Blended problem-based learning: designing collaboration opportunities for unguided group research through the use of Web 2.0 tools

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Abstract

This paper reports on the evaluation findings for a postgraduate Law programme following a problem-based learning (PBL) curriculum, which introduced group wiki and blogging tools for students to use in support of a series of unguided group research activities. Following a face-to-face PBL session where students were presented with a new problem and brainstormed learning outcomes and tasks as a framework to solve it, the virtual tools were then employed to support discussion and sharing of research outside the classroom, leading to the production of a collaborative solution by the group. The problem-based exercises targeted higher order thinking, with students encouraged to demonstrate skills in articulating and explaining the solutions they had reached in relation to the case problem, as well as negotiating and interpreting issues.

This paper considers the online stage of the PBL process, looking at the reception of the study methods for the research activity and the effectiveness of the web tools in supporting the unguided group research tasks. Evaluation focused on levels of student engagement during the performance of the research tasks and the nature of the online learning exchanges to see whether they reflected the higher-order thinking which had been targeted by the course instructor in the PBL exercises. Findings are drawn from a mixed-mode evaluation of the first delivery of this course in 2009, carried out through activity logs, content analysis of blog posts and focus group interviews. The results reveal a positive reception for the learning methods and tools with evidence of higher order thinking and reflective skills in the logged exchanges as students became accustomed to the new learning methods. The pattern of contributions gradually evolved from 'one-shot' postings of solutions to critiques of peer contributions and revision of original posts, demonstrating collaborative working between group members towards an agreed solution. However, this study highlights the challenges for instructional support in the management of the learning process for these tasks - specifically in addressing students' anxiety over their performance in the online tasks and a perceived need for individual and collective feedback in support of the unguided research task. Getting the balance right in providing facilitation rather than direction in the conduct of the unguided research tasks, whilst providing adequate feedback on student performance, remains a challenge for PBL tutors and a theme for further research.

Keywords

Problem-based learning (PBL), blended learning, unguided group research, virtual collaboration

Introduction

There is an emerging evidence base for using technology to support problem-based learning (PBL), although until recently most studies had focused on technology as an alternative method of delivering the content and resources supporting the problem scenario (as noted by Savin-Baden and Wilkie 2006; Donnelly 2006, 2010). New research points to a shift in instructional design from using technology for content delivery towards supporting interaction and the active engagement of students in learning activities. Wheeler et al. (2005) have described how online learning may support active problem-solving and the immersion of students within situated learning tasks which address real-life problems. Studies on blended PBL have indeed begun to address student-centred learning designs and their impact on learning behaviour (Savin-Baden and Wilkie 2006). There are indications that students prefer to have web support for PBL (Cunningham et al. 2006), and that a blended format can have a transformational impact on their learning, encouraging learners to engage in critical thinking

(Donnelly, 2009), although in the majority of studies to date the positive reception of technology by students relates more to the ease of online access to resources, provision of tools for enhancing face-to-face discussions (de Leng et al. 2006) or basic tutor-student question and answer interactions (Dalsgaard and Godsk 2007).

Identifying and enabling peer (learner-learner) collaboration in the online environment in a way that demonstrably supports student learning remains a challenge and may involve a variety of instructional roles in managing student learning (Danielsen and Nielsen, 2010), although some studies have reported positive responses from students in qualitative surveys and focus groups in relation to their learning experience (McCall 2010; Woltering et al. 2009). Studies applying the pedagogy of online interaction to analysis of collaboration in the context of PBL are beginning to emerge (Bromby 2009; Donnelly 2006, 2010), and it is in this context that this research paper is placed.

York's approach

This paper reports on a blended design approach for a postgraduate LLM Law programme at the University of York, which introduced technology to support the performance of unguided group research tasks. The selection of collaborative tools and a virtual space for student-managed activity was consistent with the philosophy of the teaching programme, to foster self and group-management skills expected of students at this level. The emphasis on virtual collaboration was also intended to be enabling for students who were geographically dispersed and unable to collaborate face-to-face during the period of unguided group work.

The role of technology within the PBL cycle

The problem-based learning sessions were delivered in the first term of the new programme in October 2009 across two compulsory modules (20 credits each) and two optional modules (10 credits each) for a small cohort of 7 international postgraduate students, drawn from a mixture of countries including China, South Korea, Pakistan, Germany and the United Kingdom.

At the start of each PBL cycle, a new problem was introduced in a face-to-face session, with a PBL tutor acting as facilitator and providing feedback on the performance of the group. For each problem, a student acted as Managing Partner or Chair, taking responsibility for leading the discussion and managing the interaction of the group, and another student acted as scribe, recording the details and outcomes of the discussion. These roles were rotated amongst the group to ensure equality. In these sessions the students identified their prior knowledge, learning outcomes and priorities for individual research, which were identified through a brain storming exercise facilitated by the PBL tutor. The learning then moved to the self-managed collaborative space on the University's virtual learning environment (VLE), where students were presented with group wiki and blog tools (Learning Objects Campus Pack 3 tools hosted within the Blackboard VLE) to manage their own research activity to address the learning outcomes and seek an agreed solution to the problem.

At this stage of the PBL cycle, it was anticipated that students would engage in self-directed learning, with the collaborative process shifting from defining the problem and sharing prior knowledge to negotiating and constructing new knowledge (Schmidt 1983; Hmelo-Silver 2004). Students were encouraged to research solutions to the targeted learning outcomes for the problem under review and post their ideas to a blog, with no prescription as to the form in which they made their submissions. The group wiki was reserved as the space for the group's finalised solution, drawing on the blog postings and combined research effort. The research and negotiation of the finalised solution were intended to be unguided, with no input from the PBL tutor, although an interim face-to-face meeting was convened midway through each exercise to check that students were on the right track. Individual contributions to the group work were assessed as 30% of the coursework mark for the module, acting as an incentive for engagement and group participation.

Evaluation methods

Evaluation focused on the nature of group interaction within the virtual space that had been set up for the unguided research task – in particular how students responded to this medium in their approach to the weekly problems. This involved a study of the full range of learning that was being supported on-line, from evidence collection and reporting of findings relevant to the problem under discussion to deeper levels of learning involving the critiquing of conclusions and delivery of constructive feedback to others.

Proceedings of the 8th International Conference
on Networked Learning 2012 , Edited by: 382
Hodgson V, Jones C, de Laat M, McConnell D,
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ISBN 978-1-86220-283-2

By drawing on multiple data collection methods, the research aimed to build up a rich picture of student learning across a selected range of PBL activities. Weekly blog sites were randomly selected from the compulsory Law and Commercial Transactions and the optional Corporate Finance and Corporate Insolvency modules of the LLM programme to serve as a focus for the research activity, which investigated PBL activities over a period from October – November 2009.

The unit of analysis for the online contributions was a blog post or comment associated with a post, which could contain multiple 'units of meaning' within each post. To evaluate the posts for each selected weekly problem, Fox and MacKeogh's 16 categories of cognitive thinking (2003) were employed, which are in turn adapted from Salmon's original framework for interpreting online contributions (Salmon 1998). This framework maps closely to the stated objectives for the unguided research in addressing evidence of self-directed research (reading/citation of resources) and of skills ranging from opinion forming (declarative statements) to higher-order cognitive skills (articulating and explaining; critiquing and challenging ideas of others).

Quantitative research methods were also used to track students' visits to the VLE module sites and to the weekly blogs where research findings were posted. In addition to this, the number of blog posts and comments that were made were recorded as a means to measure individual contributions to the PBL group research activity. Finally focus group interviews were conducted with the course instructor, PBL tutor and students to probe their accounts of the learning that had taken place online.

Evaluation findings

Profile of the LLM cohort

The cohort had little prior familiarity with the PBL approach and use of online tools at the outset of the LLM programme. One of the students had encountered a seminar based discussion of Law in her undergraduate studies, although this was focused on the theory rather than practice of Law. For the others, the discursive and research based components of PBL were entirely new. Some of the students were familiar with VLE platforms and module sites as repositories for course resources and test questions, but not as spaces for collaborative research and the elaboration of knowledge. As a way of introduction to prepare students for these new learning methods, the cohort observed a face-to-face undergraduate PBL session and followed a dedicated training session on how to post messages to a blog site within the VLE.

Outline of key findings

Activity logs for the Corporate Finance and Corporate Insolvency and Law and Commercial Transactions modules reveal a regular pattern of log-ins for the weekly PBL tasks, with students accessing the VLE on a daily basis. However, the pattern of posts reflects a concentrated period of activity at the end of the weekly study cycle during which students delivered their responses to the targeted learning outcomes. Table 1 reveals the frequency of individual contributions, with individuals contributing a mean average of 2 posts per problem. Whilst the number of posts may seem low, it is worth noting that students were expected to address all the learning outcomes in their posts, which led to long and considered responses to the PBL problem under investigation. Interaction between students was limited, but some responses acknowledged previous contributions – for example an elected scribe provided an aggregate response to a problem at the end of each weekly research cycle.

Table 1: Frequency of individual contributions to PBL blogs

Students	Frequency of blog posts & comments			
	LCT wk3	CF wk2	CF wk4	LCT wk6
Student 1	1	2	4	2
Student 2	1	2	1	2
Student 3	2	6	2	1
Student 4	1	3	1	1
Student 5	3	-	-	5
Student 6	2	-	-	1
Student 7	1	-	-	2

Table 2 (below) reveals the categories of messages that students posted to the blog sites, coded against Fox and MacKeogh's adapted framework (2003, 129-131).

Table 2: Content analysis of PBL blog posts

Characteristic of cognitive skill	% of posts exhibiting characteristic			
	LCT wk3	CF wk2	CF wk4	LCT wk6
Offering resources	16%	14%	16%	13%
Making declarative statements	0%	5%	0%	2%
Supporting positions on issues	11%	8%	14%	6%
Adding examples	8%	8%	8%	19%
Articulating and explaining	18%	16%	14%	17%
Asking questions	8%	5%	0%	4%
Inviting critique	3%	0%	5%	0%
Reflecting personal experience	0%	0%	0%	2%
Re-evaluating personal positions	3%	0%	0%	2%
Agreeing with ideas of others	3%	5%	3%	8%
Expanding ideas of others	11%	5%	5%	2%
Critiquing and challenging ideas of others	3%	3%	3%	10%
Negotiating and interpreting	13%	19%	16%	6%
Defining	0%	5%	14%	6%
Summarising previous contributions	3%	0%	0%	4%
Proposing actions based on developed ideas	3%	5%	3%	0%

Matching the results against the targeted objectives for the unguided research, we can observe a close fit in terms of the evidence of wider reading and citations (examples / offering resources categories) that were included in blog posts. Evidence of higher order thinking is also revealed in the results, with the leading categories reflecting skills in articulating and explaining positions, as well as negotiating and interpreting issues. This reflects developed lines of argumentation, moving beyond opinion-based conclusions to reasoned discussion on the issues at stake, as illustrated in the following excerpt from a blog post for the Law and Commercial Transactions research task:

> "I am open to being corrected on this, so this is just a question: Regarding the paragraph wherein you say ''In this case, there may have been a counter offer by N by stamping the performance certificate but there was no acceptance as it was never communicated further to M (my italics). The better approach here may be to take the "first shot" approach as advocated by Lord Denning in Butler v Machine Tools so as to see whether the first offer communicated, that of M to N was accepted by N. It seems it was, so according to this approach the fact that N had their own standard terms and conditions stamped on top of M's is irrelevant as it was never communicated to M."

Interestingly, an increased frequency of messages acknowledging other contributions is apparent in the Week 6 blog, either by agreeing with or critiquing the ideas of others. This may suggest that students acquired a greater confidence in the virtual space as a location to test out ideas, rather than publish answers to the learning outcomes under research as the LLM course progressed.

Focus group responses revealed that students conducted all communication for the problems online, without recourse to face-to-face meetings or telephone discussions to resolve problems. Indeed they viewed this approach as a strength in supporting the flow of the research tasks:

> "..it's quite helpful because you are actually seeing someone's argument written out, so you can actually follow it, which is useful. Sometimes when people are speaking, you get lost with what they are saying, whereas when you're reading it you can think – you can read back – and it's quite good to see two views. If you're not involved in the argument, you can see which side you agree with, so it's useful."

Proceedings of the 8th International Conference on Networked Learning 2012 , Edited by: Hodgson V, Jones C, de Laat M, McConnell D, Ryberg T & Sloep P

ISBN 978-1-86220-283-2

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This extended to disagreements and questions, with group members perceiving the virtual space as a place to log issues that they were struggling with, thereby making their working process transparent to the course instructor. Given the assessment criteria governing individual contributions to the PBL work - accounting for 30% of the coursework mark for a module - this was an important consideration to take into account. However, the emphasis on communication through blog posts also appeared to help students in engaging in reflective learning and the application of theory to practice:

> "..when you are forced to write something and put it on the blog you have to reflect your own thoughts more, and I think that's quite helpful. Because sometimes if you just read a book, you read it and take it and maybe you learn it or maybe not and that's it. But you have really to think about it and make some research and find different information and put it all together and think about it, and then…you are more involved into this legal material and sometimes..you can see new problems."

Disagreements led in some cases to the revision of original arguments, with individuals posting corrections to their original posts, acknowledging the input that they had received from other participants.

> "..I posted something and then I think X corrected me on something, and then I went through it and I was like 'oh yeah you're right' so I just corrected it, but I didn't correct it like, you know, wipe what I had written, I just put 'Oh well I was wrong on this point so just a correction on that, so it's not like I was wiping it and making it look nicer but I just responded to what was she said and I said I was wrong you were right or something like that."

However, participants pointed to one significant shortcoming in the design of the unguided research task which related to the absence of feedback on individual contributions to the research process and learning outcomes, which students felt would have enhanced their overall learning.

> "Well I would prefer actually to get proper feedback, not only like we get on the problem in the class, but also proper feedback every time on our blog or wiki, or at least every some time. You know, we need to know..."

They were also not presented at the end of the weekly cycle with an approved set of solutions for the problems under discussion, which teaching staff felt might have undermined their sense of "learning through doing – active learning" – a hallmark of the PBL approach.

Conclusions and discussion

The research reflects a preliminary step in the evaluation of the online delivery of self-managed PBL research activity for a small cohort of students over two modules of a study programme. Whilst acknowledging the limitations of this study, the results nonetheless indicate the potential for online tools to support reflective thinking and the elaboration of knowledge through self-managed learning, contributing to the emerging evidence base of blended design approaches for PBL (Savin-Baden and Wilkie 2006; Donnelly 2010). In particular, the findings reveal how a group blog space may serve as an effective forum for evidence gathering and presentation of solutions in relation to the targeted learning outcomes, reflecting situated cognition - i.e. learning based on the 'thinking through of real-life problems' (Wheeler et al. 2005: 127). As students became more familiar with the learning methods they displayed a greater willingness to engage in critical discussion and negotiation towards an agreed solution.

The results are striking given the cross-cultural make-up of the cohort and the different learning philosophies which students brought to the programme. The cohort's lack of familiarity with the PBL approach and exposure to online learning methods at the outset of the programme may be contrasted with the positive way in which learners embraced this learning culture as the modules progressed, viewing the collaborative tools as enablers rather than barriers to group work in supporting the development of critical discourse. The pattern of asynchronous postings and evolution of a textual record of contributions within the group blog assisted students in reflecting on the problem under review, and this was viewed as a more effective way of learning than engaging in face-to-face or synchronous discussion by telephone or web conferencing tools. Whilst the course

Proceedings of the 8th International Conference
on Networked Learning 2012 , Edited by:
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ISBN 978-1-86220-283-2

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instructor anticipated that the assessment rules governing the conduct of the research tasks would act as a driver for participation and the asynchronous textual exchange serve as an effective way in which international students could share information and overcome language barriers, it was less certain how group members would adapt their style of learning to the online space and use this medium to engage in critical discourse. The evidence reflects how students successfully self-regulated disagreements and opened up their personal contributions for critical comments without recourse to the PBL tutor for support. The PBL tutor's activity consequently remained focused on helping students to define learning outcomes in the face-to-face sessions and overseeing progress updates on the research activities in the mid-point sessions, without recourse to intervention in the online learning space.

The findings suggest that blended study methods can help to create the conditions for unguided group research tasks; however further work is needed in researching the roles which students adopt online and the processes of negotiation and development of knowledge which they engage in during PBL activity as a way of understanding how best to support student learning. Danielsen and Nielsen (2010) have reported on the different dimensions of instructional support for PBL, highlighting the varied roles which instructors adopt in managing student learning as 'expert', 'process oriented supervisor' and 'therapist'. Aside from facilitation and group management skills in supporting student learning, the experiences of the LLM students in this study shed light on another challenge; namely how to recognise and validate individual contributions, providing reassurance that students are on the right track in their research activities whilst retaining the hallmarks of a group-based PBL study approach and an unguided learning process. As Hmelo-Silver et al. (2006) have found, there is a dilemma in terms of the level of virtual presence required to support student learning for online activity, with a balance to be drawn between facilitating rather than policing student contributions, which enter the domain of more directive and traditional pedagogies.

References

Bromby, M. (2009). Virtual Seminars: Problem-based Learning in Healthcare Law and Ethics. Journal of Information, Law & Technology (JILT) 2009, no.3, http://go.warwick.ac.uk/jilt/2009_3/bromby [viewed 25 November, 2011].

Cunningham, C. E., Deal K., Neville A., Rimas H., & Lohfeld, L.. (2006). Modeling the Problem-based Learning Preferences of McMaster University Undergraduate Medical Students Using a Discrete Choice Conjoint Experiment. Advances in Health Sciences Education 11: 245–266.

Dalsgaard, C., & Godsk, M.. (2007). Transforming traditional lectures into problem-based blended learning: challenges and experiences. Open Learning: The Journal of Open and Distance Learning 22, 1: 29-42.

Danielsen, O., & Nielsen, J. L. (2010). Problem-oriented project studies - the role of the teacher as supervising / facilitating the study group in its learning processes. In L. Dirckinck-Holmfeld, V. Hodgson, C. Jones, M. de Laat, D. McConnell & T. Ryberg (Eds.), Proceedings of the 7th International Conference on Networked Learning 2010: 558 - 565. http://www.lancs.ac.uk/fss/organisations/netlc/past/nlc2010/abstracts/PDFs/Danielsen.pdf [viewed 14 Jan 2012].

de Leng, B. A., Dolmans, D., Muijtjens, A., & van der Vleuten, C., (2006). Student perceptions of a virtual learning environment for a problem-based learning undergraduate medical curriculum. Medical Education 40, no. 6: 568-575.

Donnelly, R. (2010). Harmonizing technology with interaction in blended problem-based learning. Computers & Education 54: 350-359.

Donnelly, R. (2009). The nexus of problem-based learning and learning technology: Does it enable transformative practice? European Journal of Open, Distance and E-Learning. http://www.eurodl.org/?p=archives&year=2009&halfyear=2&article=371 [viewed 14 Jan 2012].

Donnelly, R. (2006). Blended problem-based learning for teacher education: lessons learnt. Learning, Media and Technology 31, no. 2: 92-116.

Fox, S.,. & MacKeogh, K.. (2003). Can eLearning Promote Higher-order Learning Without Tutor Overload? Open Learning: The Journal of Open and Distance Learning 22, no. 2: 121-134.

Hmelo-Silver, C. E., Nagarajan, A., & Dery, S.J. (2006). From face-to-face to online participation: tensions in facilitating problem-based learning. Savin-Baden, M., & Wilkie, K. eds. (2006). Problem-Based Learning Online. Maidenhead: Open University Press.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? Educational

Proceedings of the 8th International Conference on Networked Learning 2012 , Edited by: Hodgson V, Jones C, de Laat M, McConnell D, Ryberg T & Sloep P

ISBN 978-1-86220-283-2

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Psychology Review 16, no. 3: 235-266.

McCall, I. (2010). Online enhanced problem-based learning: assessing a blended learning framework. The Law Teacher 44, no. 1: 42-58.

Salmon, G. (1998). Developing learning through effective online moderation. Active Learning 9: 3–8.

Savin-Baden, M., & Wilkie, K. eds. (2006). Problem-Based Learning Online. Maidenhead: Open University Press.

Schmidt, H.G. (1983). Problem-based learning: rationale and description. Medical Education 17: 11-16.

Wheeler, S., Kelly, P., & Gale, K. (2005). The influence of online problem-based learning on teachers' professional practice and identity. ALT-J, Research in Learning Technology 13, no. 2:125-137.

Woltering, V., Herrler, A., & Spitzer, K. (2009). Blended learning positively affects students' satisfaction and the role of the tutor in the problem-based learning process: results of a mixed method evaluation. Advances in Health Sciences Education, 14, 725-738.

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on Networked Learning 2012 , Edited by:
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