Should We Teach Students How to Learn?

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ABSTRACT

Student engagement and commitment are essential for successful science learning. At present, the design of course materials is usually primarily focused on disseminating as much information as possible within the limited amount of lecturing time available. This gives less emphasis on strategies to consolidate acquired information and to stimulate self-directed research into particularly interesting topics. Guiding students into forming a community of learners could enhance the efficiency of the learning process by sharing resources and discussing common difficulties. We set up an online chat room associated with the Parasitology module for Level 4 Life Sciences degree students, at the University of Dundee, which was run in parallel on Blackboard and on a restricted access Facebook group. Participation in the chat room was strictly voluntary, although students were advised it would be part of their formative training. The feedback results show the Facebook group was largely favoured over the Blackboard interface and that the students found the idea interesting, although engagement was mainly passive. Students reported that the major obstacle to participation was lack of time due to a heavy course workload, which also inhibited them in engaging in any further research on the themes proposed in the chatroom. Interestingly, a large majority of students indicated that they would like the lecturer's participation in the chat room. These results indicate that students undervalue the role of self-directed formative training and collaborative learning in their studies, and calls into question the efficiency of current methodologies for preparing the next generation of autonomous and critical thinking scientists.

Keywords: student engagement; online community of learners; chat room; Facebook; formative training.

Introduction

The fast-growing body of knowledge in the various subjects that constitute STEM disciplines (Science, Technology, Engineering and Mathematics) generates a natural tendency amongst teachers, many of whom are highly successful researchers, to share with their students the latest breakthroughs and technical advances as the basis of their lectures. This practice is further enabled by the proliferation of Open Access literature, justifying the teachers' expectations that the students can readily access and read the pertinent references. However, this increasing volume of knowledge represents an immense challenge when designing a course module, for selecting which aspects to include for a particular level and manage the limited contact time available. In most cases lecturers rely on a strategy of delivering core concepts in didactic lectures whilst referring the students to a more comprehensive reading list, for further understanding of the subject.

There are nonetheless several issues associated with relying on this strategy. Often, reading lists are extensive, making students feel anxious and overwhelmed. Also, frequently and perhaps more challenging, the topics covered in scientific research papers are complex and not especially accessible to non-experts. These aspects can contribute to discourage students from pursuing further independent study. And yet creating such opportunities is a fundamental aspect of science learning. The ability to interpret information and data from diverse sources and adapt and apply methodologies to different and new scientific questions are essential skills in the development of critical scientific thinking. Therefore, educators face a challenge to develop new strategies for efficient learning and teaching in a science degree.

The establishment of communities of learners, where discussion and peer feedback are stimulated and valued, can help the students expand their understanding of course content. It is widely accepted that engaging in collaborative work helps students consolidate their learning as it gives them the opportunity to build knowledge through self-directed research and resource sharing (Lave & Wenger, 1991; Tu, Blocher, & Roberts, 2008; Armfield, Armfield, & Blocher, 2015). Being involved in an online community of learners allows students to tap in to diverse resources for researching, organising and disseminating information, while managing their individual learning at their own pace and according to their specific learning needs.

Learning how to learn

Several studies indicate that there is a consistent correlation between successful learning and student engagement (Rocca, 2010; Trowler, 2010; Biggs, 2012; Thomas, 2012; Casuso-Holgado et al., 2013). These studies indicate that the teaching, learning and assessment practices conducive to more significant learning gains include contact time with teachers, prompt feedback and collaborative learning.

Many students still tend to display a passive attitude towards the learning process (Herrmann, 2013; Bone & McNichol, 2014). They can view this process in two stages: in the first phase they are lectured on the subjects, given study materials and told of learning objectives; in a second phase, they read on those subjects, search the lecture notes to see which aspects were covered, match them to the learning objectives, and finally get tested on 'what they have learned' in an exam. However, in many cases the subjects were only comprehended for the purpose of the exam and true learning only happens later on in further studies (e.g. postgraduate degree) or in a professional context. This behaviour in turn tends to generate frustration in teachers, who feel they are wasting valuable time on students that do not care, or that they have failed to communicate well with them. Several factors contribute to a lack of involvement or engagement, including difficulty in following the subjects being taught, failing to appreciate their relevance, excessive use of unfamiliar terms and lectures being too intense, with large amounts of subject matter covered in a short period (Rogers, 2013).

Research suggests that greater involvement by students in the learning and teaching process can achieve significant improvements in student engagement and academic results (Kay & LeSage, 2009; Streeting & Wise, 2009). A strategy of involving students with their own learning requires organising learning tasks for delivery as group, or individual work presented in class. Accordingly, the Parasitology module at the University of Dundee has included, for the academic years 2014/15 and 2015/16 an assessment consisting of presentation of primary research papers, covering many of the fundamental techniques and allowing for some revision and consolidation of the concepts introduced in lectures. The students also have to submit an analysis of this research paper in writing. During assessment of the students of the 2014/15 cohort it became clear that many demonstrated significant difficulties in interpreting and conveying scientific information.

Using an informal online environment to facilitate 'science talk'

Scientific texts can often be written in a very technical and inaccessible language, which can create an added level of difficulty for students. Also, the differences in each person's background knowledge and training play an important part in how easily one can understand the concepts under discussion. Shyness and the pressure of being in class, and in presence of their lecturer, can inhibit the students from asking for further explanations when struggling to understand a particular subject.

It is reasonable to assume that creating an informal learning environment, where students could feel comfortable to ask any type of question and get help to overcome their difficulties, would facilitate greatly their learning progress. In an effort to implement this strategy many lecturers offer to hold office hours, particularly during revision time. Accordingly, these were made available to the Parasitology students at Dundee, however this offer was not taken. The reasons for this are unclear although feeling underprepared and afraid of 'asking stupid questions' may be important factors (Weimer, 2015; Condis, 2016).

In their report to the European commission, the High Level Group on the Modernisation of Higher Education (HLGMHE, 2014) reports that new technologies and communication platforms can increase interactivity between teachers and students, as well as between students, and help teachers cultivate their role as mentors "… developing with students the skills of information management, understanding and questioning, critical thinking and knowledge application" (HLGMHE, 2014, p. 19). Given this evidence, could we then exploit online learning environments to promote informal learning?

Online environments are an integral part of all current learning experiences and students use various types of media, integrating them in several learning tasks (Hrastinski & Aghaee, 2012; Junco, Elavsky, & Heiberger, 2012; Collinson & Halliwell, 2013). For example, Wikipedia, PubMed, NCBI, YouTube and Google Scholar are used for retrieving content, while social media like Facebook and Twitter are mainly used to keep contact with colleagues and share information. Institutional interaction as well as contact with tutors and lecturers tends to occur either on Virtual Learning Environment (VLE) platforms, like Blackboard, or via e-mail (Hrastinski & Aghaee, 2012). Recent evidence, however, suggests this compartmentalisation is becoming much more fluid with both lecturers and students increasingly incorporating various online tools with social media for learning purposes (Dabbagh & Kitsantas, 2012; Seaman & Tinti-Kane, 2013; Moll & Nielsen, 2017).

This research project attempted to explore the potential of introducing a chat room as an informal e-learning environment to promote the discussion of course-related topics, as a means to facilitate understanding of scientific concepts and encourage further reading of relevant literature. It additionally aimed to evaluate the outcome of using a social media platform and compare it with the institutional VLE.

Project development and running

The idea behind running a chat room was to create a platform to engage the students further with Parasitology, and stimulate a student-led discussion of key questions that could help identify the concepts that students found challenging. We hoped to facilitate their understanding of these concepts through peer-to-peer collaboration aided by mentor intervention. We also aimed to encourage the students to engage in further reading and research to enhance and consolidate their knowledge of the subjects covered in the lectures.

It was decided and clarified to the students that participation in the chat room was strictly voluntary and not to be assessed, although it was also stressed that this experiment was to be taken as formative learning and that to participate in the discussions could help them consolidate their learning and be used as a self-assessment tool. Each week a question was released that was related to the subjects addressed in that week's lectures but somewhat broader and more discursive in scope, requiring the students to put the knowledge recently acquired into a wider context. The project was run only for the duration of the lecturing period, and in parallel

on both the University's Blackboard environment and on a restricted access Facebook group. Figure 1 illustrates an example of these weekly questions.
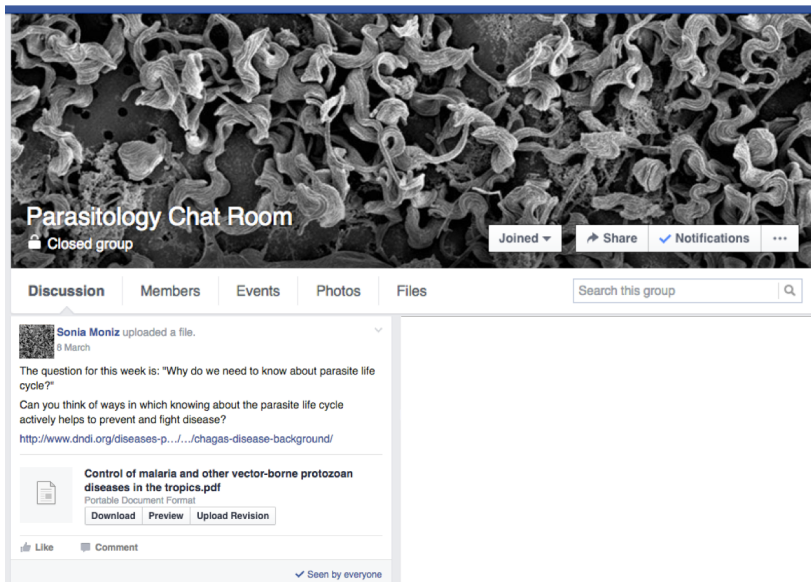

Figure 1: Screenshot from Parasitology chat room on Facebook

Further to the weekly questions, additional resources were also posted, including video links, pdf files and web links for relevant papers and articles, and advice for efficient reading and presenting scientific research papers.

Blackboard environment

The University of Dundee uses Blackboard Learn as their core VLE, where each degree module has a dedicated area, which all students and instructors can access. Although this environment is well equipped with multiple learning tools (such as web conferencing, virtual classroom and portfolio tools) it was mainly used in this module, both by the students and the instructors, as the platform for dissemination of course materials and submission of course assessment tasks.

The Parasitology chat room was set up as a forum within the 'Discussion board' folder and each weekly question or additional resource represented a separate thread. A course-linked announcement was generated for each new thread to create awareness of a new topic and facilitate access to the relevant page. The students were invited to comment or add interesting materials to each thread and were also invited to contact the chat room moderator to propose new threads.

The main advantages of using this platform were from an organisational point of view. All the students are automatically enrolled in the module's VLE, are required to login to access course materials and submit assessment tasks, and receive email alerts with every new announcement. However, there is no method available for tracking if the students are accessing and viewing the chat room posts therefore the level of engagement could only be measured if the students commented on the questions or contacted the chat room moderator. Under these parameters, no student participation could be recorded during the period of time the Parasitology chat room was run.

Facebook group

Given the growing relevance of social media in academic contexts (Arnold & Paulus, 2010; Dabbagh & Kitsantas, 2012; Hrastinski & Aghaee, 2012; Junco, Elavsky, & Heiberger, 2012; Seaman & Tinti-Kane, 2013; Moll & Nielsen, 2015), it was decided to run the Parasitology chat room experiment in parallel on Facebook. The course moderator created a Facebook closed study group, to which all the module students and lecturers were invited to join. Out of the twenty-eight students enrolled in the module, twelve joined the Facebook group, as well as two of the lecturers. All members of this group were free to comment on existing posts as well as add new ones and also invite additional members. The course moderator had the administration rights, including editing and deleting any abusive posts and approving all new members. The posts were created for each weekly question and additional resources, similarly to the threads on the VLE, and the students were invited to participate under the same guidelines.

Unlike the VLE environment, the Facebook platform allows additional means of evaluating student engagement. The number of visualisations of each post is registered and a student's demonstration of interest can also be translated in the 'liking' of a post, in addition to making a comment.

Similarly to their behaviour on the VLE, the students did not offer any comments to the weekly questions or make any additional posts. Nevertheless, some level of student interest and engagement was observed as the posts were visualised by the majority of the students in the group within minutes after posting. A few students also 'liked' some of the posts, indicating some active engagement. However, the level of engagement tended to fade over time as the number of visualisations decreased towards the end of the period the Parasitology chat room was run.

Feedback results analysis

A feedback survey was conducted at the end of the lecturing period to reflect the student's evaluation of the Parasitology chat room. All students received and answered anonymously to the same feedback form with the following questions:

1. Did you follow the posts on the Parasitology chat room?
2. Did you follow them on 'My Dundee' or on 'Facebook'?
3. Did you ever engage with the posts (consider a 'Like' on Facebook as a form of engagement)?
4. If you answered 'No', what prevented you?
5. Did you find the posts interesting? (1 – not at all; 5 – very interesting)
6. Did you find the posts useful? (1 – not at all; 5 – very useful)
7. Did you read the references suggested on the weekly questions?
8. Did you do any additional searches/reading on the subjects of the weekly questions?
9. Did you find the additional resources (e.g. PowerPoint regarding presentation tips) useful?
10. What type of resources would you find useful in the future?
11. Would you like to have a different format? (such as a 'question forum' during revision period)
12. Would you find it useful if the lecturers participated in the discussions? (1 - No, I would be less willing to engage; 5 - Yes, I would be more willing to engage)

Out of the twenty-eight students enrolled on the Parasitology module, twenty-one completed their feedback forms. We asked that the students who answered they were not following the chat room still considered questions 4 and 10-12.

Of the twenty-one students who completed the feedback forms, 54.2% reported they were following the chat room posts and of these 72.7% preferred the Facebook platform. The vast majority (72.7%) said they did not further engage with the posts, mainly alleging time constraints caused by the pressure of course work (27.3%), lack of interest (27.3%) and little involvement by other students (9.1%).

Overall, the students who were following the posts mainly found them interesting and useful, as shown in Table 1.

Did you find the posts interesting?	Very interesting - 18.2% Interesting - 54.5% Somewhat interesting - 27.3%
Did you find the posts useful?	Very useful – 9.1% Useful – 45.5% Somewhat useful – 36.4% Very little useful – 9.1%

Table 1: Student evaluation of interest and usefulness of the posts in the Parasitology chat room

Almost all the students (81.8%) reported they did not read the additional literature references suggested alongside the weekly questions or did any further reading on those subjects. They overwhelmingly (90.9%) found useful the posting of additional resources such as advice for efficient reading and presenting scientific research papers. When asked what type of additional resources they would find useful in the future, the answers included articles and videos explaining Parasitology concepts (36.4%), example exam questions (9.1%) and more guides to presentations and essay structuring (9.1%). The majority (54.5%) of these students also answered they would like to have a 'question forum' format during revision period in the future.

For the students that answered they were not following the posts in the chat room, the answers to questions 4 and 10-12 were analysed. The answer to question four was taken as the reason for answering 'No' on question 1 and again the vast majority of students (60%) alleged time constraints due to course workload for not following the chat room, although 20% still answered they were unaware of its existence. Regarding what type of resources they would find useful in the future, they mentioned research papers

from invited lecturers and making participation part of their final grade among other suggestions. Interestingly a smaller proportion (30%) of these students were interested in having a 'question forum' format during revision period in the future.

Finally, we evaluated the answers to question 12 for both the students who were and who were not following the chat room. The results suggest that those engaged with the chat room would like to see the lecturers involved in the discussions (72.7%) although that would perhaps not necessarily increase their level of engagement, since no students replied they would be more willing to engage. However, the answers from students not following the chat room suggest that having the lecturer's active participation may act as an incentive to engagement.

Would you find it useful if the lecturers participated in the discussions?	
Students following the Parasitology chat room:	Students **not** following the Parasitology chat room:
Yes, I would be willing to engage – 72.7%	Yes, I would be more willing to engage – 30%
Yes, I would be somewhat willing to engage – 9.1%	Yes, I would be willing to engage – 20%
No, I would be less willing to engage – 9.1%	Yes, I would be somewhat willing to engage – 20%
No answer – 9.1 %	No answer – 30%

Table 2: Student evaluation of the impact of having the lecturers involved in the chat room discussion on their level of engagement

We cannot determine currently if participating in the chat room can have a positive impact in the academic outcome. However, assessing the presentation and critique of research papers in class of the 2015/16 cohort, it seemed they benefited from the advice for efficient reading and presenting scientific research papers, posted as an additional resources, compared with the 2014/2015 students.

General discussion

In this research project, an informal and formative learning space was created for Parasitology students. We provided them with a means of collaborating to the discussion of broader themes within the field, where they would be given the opportunity to explore difficulties, share resources and consolidate learning to be more confident and better equipped when engaging in their individually assessed tasks.

The key observation on the outcome of this research project was that none of the students actively participated in the forum by posting a comment or sharing additional information. Although the students mainly referred to lack of time due to heavy course workload as their reason for not actively engaging in the discussion, it is reasonable to assume that the fact participation was not mandatory played a role. The feedback clearly suggested that the students prioritised work they felt was assessed or would directly benefit their final grades, with the implication that they believed this resource offered no immediate benefits. Indeed, one of the students suggested making participation assessed and counting for the final grade, when asked 'What type of resources would you find useful in the Future?'.

However, it was clear from the Facebook group page that the students were following the materials posted by the moderator. In fact, a significant number were accessing the page and seeing the posts within a few minutes after they were posted. This behaviour can be classified as *lurking* and it has long been observed in diverse contexts of online learning (Beaudoin, 2002; Dennen, 2008; Arnold & Paulus, 2010; Collinson & Halliwell, 2013; Milligan, Littlejohn & Margaryan, 2013). In fact, online *lurking* is not that much different from what happens in face-to-face learning environments where the majority of students do not interact with their lecturers or tutors, reflecting the student's passive attitude towards learning that has been documented (Herrmann, 2013; Bone & McNichol, 2014)

Most of the studies that report *lurking* behaviour conclude that the students still benefit from it (Beaudoin, 2002; Dennen, 2008; Arnold & Paulus, 2010; Milligan, Littlejohn & Margaryan, 2013). In this study, the majority of the students that were following the Parasitology chat room rated the posts as interesting and useful, therefore it is reasonable to assume they had some level of engagement and saw the resource as adding some value to their learning. Whilst we cannot exclude the possibility that the students discussed or shared information offline, it seems clear that students missed an opportunity to assess their knowledge, to collaborate with colleagues and instructors to help them overcome difficulties, and to feedback on the course contents.

As research professionals, the lecturers, tutors and mentors in science degrees are challenged to imprint on their students the relevance of evolving these skills for the success of their future careers. We must then ask how we can better communicate the value of a collaborative online learning space for discussion of course materials as a way of improving and facilitating their studies.

The majority of the students favoured participation of the lecturers in the chat room in the future. From the student's point of view, teacher participation offers validation of the contributions to the discussion but it also helps to confer structure to the learning process (Lave & Wenger 1991; Milligan, Littlejohn & Margaryan, 2013; Tanner, 2013). It is crucial to instil in the students responsibility and ownership for their learning. As scientists they will be required to engage in a community that is ever evolving and relies heavily on collaborative work and peer feedback. Enrolling in communities of learning and practicing at giving and receiving formative feedback will help students develop invaluable skills. Mentors and lecturers have an important guiding role at the early stages of formation of these communities of learners. The feedback results of this pilot project suggest that involvement by lecturers can encourage the students to engage with and appreciate the relevance of virtual formative training resources.

Participation in online discussions is also an efficient and flexible means of increasing contact time with the students. The flexibility and more informal nature of a discussion forum could help overcome some of the obstacles that we suspect may be preventing the students from attending office hours made available for them and address the issue of active engagement we encountered.

The academic value of social media

The use of social media in the academic context is still very controversial. Some teachers prefer to stay out of social media networks to prevent unwelcomed interactions and also to preserve their privacy (Seaman & Tinti-Kane, 2013). Students on the other hand tend to use social media frequently, but still make a limited use of such media to support their studies (Smith & Caruso 2010; Hrastinski & Aghaee, 2012). A broader and more generalised application of platforms such as Facebook or Twitter in learning methods involves a change in how these are perceived and used. Still, both students and teachers are advised to have separate pages for personal and professional/academic use and be highly rigorous in setting privacy definitions (Snehansu, 2013).

Some studies have argued the value of social media to coordinate group work and promote collaborative learning (Dabbagh & Kitsantas, 2012; Hrastinski & Aghaee, 2012; Junco, Elavsky, & Heiberger, 2012; Armfield, Armfield, & Blocher, 2015). Social media is an integral part of the student experience and plays an important role in forging personal and working relationships between classmates and colleagues. In a sense, following someone on Facebook or Twitter could be the first step in establishing a community of learners.

The social media platforms have also some additional features that make their use particularly attractive, possessing a myriad of facilities to allow the sharing of information in various formats, from short text messages to images and videos and interactive tools. The use in parallel of Facebook and Blackboard highlighted that sharing materials on Facebook was more user friendly and quicker, with all the tools immediately available on the interface. Sharing the same resources on the discussion board on Blackboard was visually less appealing and making use of the full potential of the platform required navigating between multiple applications. Whilst the familiarity and plasticity of Facebook and similar social media platforms are potentially more engaging to the students, instructors and students may simply require additional training to be able to take full advantage of the several tools available on Blackboard and similar VLEs.

For this particular research project, the use of a social media platform also allowed having a measure of student engagement, due to reporting on visualisation of the posts in the chat room. Although it is entirely possible that the *lurking* phenomenon observed in the Facebook group also happened in the VLE, there is no way of measuring this level of engagement in the latter platform, precluding the instructors from accessing this form of feedback.

This research project has provided some interesting insights into how students develop and prioritise their learning activities. It has emphasised that non-assessed learning tasks are generally undervalued and that students seem to experience difficulty in engaging in a community of learners without lecturer intervention. It was also clear that engagement was greater with social media than with the institutional VLE, most likely reflecting the students' regular use of these platforms. However, not even the familiarity with social media was sufficient to overcome lack of engagement in formative, self-directed learning. These observations, finally, challenge lecturers to find alternative strategies to direct students to take ownership of their learning.

Biographies

Sonia Moniz is a research scientist at the University of Dundee where she is also training in Teaching in Higher Education.

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