Shadow Modules: Addressing the heterogeneity of technologies for collaborative learning outside of the classroom

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Abstract: Informal learning, outside of the classroom, can benefit from collaborative activity between students. This informal collaborative learning can be facilitated by interactive technologies, just as is seen in formal learning. Web 2.0 technologies have the potential to facilitate informal collaborative activity and share its outputs more-widely between students. However, due to the unstructured nature of informal learning, the technologies used by students may be varied and lacking alignment, and therefore could potentially hinder collaboration and the benefits thereof. This paper outlines the challenges faced in encouraging collaboration between students in informal learning, and how in Higher Education the use of a scaffolded structure has facilitated better alignment. A student-led, student-focused study group approach, Shadow Modules, can facilitate collaborative learning between students using Web 2.0 technologies. By encouraging students to organise themselves, and by scaffolding interaction through use of self-selected technologies, greater alignment and support of learning is achieved.

Keywords: Web 2.0, informal learning, scaffolding, social media.

Introduction

A key aspect to any learning activity is its reinforcement outside of the classroom. Reinforcement occurs through informal learning situations (self-directed learning, reading, revision and problem-solving). Of key importance is the ability of the learner to relate formal and informal learning situations to each other. Collaborative learning approaches have great potential for formal learning situations. By negotiating meaning with others, a learner will develop a richer and more-complete understanding of a subject or problem (Mercer, 1996). Collaborative activity can also be of benefit in informal learning situations (Song & Lee, 2014), encouraging learners to negotiate meanings and solve problems collectively, in ways that are similar to formal, class-based activities. Collaborative activity can make informal learning more time-efficient and effective (Scott *et al.*, 2014a,b).

If collaboration between informal learners is to be encouraged, then some form of communication between individuals will be required. Communication and coordination of collaborative activity can be facilitated by technology. However, the challenge with informal learning is the distributed nature of the learners. By its very nature, informal learning will take place outside of the classroom, and therefore any collaboration will involve a variety of technological solutions, individual to each student. Coordination of an effective dialogue between individuals therefore requires some form of scaffolding, especially with respect to the heterogeneous collaborative technologies involved. This situation therefore makes for a challenging classroom case in the use of technology.

The pedagogy involving coordination of collaborative learning using technology is well-established, with the benefits of computer supported collaborative learning (CSCL) in the classroom being well documented (Resta & Laferrière, 2007). In particular the use of Web 2.0 technologies to support collaborative activity has been proven (e.g. Ravenscroft, 2009; Kuswara & Richards, 2011). Web 2.0 technologies are cloud-based media with the ability for users to contribute and comment upon others' contributions (e.g. social media, collaborative-authoring platforms, wikis and blogs). Web 2.0 technologies also have potential to facilitate collaborative learning outside of the classroom. Web 2.0 technologies can support collaborative links between learners during informal learning and may facilitate the continuance of the learning activity, and the all-important collective negotiation of meaning, beyond face-to-face interactions. Web 2.0 technologies also have the potential to develop a 'community of learners' in the informal learning space, and to connect these learners and their activities back to the formal learning of the classroom (Ravenscroft, 2009). Using Web 2.0 technologies, it is possible for learners to engage in discussions, or to create resources and materials that can support their own learning and that of their peers. Most significantly, it is possible for these learners to share resources within the learning community. However, there are diverse Web 2.0 technologies, used to various extents by different students. For technologies to be used to support collaborative learning among a dispersed community of students, some form of scaffolding is required.

Orchestrated Collaborative Classroom Workshop 2015, June 7, 2015, Gothenburg, Sweden.

Challenges to Practice

For this classroom case, the challenges to facilitating collaboration in informal learning are as follows:

- Undergraduate students are reluctant to participate in extensive collaborative activities (Scott *et al.*, 2014b).
- Independent learning, by default, is a dispersed and un-coordinated activity.
- Students' use of technologies is varied, with a variety of collaborative technologies adopted for social use, which could cause communication difficulties if adapted to pedagogic uses.

A degree of scaffolding of the collaborative activities is therefore desirable, in order to encourage engagement and to ensure that the outputs of any collaborative activity can be shared effectively. This paper describes an approach taken to scaffold collaborative learning between students in an informal learning environment, by using a small suite of Web 2.0 technologies to coordinate a student-led and student-focused collaborative format termed Shadow Modules. By providing a scaffolded format, with students encouraged to use technologies that encourage co-authoring of content, the communication required for collaborative learning is achieved, but without the additional challenge of heterogeneity of technologies. Although direct involvement with the collaborative activity is limited, the outputs of this activity can be shared widely and have significant effects on student outcomes. Although this model is designed for the higher education setting, it can easily be adapted for other settings, and also provide benefits of digital literacy and appreciation of the potential of technologies.

Methods

Educational context

The work was undertaken at a research-focused University in the UK, within the School of Biosciences, a large School of c.1600 students across 12 degree schemes. Subjects of this intervention were undergraduates, typically aged 18-22, with a roughly even gender balance (with a slight bias towards females) within the student population. Students are typically high achievers with high levels of motivation, and have confidence in the use of contemporary technologies, both hardware and software. Typically students use a limited range of software approaches for class-based learning (mostly Microsoft Office and statistical packages, with some specialist platforms used by Final Year students on specific modules). The ICT infrastructure of the University is up-to-date, and students typically own a laptop computer and either a tablet device, smartphone, or both. The University uses a virtual learning environment (VLE) which is based on the Blackboard suite of resources. However, use of technologies in classes is infrequent, due to limited access to classroom facilities with sufficient ICT hardware.

Outline of the Shadow Module approach

Shadow modules are a system of student-led and student-focused study groups; informal learning activities, designed to run along-side the formal modular structure, and to feed back into the formal taught curriculum (Scott *et al.*, 2014a). The format of a Shadow Module can vary, but follows general principles as summarised in figure 1, as follows: (1) Shadow modules are led by a volunteer shadow module leader (or leaders) from the module cohort; (2) The Shadow Module Leader liaises with the academic module leader to identify areas for study; (3)The shadow module leader then organizes one of three forms of interaction, a peer-taught class, a collaborative study group, or a virtual collaborative community using social media (e.g. Facebook); (4) The Shadow Module groups produce outputs which can then be shared with the participants by using defined Web 2.0 technologies (Google Drive and Facebook); (5) The resources can also be shared with non-participants, through the coordinated media used in (4); (6) The outputs of the Shadow Module can also impact upon the academic lead, and can feed back into the pedagogic approach for that module (impacting on teaching methods, curriculum, support, etc); (7) The Shadow Module Leader can also influence the future development of the academic module.

Assessment of Shadow Module technologies

The technologies adopted by 9 Shadow Modules (4 peer-taught, 2 group-based and 2 social media-based) were reviewed for their impact, coverage, reach and ease-of-use. The technologies were assessed through comments from Shadow Module Leaders through diaries and interviews. Shadow Module Leaders were asked to keep a weekly diary detailing their experiences of running the Shadow Module, and the affordances or restrictions placed upon them by technology. Shadow Module Leaders were also interviewed in semi-structured interviews to determine the approaches they found most beneficial, and the potential limitations they faced, and how they were overcome.

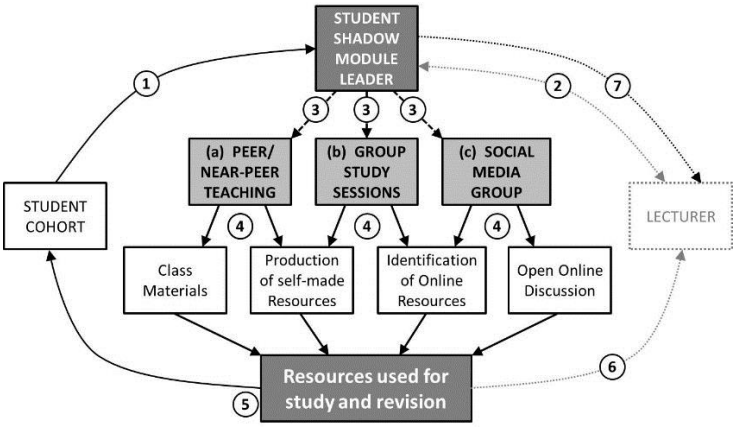

Figure 1. The Shadow Module pedagogy (adapted from Scott *et al.*, 2014b)

Shadow Modules were not structured in a formal way to begin with, and had (deliberately) almost no direct involvement from the lead academic for the module, in terms of their in-session activities. The non-virtual Shadow Module formats would typically use a classroom in which to meet initially, where students would bring laptops and tablet devices for internet searching and accessing research papers and reviews. Groups would use whiteboards and paper to design resources, which could then be photographed and uploaded to a common collaborative ICT space. The medium chosen for this collaborative ICT space was the Google Doc (from the Google Drive suite of resources) which allowed co-authoring of a word-processed document and uploading of images and hyperlinks. The link to the Google Doc could be shared with participants and non-participants, thus expanding the audience for the outputs of the collaborative sessions. For the virtual group approach, a social media platform (Facebook, or a bespoke social medium for education, 'Learnium') was used, allowing students to post questions, share resources and rich media (images, videos and audio files) and discuss content.

Qualitative Analysis

Weekly diaries and interviews were transcribed and coded using NVivo content analysis software. Analysis was repeated by 2 researchers independently when deciding on the codes to be used for the analysis.

Findings

Preferred technologies to link informal learning back to the classroom

An analysis of the technologies employed in Shadow Modules, and the diaries and views of Shadow Module Leaders, revealed that 6 main technologies were used by students in running the Shadow Module activities (Table 1). However, the key finding was that only two of these were deemed to be of use in facilitating the collaborative activity. The most commonly-used and beneficial technology for the sharing of material and information was the Google Docs facility of Google Drive. This collaborative-authoring technology enabled students to co-author a document, upload images and text, and to share this widely with the student cohort. Google Docs was the most collaborative of all the media used. However, Google Docs was limited in the ability to embed rich media resources. Social Media (Facebook) was the next most-used technology, as a more-versatile medium for sharing links, rich media, sharing resources students had identified, and for discussion of problems and issues. Using a social media platform (such as Facebook), however, runs the risk of alienating non-Facebook users, and can cause resentment of the educational environment impinging on the social space.

Whichever technological approach was adopted by students, however, it was clear that the students quickly adapted to its use and self-selected the favoured approach, with the benefits and limitations of the technology quickly becoming appreciated by the users. Therefore, the heterogeneity of technologies was addressed by the students' own choices when framed within a moderately-scaffolded activity. The one technology that was rejected as a collaborative medium was the University VLE, which was reported by several students as being unwieldy and lacking in versatility. In particular, the VLE lacked the facility for rapid and real-time communication between users. This real-time communication is essential for the collaborative process. Without the ability to communicate, collaborative activity was seen as less effective.

Table 1: Reflections on media tools for Shadow Modules

Platform	Benefits	Limitations
Google Drive	***Ease of Use* –** Identical to word processing progs	***Lacks Privacy*** – Anyone with link can view/contribute
	Versatile synchronous collaboration platform.	***Anonymity if no Google account***.
	Ease of Access *due to Cloud location*	***Accidental document changes*** possible
	Collaborative mechanisms (in-text discussion "chat" facility).	***Linearity of collaboration*** (difficult to localize contributions within a long document)
	Co-construction of content (editing in real time).	***Navigability of large document*** with multiple authors
Facebook	***Rapid communication and discussion***	***Not all students wish to use Facebook***
	Ease of sharing resources	***Mixing social space and educational space***
Prezi	***Good depth of information possible in medium***	***Difficult to learn to use***
	Embedding of Rich Media possible (e.g. video)	***Sharing link requires other medium*** (e.g. email/VLE)
Study Blue	***Flashcards and Quizzes for student revision***	***Difficult to use*** (creation and sharing)
	Mobile access via App	***Access and privacy*** (resources uploaded are public)
Wiki	***Effective asynchronous collaboration space-***	***Complex synchronous editing***
	Content can be well structured, making it easier to navigate.	***Difficulty of use*** – Not easy to learn coding language for wiki format
	Versatility (use of rich media tools embedded)	***Limited functionality*** - Like Google Drive, the result is linear. Difficult see relationship between entries.
VLE	***Primary system in institutional online working environment*** - students are familiar with functions	***Very restricted*** at facilitating student communication and collaboration
	Mobile App supported	***Not versatile or user-friendly***

Conclusions and implications

There are many technological options available to students for collaboration, either traditional or Web 2.0-based. The potential for misalignment of technologies and for diversity of technologies means that coordination of collaborative activity in a dispersed community, such as is the case with informal learning, is a potential concern. Without a scaffolded format for interaction, it is likely that students will not be able to share ideas or collaborate due to this issue of heterogeneity. However, by encouraging the development of a scaffolded collaborative activity, homogeneity is achieved by the students themselves identifying what is most effective for that particular environment. Therefore by developing a medium for interaction between students, through a format such as the Shadow Module, effective use of technology can be achieved to support learning, but within a limited, and relatively homogeneous, framework. By being student-led, the engagement of students either in the collaborative activities or outputs will be through a small number of technologies, overcoming the challenges of heterogeneity. While this approach to encouraging collaboration is modeled on a university undergraduate structure, it could easily be adapted to the secondary sector, or potentially earlier. The key driver in this process is the development of a community of learners in the informal setting, thus reducing the dispersed nature of the informal learning approach. By the students themselves coordinating and selecting the media that best suit the activity, the students will develop digital literacy skills as well as supporting their learning of the subject curriculum. An appreciation of the potential for Web 2.0 technologies beyond their being social tools will have a benefit to students for their future learning and employability prospects, and so the Shadow Module approach has the potential not only to align student uses of technology, but also to deepen their appreciation of how technology can support learning.

References

Kuswara, A. U. & Richards, D. (2011). Realising the potential of Web 2.0 for collaborative learning using affordances. *Journal of Universal Computer Science*, 17, 311-331.

Mercer, N. (1996). Words and minds: How we use language to think together. London: Routledge.

Ravenscroft, A. (2009). Social software, Web 2.0 and learning: Status and implications of an evolving paradigm. *Journal of Computer Assisted Learning*, *25*, 1-5.

Resta, P. & Laferrière, T. (2007). Technology in support of collaborative learning. *Educational Psychology Review, 19*, 65-83.

Scott, J. L., Moxham, B.J. & Rutherford, S.M. (2014a). Building an Open Academic Environment - New Approaches to Empowering Students in their Learning of Anatomy. *Journal of Anatomy*, *224*, 286-9

Scott, J. L., Mistry, S.L., Moxham, B.J. & Rutherford, S.M. (2014b). Using Web 2.0 technology to support and enhance collaborative activity outside of the taught curriculum in Higher Education. In Rutherford, S. (ed.) *Collaborative Learning: Theory, strategies and educational benefits* (149-174). New York, Nova.

Song, D. & Lee, J. (2014) Has Web 2.0 revitalized informal learning? The relationship between Web 2.0 and informal learning. *Journal of Computer Assisted Learning*. 30: 511–533.

Acknowledgments

The author would like to thank the participating students in the Shadow Modules, Jonathan Scott and Sumit Mistry. This work funded by the Higher Education Academy (UK), Teaching Development Grant GENTDG1030.