of the introduction of such new technology.
6. The introduction of the ePortfolio has not been as enthusiastically received by the first year as either the introduction of the Wiki in its pilot or the introduction of the Wiki to the current first year students. However the Wiki served its purpose solely within the one-semester project – the ePortfolio serves a long term purpose and its acceptance and development will be monitored in the future. In addition, this study has focussed on its use as a means of assisting group-based project work – not in its normal role as a self-development/showcase facility.
7. Wikis are a valuable and popular way of facilitating senior student's team work at a level commensurate with professional practice.

## References

- Brumley, J., Buckeridge, J. and Grundy, C., 2006. Engineering needs environmental and global thinkers: a contextual analysis of student learning preferences. *Proc. of 17th Annual Conference, Australian Association for Engineering Education, Auckland, New Zealand.*
- Brumley, J. and Horan, E., 1995. Undergraduate Environmental Engineering Education: The RMIT Response. *Proceedings of the National Environmental Engineering Conference, Institution of Engineers Australia.* pp. 181-188.
- Engineers Australia (2009) *Australian engineering competency standards - stage 1 competency standards for professional engineers*, Engineers Australia, Canberra. Accessed at <http://www.engineersaustralia.org.au> August 2009
- EPS Software Corp. (1999) *EPSInternal Wiki Case Study*, EPS Software Corp. 6605 Cypresswood Drive, Suite 300, Spring, TX 77379, USA. <http://fox.wikis.com/wc.dll?Wiki~EPSInternalWikiCaseStudy~Wiki>, Accessed on Aug 2009.
- Fountain, R (2005) *Wiki Pedagogy* Dossiers technopédagogiques, prophetic web site. Accessed at [http://www.profetec.org/dossiers/rubrique.php3?id\\_rubrique=110](http://www.profetec.org/dossiers/rubrique.php3?id_rubrique=110) in Aug 2007.
- Kay, J., Maisonneuve, N., Yacef, K., & Reimann, P. (2006) *Wattle Tree: Watt'll it tell us*. Technical Report 582, The University of Sydney, NSW, Australia
- Learning Objects, Inc. (2007) *The CampusLX suite*. Accessed at <http://www.learningobjects.com>, in Aug 2009 1801 18th Street NW, Suite 10, Washington, DC 20009 USA
- Molyneaux, T & Brumley, J. (2007). The use of wikis as a management tool to facilitate group project work. *Proc. of 18th Annual Conference, Australian Association for Engineering Education, Yepoon, QLD*
- PebblePad (2009). [www.pebblepad.com](http://www.pebblepad.com), Pebble Learning Ltd, e-Innovation Centre, University of Wolverhampton, Shifnal Road, Telford, TF2 9FT.
- Trac (2007) Edgewall Software, web site accessed at <http://trac.edgewall.org/> in Aug 2009. Flintvagen 6-216, Umea, NA 90740, USA

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