

# Experiences of flipping the classroom: reflection on the implementation of flipped teaching.

## Abstract

Flipped teaching is the use of online lectures before the face to face session to allow students to study material in their own time and own pace and leaving time for more interactive face to face sessions with academic staff. This article reflects upon the implementation of flipped teaching in a level four module in the division of Built Environment and Civil Engineering discussing how the process worked in practice as well as feedback and reflection from both students and staff involved.

## Introduction

### Flipped teaching

The term flipped teaching is an approach to teaching that critiques the role of traditional methods of didactic pedagogy, rather than relying on the presence of an academic in a lecture hall and students passively listening. The flipped approach becomes an online lesson which is studied before the face to face session, in which the content can be applied and problem solving undertaken with the academic present to provide support and correct misinformation (Jump 2013). It is important to consider that whilst flipped teaching can be a useful method of delivery, especially to large groups, it often requires more effort from both students and instructors and also to understand that not all students will embrace or necessarily like flipped instruction (Willey and Gardener 2013). There are a number of advantages to the flipped teaching approach, Freeman-Herreid and Schiller (2013) summarise the advantages as set out by Fulton (2012) as: (1) students move at their own pace; (2) doing “homework” in class gives teachers better insight into student difficulties and learning styles; (3) teachers can more easily customise and update the curriculum and provide it to students 24/7; (4) classroom time can be used more effectively and creatively; (5) teachers using the method report seeing increased levels of student achievement, interest and engagement; (6) learning theory supports the new approaches; and (7) the use of technology is flexible and appropriate for “21<sup>st</sup> century learning”. In addition Freeman-Herreid and Schiller (2013) identified these further benefits: (8) there is more time to spend with students on authentic research; (9) students get more time working with equipment that is only available in the classroom; (10) students who miss the class can still watch the lectures; (12) students are more actively involved in the learning process; and (13) they also really like it.

## **The module and rationale for flipping**

The module in which the flipped implementation took place was a land surveying module which is compulsory for all first year (level 4) students in the Built Environment and Civil Engineering division (approx. 150 in 2013-14). The delivery of the module consisted of two hour lectures every week and five practical workshops throughout the semester. The face to face sessions followed the traditional concept of students coming to the lecture where the academic would deliver the content and provide the students with further reading and examples to attempt in their own time. This left very little time for more engaging activity such as working through examples and applying knowledge. Whilst attendance and pass rates in the module were not problematic, there was a high demand for additional tutorials which took place outside of the timetabled sessions for the module, especially in the approach to exams and therefore a change in practice was prompted.

## **Flipping the classroom in practice**

The flipped delivery includes two phases, the online delivery, focusing on delivery of content, followed by a face to face session focusing on applying the knowledge from the online material.

### **Online delivery**

Prior to the start of the semester the traditional lecture slides were updated and then recorded with the lecturer's voice over using screen capture software (Camtasia Relay). Each lecture was divided into a number of 'bite sized' sections which were recorded individually to allow the students to access the material in smaller, more manageable chunks. Whilst it was anticipated that all sections would be watched in the same sitting, this method provided students with the option of repeating certain areas more easily than scrolling through a whole lecture and also had the added benefit that if a mistake was made in the recording or if a certain section needed to be updated in the future, this could be done without having to record the full lecture again. In general the video clips lasted between five and 15 minutes, with an overall duration of between 45 and 60 minutes, Figure 1 demonstrates a typical breakdown of a lecture into the sections as described with the recorded length of each section. Videos were posted on the virtual learning environment "Student Central" and were accessible directly from the platform with no need to download and no restriction on the type of device used to access them (e.g. tablet, laptop or smartphone).

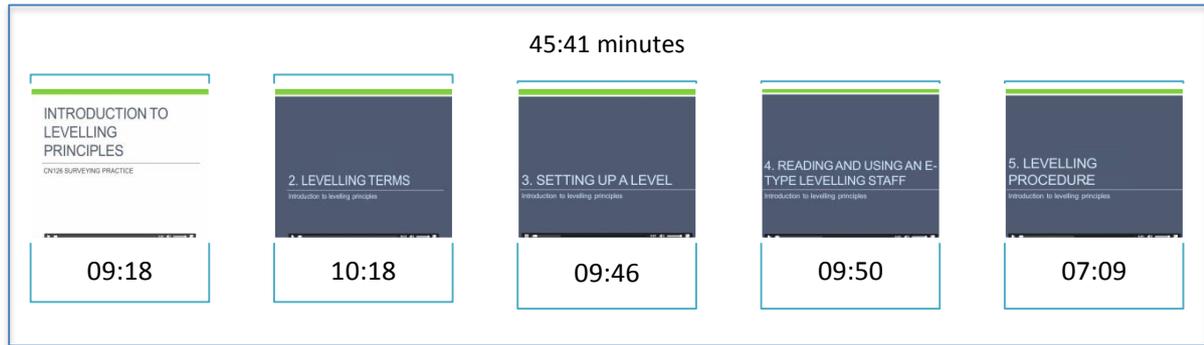


Figure 1 Typical video set

Much of the material involves mathematical problems and therefore in the lecture videos examples of these problems were demonstrated. Students were provided with the specialist worksheets on which the calculations were to be recorded and advised in the videos to work through the problem as they watched the video. Unlike in live lectures, this allowed the individual students to work at their own pace and rewind and recap as necessary. At key points within each problem students were advised to pause the video and complete the rest of the section (as shown in Figure 2) before moving on to the next process, allowing them to ensure they understood and were able to carry out the work and check their answers in their own time. At the start and end of each video the students were also provided with the learning outcomes for the video set, allowing them to reflect on if they had achieved these or not and prompting them to repeat certain sections or make a note of questions they may have to aid their understanding. A discussion board for each video set was set up alongside the videos to allow students to post questions which could be answered by the lecturer or other students, however this was not widely utilised.



Figure 2 Example “pause, rewind, play” slide

### Face to face sessions

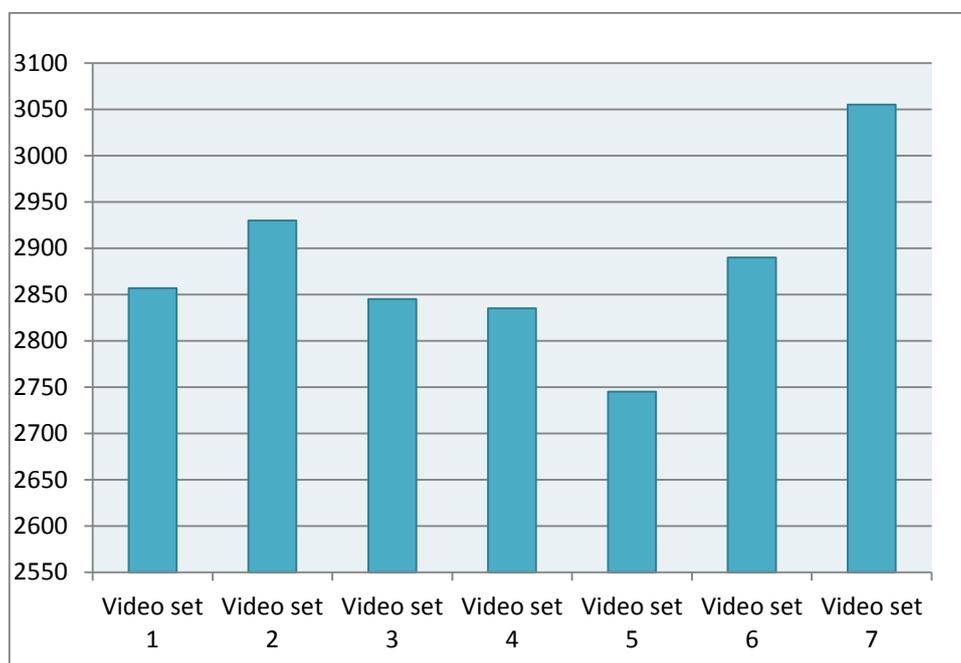
The format of the face to face sessions changed from a two hour session (before flipping) focussing on content delivery, to a one hour tutorial in which students could work on problems with the help of the lecturer. It was made clear to students that the face to face sessions would not be a repeat of the lecture videos and that in order to participate in the tutorials they must watch the videos prior to attending. Each tutorial began with a recap of the learning outcomes to highlight to the students again what they should have gained from the videos, followed by a series of multiple choice questions to test understanding and a further more in depth exercise to apply the knowledge. The multiple choice questions were asked using “Poll Everywhere” live audience participation software, allowing students to use their mobile devices (such as smart phones and tablets) to anonymously answer the questions and see how they were performing against the rest of the class. The questions were designed to ensure that students had understood the main concepts of the videos and to highlight areas they may need to go back to. This part of the tutorial usually lasted for around 10 minutes with the rest of the time dedicated to attempting exercises designed to ensure students could apply the knowledge and concepts from the videos, for example attempting full calculations with the assistance of the lecturer if required.

### Student engagement

Throughout the module engagement was monitored in a number of ways, the number of views of each set of videos was recorded week on week as well as information regarding when and at what time videos were being accessed. Attendance of the tutorial was also monitored each week. Once

the module was complete, a comparison of marks and attendance from the previous year's cohort (taught in the traditional format) was made to identify any changes.

Seven video sets were published, two of which covered two weeks of tutorials, there were also introductory and revision tutorials, in total covering 13 weeks of contact time. Figure 3 shows the total number of times each set of videos was accessed throughout the module. With the number of students registered on the modules at around 150, it is clear from the figure that each student is accessing the videos several times (with an average of approximately 2850 views per video). It is interesting to note that the video which received the lowest number of views, video set 5, was the only set that did not cover any calculations.



**Figure 3 Total number of views per video set**

Figure 4 provides a snapshot of when the videos were being accessed; again, it is interesting to see that although most of the engagement was on a Tuesday, the day before the tutorial session, there was a steady level of engagement throughout the week, suggesting that students are engaging with the material at the time that best suits them, as well as accessing the material again, possibly after the face to face session.

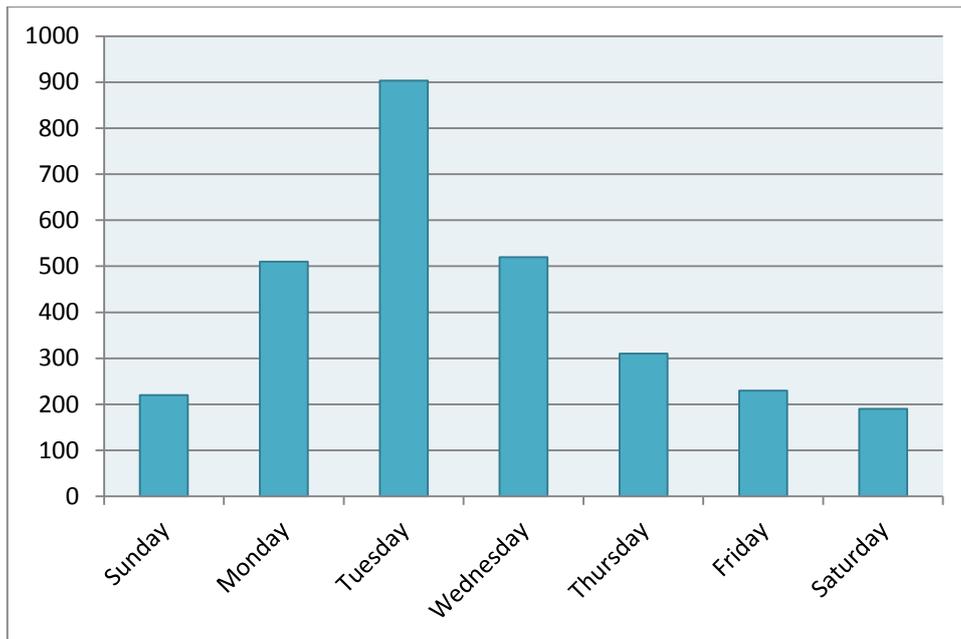


Figure 4 Views by day of the week

Figure 5 shows when one set of videos (in this case set 3) were being accessed. In the first three weeks there was little or no engagement as expected (as the material wasn't to be covered yet) however in weeks four to seven there is a high level of engagement with this video set. Although this is to be expected in week four as this is when the tutorial for this set of videos took place, it is encouraging to see that the videos were still being accessed alongside the following week's material. Another important aspect shown by Figure 3 is the use of the videos for both preparation of coursework, which was submitted throughout weeks 11 and 12, and for revision for the exam which took place in week 14 where the access to the video set was at its peak.

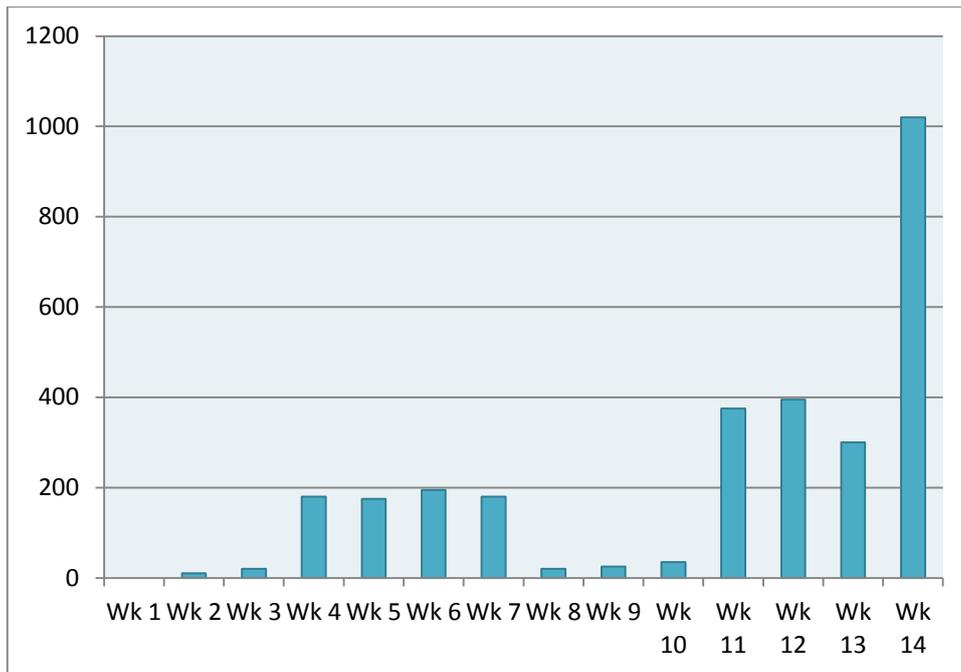


Figure 5 Views by week

A concern with the flipped model before its implementation was that attendance of the tutorial session would be significantly reduced. Attendance before and after flipping the module can be seen in Figure 6. In the previous year where the traditional approach had been used, attendance fell slightly throughout the module, a similar trend was seen after the flipped implementation with a more significant difference between weeks four and seven, however towards the end of the module attendance was in line with or exceeding that of the previous year.

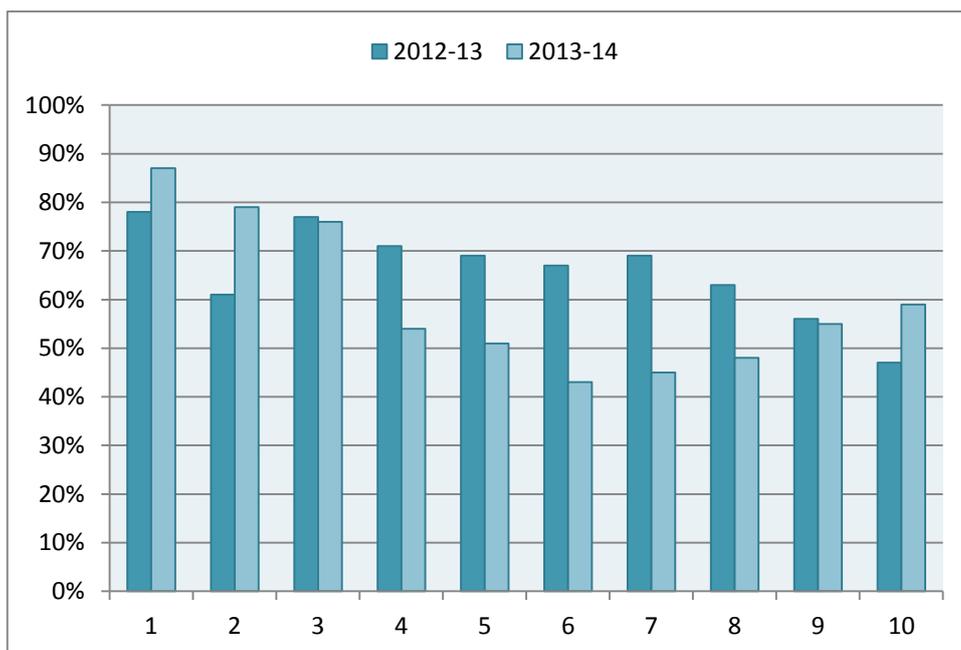


Figure 6 Attendance before and after flipped implementation

As well as a comparison of attendance, achievement was also compared before and after the flipped implementation to establish the impact that the change of delivery may have had. Figure 7 provides an overview of the marks from before and after the flipped implementation, as with attendance there was not a significant impact, however the percentage of students achieving either a first or upper second grade did increase with the new delivery and those achieving a third or lower second were reduced. Students failing the module did not change considerably.

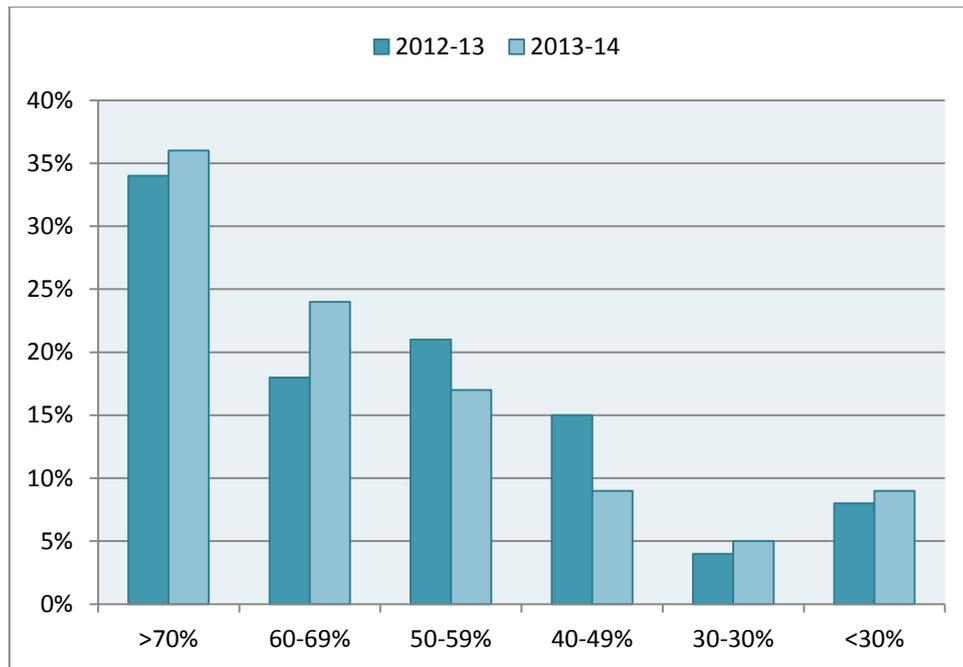


Figure 7 Comparison of marks before and after flipped implementation

## Student feedback

As well as analysing the engagement and achievement as described above, feedback was sought directly from the students involved by means of an online questionnaire. The questionnaire took place five weeks into the module to ensure students had had time to engage and reflect upon the change in delivery but to allow changes to be made if required. The response rate was fairly low at 15% however a balance of opinions was provided.

Overall the feedback concerning the ease of access to the videos was positive, with 95% reporting finding the videos either easily or very easily. In addition to this, 76% of students found the video content to be either useful or very useful with no responses indicating that the content was not at all useful. This indicates that engagement with the online material was generally a positive experience for the students. When focusing upon the face to face sessions, it became apparent that the multiple choice questions received a mixed response, with more than half the respondents giving either a neutral or negative response as to their usefulness. The more in depth exercises however

received a more positive reception, with over 65% reporting that they were either useful or very useful. When asked if they would like to see the flipped mode of delivery used in other modules, 56% indicated that they would like to see it in some modules and 33% would prefer it not to be used in others (Figure 8).

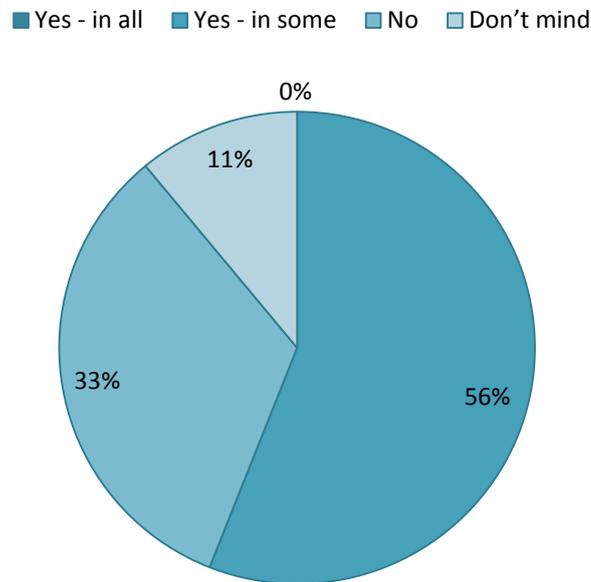


Figure 8 Attendance before and after flipped implementation

As well as the multiple choice questions, respondents were also asked to explain their response to whether or not they would like to see the flipped model used elsewhere in the studies. Responses were generally favourable towards the flipped style but with an understanding that it is perhaps more suited to some modules than others (for example ones with high mathematical content). Quotes such as *"The video allows us to have a more one to one learning approach, with the major benefit of being able to pause the video to take notes, and then resume whereas in a class, if we were taking lots of notes, we can easily miss out on things you say"*; *"I can watch the videos in my own time and rewind as I need to. There's less chance of me getting lost/losing interest like I could do live"*; and *"It gives the advantage of having the lecture over and over again for better understanding"*, show that much of the benefit of the flipped model is the ability to work at a pace which suits the students and be able to recap on material to gain a better understanding. However, some students did not feel this way stating that: *"This module feels like distance learning. I am paying to be taught not teach myself online. I prefer to be engaged by an actual teacher"*. On balance another comment highlighted both the benefits and perceived weakness of the model *"...the advantage of having a live lecture means you are able to ask questions at that time....however, video lectures allow you to go through the lecture at your own time, write detailed*

*notes for future revision and go over material you didn't understand either at the time or in the future", highlighting the concern that questions which occur when engaging with the material cannot be answered immediately as in a live lecture.*

## **Discussion and conclusion**

Overall the experience of flipping the delivery of this module was a positive one for both the students and the lecturer, whilst the preparation of videos required significant time, once the module was running (and in subsequent years) there was noticeable payback for this. The rationale for flipping was in relation to the large proportion of students requiring additional tutorial support, whilst not formally recorded, it was noted that there appeared to be a considerable reduction in the amount of extra tutorial time requested by students, especially around assessment and the introduction of the tutorial instead of the lecture allowed the lecturers time to be spent more effectively, providing the students with much more meaningful and useful contact time than in the past.

In general, the experiences from this module concur with those of others who have implemented the flipped model elsewhere. Bishop and Verleger (2013) describe the experiences of a number of studies into the flipped classroom, reporting that despite differences in the studies, student perceptions were fairly consistent, these can be summarised as follows: opinions tended to be positive, but there were invariably a few students who strongly dislike the change; students did tend to watch the videos when assigned, and even when they weren't; students tended to be better prepared after watching videos rather than given text books to read (especially important as Sappington et al shows that college/university students generally don't complete reading assignments (2002)); students preferred live in-person lectures to video lectures but also like interactive class time more than in person lectures.

On reflection, a number of benefits and challenges were highlighted through implementing flipped teaching in this module , these have been summarised in Figure 9.

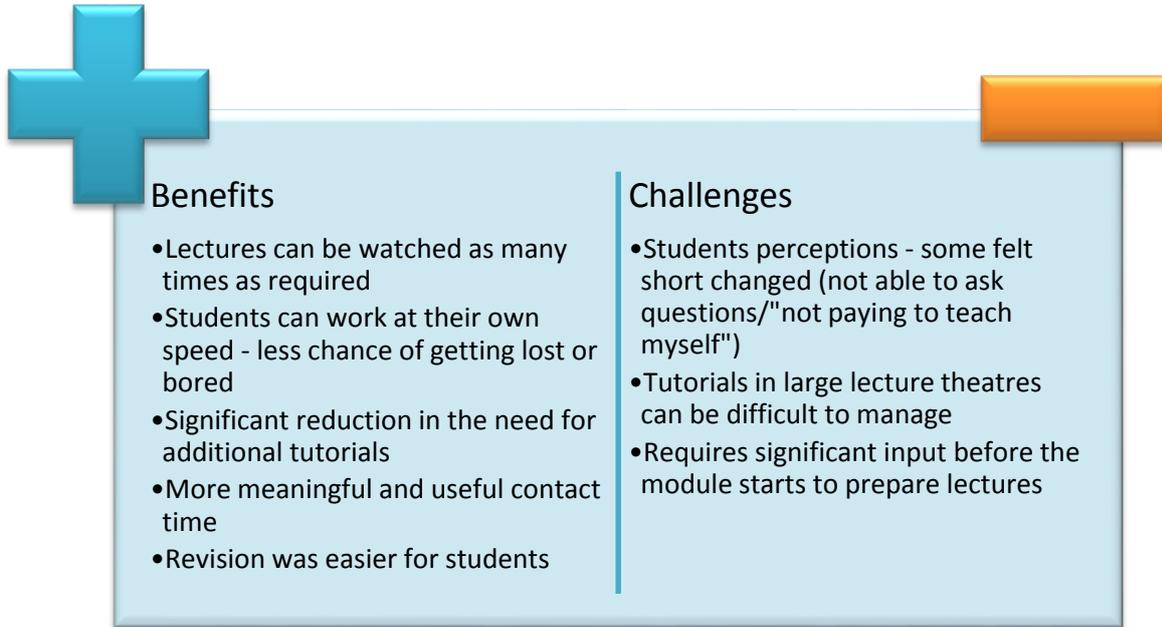


Figure 9 Benefits and challenges

Overall the perceived benefits outweigh the challenges and the flipped model will be used in the future in this module, with the possibility of using it in for particular aspects of other modules. Whilst the experience was a positive one, there are aspects that will be changed in the future, for example it was clear from student feedback that they did not find the use of the multiple choice questions to be of as much use as the in depth exercises, and therefore more emphasis will be placed on using the tutorial sessions for this type of exercise. Another outcome of reflecting upon the experience was that perhaps some students did not understand the rationale or process of flipped teaching, and felt they were being left to teach themselves, in order to provide students with a better understanding and to feel more comfortable with this kind of approach, time will be dedicated in the introduction to the module to properly explain both this to the students so they have a greater understanding of the benefits this type of delivery can offer them.

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## **Acknowledgments**

I would like to acknowledge the input of Marion Curdy, the Learning Technologist at Moulsecoomb, for her guidance on the use of flipped teaching, help with recording lectures and collecting feedback from students.

## **Biography**

Hannah Wood is a senior lecturer in the Built Environment and Civil Engineering Division of the School of Environment and Technology. After completing her PhD at the University of Brighton in 2010, Hannah was appointed as a full time lecturer and in addition to subject specific research, has an interest in researching teaching and learning within the built environment and civil engineering discipline. Hannah is especially interested in the use of technology and how this can support learning and teaching.

Word count (excluding headings, references etc): 2754 words