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Web 2.0 Technologies for Problem-

Based and Collaborative Learning – a

Case Study

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Abstract

Collaborative problem-based learning (PBL) has a well established history within medical and health care education. Undergraduate nursing students at the Glyndŵr University undertake PBL to explore ethical issues of health care; traditionally these students meet in person to discuss scenarios, provided by tutors, and present the product of their deliberations to the rest of the class. The geographical dispersion of the students has meant that most discussions have been limited to those times when the students are physically on campus by virtue of their timetabled classes. By using Web 2.0 technologies, students are able to collaborate at distance, at a time that suits them. This chapter describes how students have used these emerging technologies to share ideas and resources to prepare for class presentations; described also are the underpinning theories that inform this work together with an analysis of student use and feedback.

Keywords

Web 2.0

Asynchronous Communications

Learning Communities

Health Education

Nurse Education

Wiki

Collaborative Problem-Based Learning (PBL)

Introduction

This chapter describes how Web 2.0 technologies, in particular wiki pages, have been used to facilitate group work with undergraduate nursing students at the Glyndŵr University, United Kingdom. We begin by examining the theoretical basis for applying this technology to facilitate collaboration; we describe the nature of the problem based group work and its pedagogical value; we analyse, from the perspective of both tutors and students, the effectiveness of this approach and finally we examine the nature of discourse between students, freed from the constraints of the traditional classroom environment. Our conclusion supports the view that, sympathetically used, Web 2.0 technology can enhance the level of “conversation” between students, enabling students living remote from the university campus to engage productively in group tasks and providing a flexible forum for collaborative work.

In employing a wiki to facilitate student collaboration, tutors are able to observe the process by which students develop their final presentation, providing an opportunity to scrutinize group dynamics. We also explore how the “facebook generation” adopt language styles which are distinct from the academic language normally used within the formal classroom setting.

Background

The past few years have witnessed an explosion of Web 2.0 applications. Social networking sites such as “Facebook” and blogs have become increasing popular, especially with young adults, and many of us in higher education are beginning to consider how this phenomenon can be used to facilitate learning. We now have a ‘connected society’; connected not by face-to-face interaction but by the internet; geographical location is no longer a barrier to discourse and interaction. Whilst the social aspects of learning have long been recognised by educational philosophers such as Vygotsky, it is only recently that new theories of learning have started to emerge that reflect the burgeoning potential of the digitally connected society. Siemens (2004) has coined the phrase “connectivism” to describe how learning can reside outside the individual and how individuals can contribute to a social network of understanding and knowledge. Connectivism applies to that nebulous entity, the internet and, one supposes, to the growing use of mobile devices to access, and contribute to, a shared, socially situated body of knowledge. The scope of this chapter, however, is narrower; focussing on a single aspect of emerging technologies, the wiki, and how this can be used to exploit the potential of social networking to enhance the learning of the individual.

O'Reilly (2007), in exploring how Web 2.0 technologies allow for “remixing” of data from various sources, describes how individuals use technologies to collaborate to a common cause; this “harnessing of collective intelligences” (O'Reilly *ibid*) generates a product that is greater than the sum of its parts. This has resonances with the social constructivist approach to

learning of Vygotsky and the connectivist approach of Siemens. Boulos *et al* (2006) have highlighted the potential of wikis to help facilitate learners in constructing their own knowledge, leading to a deeper understanding. Based upon this theoretical underpinning, the authors determined to examine the potential of wiki technology to facilitate collaboration between groups of geographically dispersed nursing students.

Issues, Controversies, Problems

As Adams (2004) observes, nurse education is not simply a matter of presenting students with information to remember and reproduce in examinations; it requires the students to think creatively, to collaborate and to critically reflect upon practice. Whilst by no means unique in this respect, nurse education lends itself to a constructivist or connectivist approach to learning, especially when aligned to problem-based learning (PBL). Cognitive conflict (Savery and Duffy, 2001), whereby learners are presented with problematic scenarios that challenge their preconceptions provides a basis for reflection and, through collaboration, for constructing new paradigms of practice. Rather than providing them with solutions, students are encouraged to explore scenarios, to construct frameworks of understanding and to resolve personal and collective conflicts.

Problem-based learning and collaboration is not new in nurse education (Davis and Harden, 1999; Wood, 2003) but emerging technologies provide an additional dimension whereby students, separated by location or time, can collaborate, share resources and participate in discursive learning (Gulati, 2006). Additionally, those students that feel uncomfortable in contributing to class-room based discussions often feel liberated by the opportunity to contribute to discussions from the comfort and security of their own homes. That is not to say

that adverse inter-personal dynamics that one may see in the physical classroom are absent from the virtual world; intimidation (Doolan, 2006) and bullying (Reigle, 2007) are as hurtful in the virtual world as they are in the real and careful tutor monitoring is required to ensure that debate is both constructive and polite. Our own experiences, described later, demonstrate that misunderstandings can quickly develop into personal disputes.

It is a widely held belief that adult learners (the over 25's) are uncomfortable with emerging social networking technologies; "Facebook" and other social networking sites seem strictly for the teenage and young adult market but our experience is that mature students quickly adapt to using new technologies. Analysis of student contributions to the wiki pages show no correlation between the age of the student and the level of activity demonstrated.

Problem-Based Learning (PBL) Framework

Glyndŵr University is located in Wrexham, north Wales and works closely with the demands of the local economy. The University is addressing the widening participation agenda and its aim is to be "open to all". Approximately 110 nursing students are recruited per academic year. The Bachelor of Nursing (Hons) degree runs over a 3-year period and is evenly split between theoretical modules and clinical practice. Nursing cohorts are predominantly female and aged between 18 years – 44 years. The students generally live in the north Wales region and this represents a diverse geographical area, with many students living in rural locations.

The PBL framework is used to deliver information to student nurses about possible trauma issues in a clinical practice setting. The 'trauma' based PBL is introduced at the end of the 2nd year of a pre-registration Bachelor of Nursing (Honours) Degree Programme. The PBL is

used to develop critical thinking and problem solving skills (Hsu 2004). In nurse education, one of the main aims of PBL is to promote autonomous learning by encouraging students to take some responsibility for their own learning (Ousey 2003). This is done by the identification of the student's own learning needs in relation to the problems highlighted within the weekly PBL scenario. The PBL is timetabled for one day a week over a five-week time span. Each week the students work in small groups of about eight and each group is facilitated by a nurse tutor. The tutor's role is purely advisory, as all the student groups are encouraged to nominate a "chairperson" (student) from their individual groups. The chairperson helps focus the group towards the work required and makes suggestions on 'communicating' via the wiki page.

The main scenario is based on a young female who is involved in a road traffic accident. She requires cardiac pulmonary resuscitation (CPR) at the scene of the accident and is admitted to the emergency room (ER) via the ambulance service. This scenario, as well as exploring trauma issues, also raises issues around possible "real life" ethical dilemmas. The main format of the first PBL scenario, and the subsequent additional weekly information, is organised to encourage individual student learning with the students being principally in control of the area for exploration.

For the first PBL session, each group is given an ethical scenario to work on. The following week each group has to debate their argument, based on current and relevant evidence, in a cohort discussion. For example, ethical dilemmas may include the following: whether to continue with CPR or not, other groups debate whether to allow the patient's "partner" in to ER or not. During the following four weeks the scenario is developed and additional layers of complexity are added. Groups are provided with additional information and each group must

then work on this to expand their presentation. Student self-directed study time is also timetabled to enable students to gather information from such sources as books, journal articles and the web in order to support each feedback session. These scenarios are all related to the same patient situation and encourage the separate groups of students to solve the highlighted problems they decide are important to their particular group. The flexibility of choice allows the students to identify their main issues and, as a result, in control of their own learning. This demonstrates the constructivist approach of PBL (Hsu, 2004).

Prior to the PBL scenario being introduced to the students, an introductory lecture is delivered on how to use the “wiki page”. The students are encouraged to use the wiki page as a resource tool and also as a means of communication to organise their group work.

Student use of the wiki pages

Students were divided into five groups of eight and each group given access to their individual password protected wiki page; collaboration took place over a five week period. Analysis of wiki page usage (Table 1) shows a total number of page revisions of 497 over the five week period, giving an average of just under one hundred revisions per week or twenty revisions per group per week. Groups 1 to 4 made a similar number of revisions but Group 5, which had a number of students away on other duties for the first week, registered a lower number. We see no significance in the slight variation in the number of revisions.

Table 1: Wiki usage by student group

Group Number	1	2	3	4	5	Total
Wiki Revisions	99	104	108	109	77	497
Percentage of Total	20	21	22	22	15	100

Simple numerical analysis of wiki page revisions gives an indication of activity level but not the nature or quality of that activity. Student contributions were divided into three categories; non-task related posts, task related contributions (including sharing of original documents) and resource sharing, which includes sharing of internet resources; total contribution were roughly equal across these categories but task- specific contributions account for 65% of the total.

Table 2: Type of wiki contribution by student group

Group Number	1	2	3	4	5	Total
Non-task posts (%)	43	39	43	20	30	35
Task-related contribution (%)	23	32	28	25	40	30
Resource sharing (%)	34	29	28	55	40	35

We believe the non-task related posts to be an important element in generating a sense of community within the student groups. Often these posts would be about home life or difficulties students were experiencing; other students would respond with messages of support and offers of help. Creating a “team spirit” and bonding members of the group gives a sense of identity and a common goal. Sharing personal information in this way also empowers students to share their own views and original writings in the safe and secure knowledge that these will be received by others in a supportive and respectful manner. Inappropriate postings, “flaming”, was observed in one group (Group 1), prompting one student to comment “*However the wiki page was used inappropriately to air disagreements which discouraged some member [sic] from using it.*” Although students were given clear guidance about appropriate behaviour, it is impossible to ensure that this is observed at all times and tutors must monitor posts on a regular basis.

Task-related contributions fell into two main categories; identifying existing resources and sharing of the students’ own work. Those contributions which simply identified a resource

without additional comment received few, if any, responses; suggesting that these were seen as being of little value. Sharing original work or reflections upon resources generated many more replies and students began to construct understanding; we observed peer-teaching and team work, a core objective of the exercise.

Language Used

It was evident, from a very early stage, that students were tending to adopt very informal use of language, much akin to the shorthand used in SMS messaging (“texting”). Typical examples include:

“c u tomorrow”	-	see you tomorrow
“hope u are all happy”	-	hope you are all happy
“Dus any 1 no”	-	does anyone know

As described earlier, a very small minority of students became embroiled in flaming and used inappropriate language which required tutor intervention. Other students, normally reluctant to contribute to classroom discussion, embraced the opportunity to debate and contributed enthusiastically. This behaviour, which would not occur in a traditional face-to-face classroom, suggests that students’ perception of the electronic medium and the “rules” of social engagement was significantly modified. Without the physical classroom environment and isolated from direct contact with tutors and peers, new rules of discourse developed. Students, in effect, established a set of social norms specific to the virtual environment within which they were operating. Souter (2008) describes a similar experience with her students

when using the “Second Life” multi-user virtual environment, noting what she terms as “naughtiness” in the behaviour of some students. Whilst it is important to ensure that debate is conducted in a professional manner, freeing students from the strict code of conduct expected in the classroom setting may facilitate a deeper, more reflective learning experience. By employing informal language to discuss complex issues students are demonstrating, it is suggested, clearer understanding and the ability to relay this understanding in the language of their peers. Interestingly, when required to return to the reality of the physical classroom in order to present their findings to tutors, students reverted to the expected protocols and language of that environment. Further work is needed to establish whether different groups of students develop different sets of social norms for the “virtual classroom” and we are currently extending our research to examine such aspects.

Student Feedback

Student feedback was gathered using a short questionnaire consisting of a number of statements which students were asked to grade on a five point scale from strongly disagree (1) to strongly agree (5). Students were also given the opportunity to give free-form comments on their own experiences of using the wiki.

Table 3 Results of student questionnaire (aggregated results from 33 returns).

Statement	Score (1 = strongly disagree, 5 = strongly agree)	Agreement (as a percentage)
I found the wiki easy to use	3.76	72%
The wiki was useful in helping us share ideas and resources	4.15	83%
Our group work improved because we used a wiki	3.38	68%
I would prefer to use email to share ideas and resources	2.48	50%
I prefer to meet face to face or by telephone	3.15	63%
I would prefer tutors could not see our wiki pages	1.85	37%
I would like to use a wiki for group work in the future	3.79	76%

The questionnaire returns indicate that students found the wiki useful, that it improved the quality of their group work and that they would like to see this technology applied more generally across their studies. A significant number of students would, however, prefer to use face-to-face meetings or telephone contact for collaboration, rather than e-mail or wiki pages, indicating that not everyone is entirely comfortable using web-based communication tools. Interestingly, the students clearly prefer that tutors have access to their on-line discussions; this may reflect a desire to demonstrate the level of contribution or the need for tutor moderation. This, however, raises questions about the type of language and social rules used by these students in their on-line discussions and the fact that students then readily acquiesce to the more rigid formality of the physical classroom. This dichotomy of behaviour suggests that this group of students perceive their on-line behaviour as entirely appropriate within the context of that medium but not appropriate for the “real-world” setting of the classroom.

Example student comments

I felt the wiki page was central to our group work – everybody contributed relevant information and it was an excellent form of communication.
(DE).

It was an excellent way to help develop my knowledge This will be good to use during each module throughout nurse training.
(RW)

I found it useful for sharing information and keeping in contact with group members because we all lived in different areas. However the wiki page was used inappropriately to air disagreements which discouraged some member [sic] from using it.

(BW)

Some of our members lived in different areas so we could discuss things without meeting up.

(SS)

It was just seen as extra work among our group. We work that well as a team we'd have had the same results without using the page.

(LM)

I like it because you could share information with others. I didn't like the way everybody else could change what you had done.

(JT)

The free-form comments from students provide an interesting insight to some of the benefits and some of the disadvantages of using a wiki page for collaboration. The vast majority of feedback received in this way described the benefits, in particular how geographically-dispersed students could still collaborate in a meaningful and constructive manner. Negatives to emerge were inappropriate behaviour (flaming) and the fact that contributions could be changed or deleted by another.

Solutions and Recommendations

Facilitating collaboration between students who are geographically dispersed or in employment can be problematic; Web 2.0 technology provides an opportunity for students to contribute to group work where and when they like. Freed from the confines of classroom etiquette and geographical isolation, students are able to express their views and contribute to group work in a meaningful and constructive manner. Interestingly, students themselves evolve their own social norms and use language which is meaningful to their particular cohort; provided it is managed appropriately, we argue that this facilitates a deeper and more reflective learning experience. Disadvantages which arise through inappropriate behaviour, whether that be aggressive language or changing / deleting the work of another can be overcome by careful and diligent tutor moderation.

We believe that on-line collaboration through the use of Web 2.0 technologies such as wiki pages provide an opportunity for students to explore their own understanding within a supportive and non-threatening environment. By applying these emerging technologies to problem based learning we recognise the value of the constructivist approaches to learning and the opportunity for “harnessing of collective intelligences” (O'Reilly *ibid*). For tutors looking to assess team work, wikis provide an insight into both process and group dynamics; something difficult to achieve in traditional classroom teaching.

Future Trends

Our experiences have convinced us to broaden our use of these technologies to other student groups. Social networking applications and multi-user virtual environments have the potential to enrich the learning opportunities for our students but to exploit this fully we must gain a deeper understanding of the social interactions that take place within such environments.

Emerging technologies present us with a new opportunity to engage students with their own learning; Web 2.0 tools provide a platform for a constructivist and connectivist approach to learning and teaching. We may need to review our previously accepted pedagogic ‘truths’ if we are to exploit the potential of these technologies; this is a challenge to all of us engaged in such teaching. Conversely, these technologies may enable the visionary work of Piaget and Vygotsky to be realised.

Conclusion

This chapter has detailed our experience of using wiki pages to facilitate collaboration between adult learners on a nursing degree at Glyndŵr University, Wales, United Kingdom. The role of problem-based learning in a constructivist approach to teaching has been described and we have explored how student interaction within virtual environments differs from that observed within a traditional classroom. Freed from formal classroom environments, students are able to express themselves in the language of their peers and this, we believe, facilitates enhanced learning, greater debate and a reflective approach to

discussions. Further work is needed to better understand how social norms develop within the virtual environment and how this can be exploited to assist learning. We believe that Web 2.0 technologies provide a valuable opportunity for learners who are geographically dispersed or who have time constraints to participate in face-to-face group work. Although student work in this case study was not formally assessed, tutors are able to review not only the end product of collaboration but the process, enriching the assessment potential. In light of our experiences, we have reviewed our use of PBL and will introduce formal assessment of both final group presentations and wiki contributions in the near future.

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