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Martin, Helen

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The Inspire Module

Conference Paper

Integrating Alternative Teaching & Learning Methods to Enhance the Standard Power Point Lecture

Helen Martin, School of Applied Sciences, The University of Huddersfield

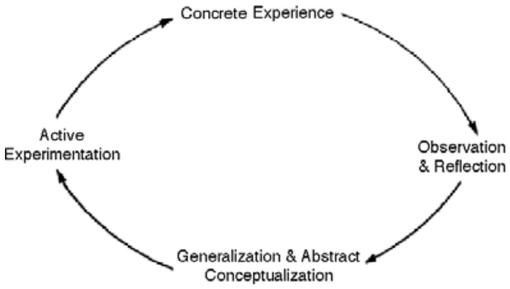
Abstract

The traditional PowerPoint lecture format was enhanced by the ‘flipped classroom’ approach in a teaching session involving mathematical equations on a microbiology module in the School of Applied Sciences. A screencast was constructed which contained much of the theory contained in the original lecture. Feedback on student learning gained from the screencast was identified during the experimental teaching session via voting pads. Seven out of nine questions were answered well (over 85% of students giving the correct answer). When answers were largely incorrect, explanations and further background information was given, followed by a repolling, which resulted in a much higher proportion of correct answers (over 80%). The time saved by using a screencast was utilised by including an animation using ‘Videoscribe’, which demonstrated how the equation linked to laboratory procedures, a game which explored one aspect of the equation, and tutorial questions to consolidate learning. On the whole, tutorial questions were answered confidently, indicating that the animation and game were useful in enhancing student learning.

Introduction and Rationale

The experimental session chosen for the ‘Inspire Module’ was one that I use for large classes. The learning outcomes require that students understand how bacteria grow, and how the numbers of bacteria are counted, using an equation. Having taught this module for several years, it felt unsatisfactory that some of the students in the class were clearly engaged with the session, but many students seemed to disappear into the background. Part of the problem was that in the group (approx. 140 students), abilities were broad-ranging. Certain students had good grades in maths A-level whereas other students had only GCSE maths. Because of this, it was very difficult to ‘pitch’ the lecture at the right level, let alone give an inspirational session. The focus of the experimental session was, therefore, on making more use of the time, to move away from the traditional lecture style, and thus attempt to reach students who would otherwise not engage. Based on Kolb’s theory of Experiential Learning (Kolb, 1994), and on my ‘concrete experience’ of teaching this number of students, I set about some ‘reflective observation’, linking in with the learning outcomes of the ‘Inspire’ module and indeed, the learning outcomes of the students module. This enabled me to think about my experiences from a different perspective, to reflect on my past experience with the large class, and actively take note of feedback from previous module evaluations and feedback from individual sessions. The module enabled me to take a period of ‘abstract conceptualisation’, in which I could consider new ideas of approaching the teaching. This led to the ultimate production of my session when I could then proceed with the ‘active experimentation’, thus concluding Kolb’s Learning Cycle (Figure 1).

Figure 1: Kolb Learning Cycle



My decision to use this particular class for 'Inspire' could also be linked to Trip's (1993) theory of critical incidents. I'd had a critical incident last year, when, at the end of the class, I asked if there were any questions and whether anything needed further explanation. No comments were made, but after the session, I had a deluge of students seeing me individually for help. Many of the questions asked could have been dealt with during the class.

So, reflective practice was an important factor underpinning my 'Inspire' experimental session. I endeavoured to embed the session to incorporate Ramsden's (1992) six key principles of effective teaching which are all important considerations to the effective practitioner (in Brown, Fry and Marshall, 2003):

- ''making the teaching session interesting and giving clear explanations
- Showing concern and respect for students and student learning
- Giving appropriate assessment and feedback
- Providing clear goals and intellectual challenge
- Ensuring independence, control and active engagement of learners
- Learning from students''

Literature and Theoretical Framework

Gibbs (1985) gave a very frank approach in his paper, 'Twenty terrible reasons for lecturing', and argues that many of the reasons given in favour of the traditional lecture either have little substance or are avoidable. One reason quoted is 'it's the only way to make sure the ground is covered', which is indeed a concern. During the traditional lecture (or didactic teaching), we may be covering the material but the amount of student learning is questionable, and until the final exams, we have no idea whether the students have learnt the material or not. Furthermore, it is difficult to know if the lecture was instrumental in this, or if their learning occurred elsewhere. Another reason quoted in Gibb's (1985) paper is 'lectures are inspirational: they improve student's attitudes toward the subject and students like them'. Biggs (2003) concurred that this is rarely the case and thus explored ideas for enriching large-class teaching. He acknowledged that the traditional lecture has its advantages, particularly for front-line researchers, as it gives them the opportunity to impart a critical perspective on their field of knowledge which is linked to current research. But for those topics where the lecturer is not actively involved in research, he suggested that the teacher should be an agent for transforming knowledge, helping students to interpret and construct their own knowledge. This idea links into earlier work by Vgotsky (1978) where he suggests that learning takes place through interactions and communications with others. His work explores the discussion-based classroom using socratic dialogue, whereby meaningful exchange between students and/or teachers promotes deeper understanding. Gibbs (1985) identified that there 'is still much lecturing going on', and nearly 20 years after writing the paper, this is very much the case. As the paper goes on to discuss, the danger is that 'students often end up with folders full of notes taken too long ago for them to remember their purpose and in too great a quantity to memorise'. He acknowledged, however, that any 'changes take time to introduce', which may be a barrier to changing teaching methods, especially with an already heavy workload. He also pointed out that alternative teaching methods may require additional resources, which may also limit any possible changes.

An alternative method to the traditional lecture that is gaining in popularity is the 'flipped classroom' approach, whereby students are given work to do prior to the lecture, thus freeing up more time for other activities during the class. This approach relies partly on students carrying out independent study but a common worry is that 'students are incapable of, and unwilling to, work alone' (Gibb's, 1985). Contrary to this, Gibb's (1985) points out that in several studies, if students are given more freedom and flexibility to learn independently, they often use their initiative more and work harder. Asking students to study in advance and come to a session well prepared is not a new idea, but technologically enabling this process has re-energised it, and makes it something that can be scaled up to large classroom situations.

Linked to the 'flipped classroom' approach, is the use of voting pads (or personal response systems) which are becoming widely advocated, not least by Moss and Cowley (2011), where they addressed the problem of science and maths subjects being difficult, often due to common misconceptions. This problem was identified in the House of Lords Committee on Science and Technology Tenth Report (House of Lords, 2006). Moss and Cowley (2011) observed that when students were given a quiz using voting pads, in the areas that the students felt they had good understanding, the least numbers of students answered correctly. Furthermore, Frame and Hayler (2006) put the use of voting pads in the context of large-class settings and reviewed the literature to gauge how they might assist in engaging more students, thus supporting their learning. They highlighted that the voting pads system is a tool, rather than a teaching approach, and should be used after careful consideration and with the aim of enhancing the learning experience. The system, however, has many potential benefits, including encouraging participation, providing timely feedback, and increasing confidence levels (Frame and Hayler, 2006). To address responses to questions given via the voting pads, the lecturer ideally needs to reflect while 'in action'. Schon (1983) suggested that it is a mark of professionalism, if the lecturer (i.e. the 'professional') is capable of thinking on their feet and responding to unique situations as they arise, a departure from the traditional lecture style.

The use of voting pads in teaching and learning also links to the model proposed by Race (2001) who said that ''doing + feedback = successful learning''. Of course, there is a risk of 'failure' if a question is answered incorrectly, but failure itself can be viewed in a positive light, if after receiving feedback, it results in change of behaviour (i.e. modifying or changing an answer) and thus reducing the risk of further failure, and achieving successful learning. The fact that students can remain anonymous can also be a very positive advantage.

The concept of using voting pads also fits into Rust’s (2002) argument whereby regular tasks need to be built in to help students pace their learning. These tasks can be linked to regular feedback from voting pad questions, thus indicating which tasks are going well, and which ones are not. Biggs (2003) highlighted how important this is as the attention span of students in a typical lecture-style environment is 10 – 15 minutes, so advocated a change in activity (or a rest) after this time period.

One such activity could be based on utilising the benefits of peer interaction, rather than simply relying on the lecturer. Vgotsky (1978) emphasised the social dimension of learning and described the ‘zone of proximal development’, a theory that allows students of differing abilities to make progress. The range of skill that can be developed with peer collaboration outstrips what can be achieved alone. The student may be able to achieve skills only with assistance initially, and this provides a scaffold or framework, which, when eventually removed, leaves the student being able to work independently. This idea is supported by the theory of ‘action learning’ and Revan’s (1998) equation of L=P+Q, where learning (L) occurs through a combination of programmed knowledge (P) and the ability to ask insightful questions (Q). Students need to be given the opportunity to ask these insightful questions, either of their peers or the lecturer, or both.

Description and Critical Discussion

I have always been sceptical that students will carry out independent study prior to lectures, and that they will instead, rely solely on lecture information. I had some evidence for this, as previous tutorial questions set as homework were completed only by a handful of students. I have, therefore, been guilty of thinking that ‘students are incapable of, and unwilling to, work alone’ (Gibb’s, 1985). This is probably largely an unfair assumption, but it is frustrating when only a few students had done the work and for most, going through the answers was simply a copying down of the answers exercise. However, if the students had already disengaged from the material, then by the time the homework questions were set, the students may have already ‘switched off’.

In my experimental session, I attempted a number of different new techniques. The learning purpose was to help students understand, and use a calculation, for working out the numbers of bacteria in a culture, as well as covering the background information. The aim was to keep students engaged with the session and to facilitate more understanding and confidence in using the equation.

At the project outline stage, I had decided to introduce the students to the calculation with the help of a game. I had two hours of contact time to cover the material, so needed to free up some time. In the past, I used an hour (or more) for the PowerPoint lecture followed by a tutorial to practice calculations.

To achieve this aim it was essential to make time available for alternative learning strategies. I attempted to use Bigg’s (2003) principle that there should be a change in activity every 15-20 minutes.

Table 1: Planned Activities for Experimental Teaching Session

Activity		Time Taken (minutes)
1	Screencast (to be viewed by students before the lecture)	17
2	Feedback questions using voting pads, based on screencast material	20
3	Didactic section – a few PowerPoint slides to introduce specific knowledge needed for the calculation	10
4	Animation (Videoscribe)	2
5	Break	10
6	Dilutions Game	10
7	Tutorial questions– a list of questions for students to work through	50

As Table 1 shows, I created a screencast for a large proportion of the lecture material which the students would view and listen to prior to the session. This was a new venture for me so I first had to learn about the technology and the types of screencast available. To that end, I attended relevant University 'Learning Bytes' and Human & Health Sciences Teaching and Leaning sessions. These introduced me to different options and I decided to use the PowerPoint version (rather than Screencast Omatic, OCam or Camtasia) as I was already familiar with the software. So I made my screencast, using a Samsung 'Bo Mic' microphone. I found that I had to write a script, otherwise the flow was interrupted with gaps and 'urms' etc. The screencast was seventeen minutes long. I posted it on Unilearn six days before the scheduled class and asked the students to listen to it beforehand, and pointed out the option of listening again if necessary.

To check that the students had listened to the screencast, I asked a number of questions relating to the material, at the experimental session, six days later. I used voting pads for this, which, like the screencast, was something I had never tried before. To set this up, I had to download the software (Turning Technologies) and insert questions in a PowerPoint format. Due to the type of voting pads I was using, the questions had to have multiple choice or yes/no answers. There were a total of nine questions which asked a range of memory recall questions, as well as questions that required interpreting information. Most of the questions were answered fairly well, often with over 85% of students giving the correct answer. For these questions, I gave a brief explanation for the benefit of those who answered incorrectly. When the answers given were largely incorrect, I gave a more detailed explanation, with additional background information, and then repolled the question. The voting pads, provided valuable feedback, so I could focus on areas that were problematical. One of the questions answered incorrectly highlighted a common misconception (the difference between pour plate and spread plates). The other question was one where knowledge had to be applied (involving growing bacteria causing a colour change). On repolling, far more students answered correctly, so I felt that this was time well-spent, with correct answers increasing from approximately 30% to over 80%. I highlighted to the students that this was giving them formative feedback, and that they would be able to reuse the questions for their revision. I also pointed out that as the exam would consist of multiple choice questions, this was excellent preparation. Unfortunately, additional explanations and repolling questions meant that I exceeded the allocated time by 10 minutes. However, I asked the students whether they had found the voting pads helpful, and there were many positive comments made. I also sensed from the students during this section that they were engaged with it for the full 30 minutes, so it was time well spent. Furthermore, although I had been sceptical about whether or not the students would watch the screencast, I was pleasantly surprised that many had. I asked for a show of hands as to who had watched it, and many students did put up their hands. Furthermore, when answering questions based on the screencast material, many students, often 85-90%, answered the questions correctly, thus confirming that student are able, and willing to work alone (Gibbs, 1985).

The class continued with a few more PowerPoint slides which specifically covered material relevant to calculating the equation. To summarise these principles, I then showed the students an animation, with background music, made with 'Videoscribe'. This lasted for about two minutes and showed how numbers in the equation relate to practical work in the laboratory.

Videoscribe had presented a number of challenges in its creation, mostly caused by software failure which made it very time-consuming. The other major problem was that when I showed it to the class, it stopped midway for no apparent reason. Up to that point, the students appeared to be watching intently, but after trying to restart the animation, the students became restless, and I didn't feel I had their full attention when the animation did eventually run successfully. This highlights a key problem with trying out new strategies for teaching and learning, as it is always a gamble. Some ideas will be successful, whilst inevitably, others will not. Relying on activities that are based on technology run the risk of not working perfectly, as this session demonstrated.

In contrast to the reliance on technology was the next activity, the 'Dilutions Game'. After a ten-minute break, every pair of students was given an envelope containing pieces of paper with different dilutions, relating to the equation, that they had to sort out. During this section, I was able to circulate around the students, giving them a chance to ask questions. This was valuable, as many students did use this opportunity, and when the same question was repeated, I could address the whole class with an explanation. It was encouraging to see that most students engaged with the activity. Some students needed help to get going, but once they fully understood what to do, they seemed to be well engaged. The advantage of this activity was that as well as encouraging peer interaction (and this led to some heated discussions!), I could check that the students had sorted out the dilutions correctly. When I saw errors, we could discuss these. Again, this enabled me to spot common mistakes that I could deal with as a class. So, overall, I felt that the Dilutions Game was a success in terms of student learning. However, timing was an issue as I had allocated only ten minutes for the game. After ten minutes, I asked who had finished the activity, and as the majority of the group had not, and appeared to be engaged, I gave them another ten minutes. Also, I had intended it as a game in the true sense, with a winner, but it was impossible to assess this as several groups finished 'first', and it would have taken too long to check all the answers during the remaining time.

The final section of the experimental session involved students working through a number of questions based on the material covered during the class. Students, working either individually or in pairs, had to use the equation that was introduced in Videoscribe, and based on dilutions as explored during the Dilutions Game. It was clear that some students were very confident with the material, and produced correct answers very quickly, while others took longer. It was very useful to be able to circulate around the class, helping with individual questions which again, highlighted one of the benefits of the flipped classroom.

Rossiter (2014), in his paper discussing the experiences of, and resources to enable lecture flipping in systems and control engineering, commented that the most rewarding thing about this approach was to see how much interaction there was, such as students offering opinions, discussing, and demonstrating where they were confused, and so on, and I would certainly agree with this as a very positive outcome of my experimental session. At intervals, I went through each question on the screen, and gave the answer. For the more confident students, there was a more complex question for them to work through, and I gave this as a homework question, as well as any unanswered questions, to the rest of the class. Although we didn't manage to go through all the answers, the tutorial questions did give students the opportunity to consolidate their learning, which often doesn't happen with the traditional lecture-style approach (Biggs, 2003).

Conclusion

In conclusion, the methods used in my experimental session were partly in line with the 'flipped classroom' model (Bates and Galloway, 2012), and overall proved largely successful. Only part of the time available was given over to the didactic style of lecturing which was reduced to about ten minutes (seven slides) of key background information, linking the screencast/voting pads material to the next activity. The original lecture had consisted of over thirty slides. The session also partially fulfilled the criteria for a change of activity every 15 – 20 minutes, although the more interactive sections required more time than originally planned. For future flipped classroom activities, I would need to take this into consideration.

From the students perspective, I felt that they had a more positive learning experience compared to my previous method of using a more didactic style. The structure of the session kept building on the students engagement. Rather than losing them because they were bored or struggling, I felt that they were given confidence, which meant they stuck with me. As a result, they were still engaged and doing the tutorial despite having had quite an intense session.

This exercise has proved extremely worthwhile and has enabled me to experiment with alternative teaching and learning methods. Having experimented with screencasts, voting pads, a game and an animation, these are all techniques that I will use in future teaching sessions. In retrospect, it was perhaps too many new ideas all at once, but having tried them, I can develop them further. The Dilutions Game would be improved by having laminated cards rather than pieces of paper, and also to think of ways that winners could be easily identified. The students particularly enjoyed using the voting pads, so I will certainly incorporate these into more teaching. The School of Applied Sciences as recently purchased new voting pads whereby the answers given can be more sophisticated, rather than multiple choice only. I will be exploring ways that I can incorporate these into my teaching.

Another positive outcome since the experimental session has been increased collaboration with colleagues, on new teaching strategies. A number of colleagues have taken an interest in alternative teaching methods and so far one has incorporated my screencast into one of his sessions, and another, has used the voting pads.

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