The Use of Wikispace in Engineering Education

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***Abstract**: Wikispaces was piloted as an educational tool for improving teaching and learning at the School of Civil and Environmental Engineering, University of New South Wales with class of 54 enrolled students. An active and self-directed learning approach was used in this subject based on interactive/ discussion-based lectures and tutorials, debates and presentations as well as private study. Students' experiences and readings were to be reflected through contributions to class and wiki discussions to facilitate brain-storming, inquisitions and facilitate students' learning from each other.*

This paper reflects on the use of Wikispaces as a teaching strategy and presents results of students' responses to a questionnaire about the use of the wiki tool, and general teaching and learning of the subject. Analyses of responses suggested that students expressed positive experiences using wikispaces and that wikispaces correlated positively with students' performance.

Introduction

Wikispaces was piloted as an educational tool for teaching and learning in a combined class of postgraduate course (CVEN 9706 Human Resource Management) and 4th year undergraduate engineering students (CVEN 4101 Project and People) at UNSW in session 1, 2009. An active and student-centred learning approach was utilised as the teaching strategy for the course.

Wikispaces was used as a platform to prepare and present lecture notes, engage students in contributing to discussions and debates that took place in the lectures and tutorials and extending and/or initiating new topics by publishing, elaborating, generating and updating discussions. A history log of each contribution was generated by the wiki.

A questionnaire was distributed to students to gauge their impressions and feedback of the use of the wikispace tool in the subject. Analysis of students' opinions as well as correlations between their usage of the wiki tool with their performance in the subject and overall performance are presented in this paper.

What is a Wikispace?

A wikispace is an online web space that enables users to create, organise, edit and link content using any web browser. It is commonly used as a collaborative medium that enables users to access it with ease for collaborative document editing (Georgetown University).

Feature of Wikis

A wiki supports hyperlinks and has simple text syntax for creating new pages and cross-links between pages (Georgetown University). Availability and ease of use are two main features of a wiki. Such simple yet powerful features are sometimes referred to as 'transparent technologies' (Wheeler, P. et al. 2005; Boulos, Maramba et al. 2006; Kirkpatrick 2006; Parker and Chao 2007). A wiki page enables anyone to edit. This means that it doesn't distinguish between authors and readers. Anyone accessing the wikispace can have editing capabilities, using simple writing syntax, linking with existing or new links, track changes or versions of any page as well as access to group discussions (Georgetown University; Murphy, Walker et al. 2001).
Such features enable continuous interaction and involvement from participants where ideas and arguments can be presented and discussed. In education, the features of Wiki allow it to be used as a web communication tool to engage students in learning with others. It has the potential to complement, enhance, and add new collaborative dimensions to the classroom (Parker and Chao 2007). Participating in a wiki involve learners taking part in their own construction of knowledge (Boulos, Maramba et al. 2006).

Subject and Class Particulars

The class consisted of 27 postgraduate and 27 undergraduate students. The ages of the students ranged between early twenties and late thirties. The gender balance was dominated by male students with a total of 12 female students.

The subject covered Human Resources Management (HRM) topics and issues including conceptual foundations of HRM, activities, roles and practices of a project and/or an organisation's human resource functions, characteristics of the workforce and the human resource environment as well as the competitive challenges influencing Australian companies. What students learned in this subject would assist in preparing them to participate and lead groups as well as to manage personnel in the workforce.

Objectives of Subject

This subject introduced students to a range of concepts and theories in Human Resource Management (HRM), and their applications to "real world" engineering situations. The focus was to provide students with the knowledge and tools to critically analyse and resolve HRM situations in inter-disciplinary contexts. Specifically, the objective of this subject was to provide students with the knowledge to:

- Develop independent thinking strategies of HRM issues and situations.
- Realise effective HRM linkage between strategy, people and performance.
- Recognise effects of globalisation, innovation, sustainability and staff retention in projects/ organisations.
- Emphasise the role of HRM in creating value and sustaining competitive advantage.
- Develop skills in analysing issues from different perspectives.
- Develop skills in collaborative communication and working in teams.
- Develop competence in presenting arguments through constructive oral and written communications.

Challenges Encountered in Designing the Subject

Designing the subject of CVEN4101 and CVEN9706 was a challenge in more than one aspect for the first author:

(1) Available academic resources for human resources in a civil engineering/ construction context were scarce although there was an abundance of material on HRM in business and other contexts.
(2) Available resources, especially recent references discussed "boom" economic situations and case studies. This implied that resources were not "topical" given the hard felt effects of the recent economic downturn.

(3) Having postgraduate students who were already working and directly affected by the global financial turndown with various experiences in HRM issues both in Australia and overseas.
(4) Most students would have work experience and can provide current "real life case studies" that contracted available literature.
(5) Based on points 2-4 above, if the subject focused on the theories and case studies of available literature the theory would not match the current practices in the workforce.

Subject Design Decisions

In order to address the challenges above, The first author consulted the university teaching guidelines (http://www.guidelinesonlearning.unsw.edu.au/) and attended a university teaching and learning workshop aimed at increasing understanding, skills and confidence in learning and teaching strategies. Reflecting on these, and considering the nature of the HRM course the first author rationalised the following:

1. Critical thinking can be provoked through discussion of experiences and differing viewpoints provided a logical sequence of arguments is presented.
2. Providing space in the time allocated for the courses such as tutorials for debating topical issues/cases where opposing viewpoints can be presented or argued would be beneficial to provoke brainstorming and critical thinking.
3. Providing space where people can present their thoughts after having time to reflect on issues discussed (after class and tutorial time) will be of great benefit.

Accordingly, in order to achieve the objectives of CVEN9706 and CVEN4101 courses, an active and student-centred learning approach based on constructive and collaborative paradigms was used in the subject. This paradigm is built on interactive/ discussion-based environment of lectures, tutorials, readings, debates and presentations as well as private study. Students' experiences and readings were to be capitalised on and reflected through active contributions to class questioning and discussions both in and out of class time. This aimed to facilitate critical thinking, brain-storming, inquisitions and encourage students learning from each other. The in-class strategies for involvement were structured debates and presentations, and the out of class involvement was through using the Wikispace tool to initiate and/ or contribute to topics and discussions. The wiki tool was also employed to be used to prepare and present lectures, and get the structured debates and presentations uploaded where everyone was able to further discuss or contribute to them.

Why Wiki was Used in the Subject

By its nature, the topics of management and human related issues and behaviours are complex and largely subjective. Therefore, facts can be arguable and contested. An argument in HRM may seem to be an opinion as opposed to a fact. However, arguments are debatable; strong and weak arguments can be differentiated, and so can sound and faulty logic and reasoning.
Accordingly, using structured debates in class seemed to fit the purposes of critically thinking about and presenting arguments and counter arguments for both sides of a debatable issue. However, structured debates will only give the chance to a maximum of six students to take part in the debate, excluding all the others except from very time-limited questions or comments. Therefore, uploading both sides of the debate on a platform where all students are able to comment and further discuss issues provided the means to engage everyone. The wiki features and capabilities seemed to provide such a platform.

In addition, capitalising on students' own experiences implied that students needed the space to share their thoughts and ideas in the class as well as out of the class (for lack of time in class). Based on the features of wiki, it was seen as a perfect medium to provide such space for students to articulate, share engage others and reflect on other students thoughts through cooperative and collaborative feedback and discussions (Miers 2004). This would allow students to engage in "conversations" about knowledge sharing (Wagner 2004). Seitzinger (Seitzinger 2006) reported that such an approach increased awareness and benefits of online collaborative learning (Seitzinger 2006; Parker and Chao 2007).

Further, the teaching strategy of student-centred learning focused on engaging students in their own learning through interactions, inquisition and reflection on materials and issues raised in class. The wiki also seemed to provide the right medium for publishing the lecture notes and giving the students the chance to contribute to the lecture material (Wang and Turner 2004).

In conclusion, wikis were seen to enhance the technological literacy and skills in collaborative and creative work (Burns and Humphreys 2005).

Survey

Since wikispace was not utilised at large as a teaching or learning tool at UNSW, it was decided based on the rationale above to participate in piloting the wiki as an educational tool. Accordingly, two anonymous surveys were conducted with the students enrolled in the subject during the session. The first survey took place in week 6 (mid session) and the second was in week 12 (last week of session). The response rates for the two surveys were 39 and 33 responses respectively out of the total enrolled number of 54 students.

The survey's purpose was twofold: firstly it attempted to obtain students views and feedback on the use of the wiki in the subject, and secondly to correlate students' usage of the wiki with their final-mark result for the subject. In addition, a correlation of their final-mark in this subject and their overall WAM was established.

The survey was paper-based. The front side focussed on the general teaching and learning of the subject. The reverse side focussed explicitly on the use of the wikispaces in the subject. This allowed us to correlate views expressed on the front side with views expressed on the flip side (wikispaces). The intention was to enable correlation of student positive/negative views on the subject with their positive or negatives views on using wikispaces on the reverse side.

Results

Both qualitative and quantitative data were gathered and analysed from the two surveys.

Qualitative Analysis

In essence, the qualitative data focused on getting students opinions about the best and worst aspects of the subject, and the wikispaces tool.

Upon analysing the front side of the survey which looked at the subject in general, the students' answers were grouped based on the following criteria:

1. General positive comments about the subject (without explicitly mentioning wikispaces as one of the best or worst features of the subject.
2. Explicit positive comments about Wikispaces
3. Explicit negative comments about Wikispaces
4. Mediocre comments (equally balanced or non committal)
5. General negative comments about the subject.

		Mid Term Survey	Final Survey
1	**General positive**	13 (33.3%)	21 (63.6%)
2	**Positive – Wikispaces**	14 (35.9%)	9 (27.3 %)
3	**Negative – Wikispaces**	2 (5.1%)	2 (6.1%)
4	**Mediocre**	9 (23.1 %)	0 (0.0%)
5	**Negative**	1 (2.6%)	1 (3.0%)
	Total	39 (100%)	33 (100%)

Table 1: Students' opinions of the Subject and Wikispaces

As illustrated in Table 1, (points 2and 3) the experience of using of Wikispaces was initially perceived more positively (14%) than negatively (2%). The general positive comments about the subject almost doubled by the end of session and negative comments stayed constant, however explicit positive mention of the wikispaces decreased. This could be attributed to the Hawthorne Effect (Mayo 1966)

where the "newness" of the tool turned in the final survey into a perception of the wikispace as being an integral part of the teaching strategies in the subject.

On the flip side of the questionnaire (explicitly tailored views on Wikispaces) students were asked about how they compared the Wikispaces tool to the university's other offering of e-learning tool (WebCT Vista) which the students have used for most of their previous subjects. The opinions were classified as Preferred Wiki, Preferred WebCT Vista, or have no preference. The results are shown in Table 2.

	Mid Term Survey	Final Survey
Preferred Wiki more than WebCT Vista	10	7
Preferred WebCT Vista more than Wiki	9	9
Have no Preference	12	9

Table 2: Students preference of e-learning tools

Unfortunately since not all students filled in both sides of the survey completely; the totals in Table 2 do not resemble those of Table 1.Some of the 14 students who mentioned wikispaces as one of the best features of the subject did not fill the flip side of the survey which focused explicitly on the particulars of the wikispaces tool. Using this point in the analyses, the answers to that question were divided into two groups: (Group 1) those that explicitly stated wikispaces as one of the "best" aspects of the subject in the subject evaluation survey but may not have filled the flip side of the questionnaire specifically targeting the particulars of using the wiki. (Group 2) were those that did not mention wikispaces explicitly on the front side (subject evaluation) of the survey but filled the questionnaire about the wikispaces tool. By doing this we were able to conduct a more detailed evaluation as shown in Table 3.

	Mid Term Survey		Final Survey	
	Group 1	**Group 2**	**Group 1**	**Group 2**
Preferred Wiki more than WebCT Vista	7	3	5	2
Preferred WebCT Vista more than Wiki	2	7	4	5
Have no Preference	6	6	1	8

Table 3: Comparison of student experience with Wikispaces and WebCT Vista

Table 3 illustrates that the experience of using Wikispaces compares favourably or at least no worse than the other online e-learning tool Web CT Vista offered by the university, especially when taking into account the "no preference" criteria.

Quantitative Analysis

The quantitative analysis was based on actual use of the Wikispaces by the students. This information was obtained from the statistical logs kept by wikispaces. It should be noted that there was a marking component for participation in the Wikispaces. Therefore, the results used for this analyses (Tables 4a and 4b) excluded the participation mark component of the subject. When comparing use of Wikispaces against results, we get the data illustrated in Tables 4a and 4b for undergraduate students. Table 4a illustrates in descending order the top numbers of wiki contributions by individual students and their corresponding final mark (minus the component of wiki contribution) in the subject. Table 4b illustrates the final marks of all students who never contributed to the wiki.

No. Of Wiki contributions	Final mark in subject (excluding wiki participation mark)
36	77
27	77
15	77
14	70
10	72
10	74
9	71
7	78
7	61

Table 4a Comparison of high Wiki contribution and performance

No. Of Wiki contributions	Final mark in subject (excluding wiki participation mark)
0	68
0	68
0	65
0	64
0	64
0	63
0	60
0	60
0	64
0	53

Table 4b Comparison of No Wiki contribution and performance

Tables 4a and 4b. demonstrate that undergraduate students who contributed to Wikispaces with performed better in the subject than those who did not contribute to the Wikispaces. The results are similar for the postgraduate students.
The difference between the students overall university WAMs[1] and their final mark obtained in this subject was calculated and correlated with the usage of the wiki tool. A negative value for difference indicates that students' final mark in the subject was below that of his/her overall university WAM. A positive value, on the other hand indicates that the final mark obtained in the subject was more than the students overall university WAM. Tables 5a and 5b show the 10 worst and 10 best changes in the difference respectively correlated with the number of wiki contributions for both Postgraduate (P) and Undergraduate (U) students.

WAM Difference	Wikispaces Contribution	P/U
-9	0	u
-8	3	p
-6.7	0	p
-6.5	4	p
-4.5	4	p
-3.5	0	p
-2.9	6	p
-2.5	0	p
-1	0	u
-1	7	u

Table 5a: Students' contribution to Wikispaces and corresponding decline in WAM

WAM Difference	Wikispaces Contribution	P/U
16	3	u
17.4	5	p
19	0	u
19	7	u
23	10	u
23.5	15	u
24.5	0	u
26	1	u
27.5	3	u
32.5	27	u

Table 5b: Students contribution to Wikispaces and corresponding improvement in WAM

Overall, it appears from Tables 5a and 5b that a high use of Wikispaces tends to correlate to improvement in the student results for this subject when compared to performance in previous subjects. However, such tendency would require a larger data pool to make conclusions.

Conclusions

In order to achieve the cognitive and communication skill improvements from a teaching tool such as Wikispaces, students need to first utilise the Wikispaces, preferably in a meaningful manner. They

[1] Weight Average Mark for all previous subjects.

also need to see value in this different medium of communication and its integration into the teaching methodology.
The Qualitative surveys undertaken (Tables 1, 2 and 3), showed that there was positive feedback from students about the use of Wikispaces. They also compared it favourably to the other online e-learning tool offered by the university. Certainly, on this first introduction of Wikispaces, this favourable feedback suggests that other subjects may drive benefit from also using Wikispaces. There appears to be no lowering of standards or student disapproval.

When looking at the Quantitative results (Tables 4 and 5), the usage of Wikispaces by students correlated with improvement in their performance. One could also surmise that other factors besides the usage of Wikispaces did also interfere with students' performance. For those, with a more marked improvement in their average (WAM) but did not use Wikispaces, one could perhaps surmise that the teaching strategies employed in this subject (without the use of Wikispaces) may have been the reason for their improvement. The sample is too small for any real generalisation at this stage. A longitudinal study over a number of years may indicate whether this supposition is valid.
There are two conflicting rationales to the conclusions proposed here, and they are both undoubtedly relevant. Degree of relevance can be only determined by using Wikispaces in other subjects integrated similarly as in this subject. The first is the "newness" of the use of Wikispaces; secondly there was assessment attached to the use of Wikispaces, thus focussing the more motivated students.

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