Evaluation of student engagement with differential media for Flipped Classroom teaching

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Abstract: Flipped learning, where the teaching content is delivered prior to the contact session, is an effective pedagogy. Most commonly, video is used for flipped approaches, although many other media are also effective, such as written, audio or electronic resources. The ideal medium used for information delivery is likely to vary, depending on the needs and learning approaches of each individual learner. Is there, therefore, a medium which is ideal for most students, or would flipped learning best be delivered using a suite of multimedia sources for the core information? This project aims to investigate the preferences shown by undergraduate students for different media in a series of flipped pedagogic settings. The project also aims to investigate whether there are any correlations between media preferences and student personality types and study approaches. Initial findings suggest that students engage readily with flipped learning pedagogies, although it is rare for students to engage with teaching materials well in advance of the class session. Early findings suggests that students show a preference for video as a medium of delivery for taught content.

Introduction

The need for active learning strategies is becoming increasingly evident in contemporary Higher Education (Prince, 2004; Michael, 2006). A strategy with well-documented success is the 'Flipped Classroom' (Bishop and Verleger, 2013; Talbert, 2017), where the standard didactic approach to HE teaching is revised in order to enhance student inquiry and active learning. In a Flipped Learning approach, core information for the curriculum is delivered prior to the 'live' class session. The 'live' lecture session is then used to reinforce concepts, develop ideas, work through set-problems and to encourage students to take a deeper understanding of their subject. Flipped Learning has been shown to have more positive effects on student achievement than any other form of blended learning (Margulieux, 2015), and is a pedagogy that is being adopted across both the pre- and post-compulsory education sectors across the globe.

Key to the success of Flipped Learning is the engaging and effective delivery of core curriculum content that would normally be given by lectures or seminars. Delivery of the taught material in Flipped Learning may be via a range of media. The most common medium reported in the literature is video, although other media are also common, such as online resources, written media, set problems or challenges, or a mixture of these. Whilst there is well-established best practice in each of these media, there is little evidence to compare student preferences for them. Similarly, evidence is limited regarding any correlations between the personal characteristics and approaches to learning of students, and their preferences for the medium of delivery. Personality traits, such as conscientiousness, agreeableness, extroversion, openness and neuroticism (the so-called 'Big Five' personality types) can potentially have a significant impact on learning (Poropat, 2014). Similarly, students who typically engage in surface, strategic or deep study strategies (Entwhistle and McCune, 2004) may have differential learning outcomes as well as differing levels of engagement with learning support resources. For a community of diverse learners, the delivery of the core taught syllabus via only one medium may potentially be limiting or detrimental to those individuals who do not engage well with that technology. An understanding of how differential students engage with different media is therefore of importance to providing effective and inclusive flipped teaching practices. By identifying student study patterns and preferences, there may be a potential to develop an evidence-based institutional strategies for investment in educational technology by observing student engagement with media in real time.

This project aimed to follow a series of flipped classes and courses and map the engagement of students with those approaches, as well as their engagement with, and preferences for, the media through which the pre-learning is delivered. The behaviour of students within the class has been followed using metrics for accessing the media on the institutional virtual learning environment (VLE). In particular the aim was to record which media the students used most often, whether they investigated different media before settling onto a preferred choice, and whether student

personality type or learning strategy correlated with these selections. Preliminary findings suggest that students do engage with the flipped pedagogy, but engagement is not universal. Also that the preferred medium for content delivery is video screen captures of lecture presentations.

Research Aims

1) **To investigate the extent to which students engage fully with Flipped Learning activities and Active Learning**. This aim will inform the future use of innovative pedagogies such as Flipped Learning, which are potentially important to re-thinking the way in which we deliver our courses for the contemporary student.

2) **To identify the learning media which students find most effective and engaging.** This aim will should inform future strategy for developing learning resources and technology-enhanced learning and teaching methods, such as blended learning and flipped learning.

3) **To identify any correlations between student personality types and/or learning approaches and use of educational media**. This aim should help identify which educational media are favoured by specific learning approaches and personality styles of students.

Methodology

Project background

The project has been carried out in a research-intensive University in the UK. The project is currently nearing completion of the second year of a 2-year programme. Taught components in Year 1, Year 2 or Year 3 modules from 6 academic Schools (History, Pharmacy, Business Studies, Welsh, Biosciences, and Computing) were taught using flipped classroom approaches. In the first year of the study, to establish a baseline of engagement with flipped approaches, flipped classes used video as a medium for delivery of the taught content. In the second (current) year of the study, the taught content has been delivered in parallel through video, audio, written transcript, Prezi, Powerpoint and a web-based learning resource (Xerte). All source media are hosted within the University's VLE, which can track the time and date of accessions of each media file by individual students. The time and frequency of accessions to each resource can therefore be tracked for the whole cohort as well as for individuals.

Quantitative data collection

In order to identify any potential correlations with personality type or learning approaches, students in each class were requested to complete a version of the Big Five Personality test (Briley *et al.*, 2014; Poropat, 2014), and the Approaches and Study Skills Inventory for Students (ASSIST) questionnaire (to identify preference for deep, surface or strategic learning approaches; Entwhistle and McCune, 2004). It will therefore be possible to cross-reference accessions of differential media with prevalent personality types and learning approaches. The results of the questionnaires were fed back to participants to support their own reflective practice and learning development. Participating students were asked their age and their gender, but no other demographic data were obtained.

Qualitative data generation

Ongoing work will involve open intensive interviews with volunteers from each class, in order to further discuss their perspectives on flipped pedagogies and their perceptions of the utility of different media platforms for their learning. Interview data will be analysed qualitatively using the constructivist grounded theory approach (Charmaz, 2013).

Ethical Approval

Participation in the research project was voluntary, and informed consent from students was obtained before any data was collected and used in the study. For the minority of students who did not give consent, they were still offered the opportunity to complete the questionnaires, and the results of the survey fed back to them before being deleted from the researchers' records. Similarly, students who did not give consent for involvement were given equal access to all media resources as their peers. The ethical considerations of the project were vetted and approved through the local ethical approval process of the lead School in the project.

Preliminary Findings

Initial analysis of engagement with video media (the first year of the project) suggests that many students do engage with flipped resources, but this is by no means universal. Table 1 shows the number of accessions of video resources for a series of 4 lectures in a Bioscience Year 1 module. Lectures 1 and 2 were on successive days, followed by lectures 3 and 4 on the same days the following week. The number of accessions shows that for the first week of videos, students predominantly accessed the lecture video on days prior to the live class session, but there were still a substantive number of accessions on the day of the lecture (most of those accessed on the day were accessed within an hour of the beginning of the lecture session; data not shown). Figure 1 shows the number of accessions per day prior to the lecture class for two of the three videos for Lecture 1. They each follow a similar trend, suggesting that students watched all videos consecutively in the same sitting. However these also show a peak of activity on the day prior to the live session.
The accession data for lectures 1 and 2 of this series are similar, showing prior engagement of the resources. However, for lectures 3 and 4, a week later, there was a noticeable drop in the number of accessions of the video, both prior to, and on the day of, the live session. In each case only between 31% and 57% of participating students viewed the videos at all.

Table 1. Summary of accessions of pre-learning video resources. Each lecture video was divided into 3 shorter video clips of 10-15 minutes each. Mean number of accessions per lecture is the mean across all three short videos for that lecture. % number of students interacting represents the number of students who gave consent to be included in the study, who accessed the lecture videos at least once.

	Lecture			
	1	2	3	4
Mean number of accessions before lecture date	403	335	95	116
Mean number of accessions on lecture date	166	125	102	98
Mean number of accessions after lecture	195	95	54	26
% number of students interacting	57%	49%	32%	31%

Analysis into the most popular times of the interactions also produced some interesting results (data not shown). For lectures 1, 2 and 3, the timepoint which gained the most accessions was around an hour before the commencement of the live contact session. For lecture 4 the greatest number of accessions was observed at the same time as the live lecture began. These results indicate that a large proportion of students were waiting until the very last minute to access the resources.

Table 2 shows the total number of accessions by month for two of the teaching sessions in this Year 1 course. The number of accessions for the full lecture powerpoint (which accompanied the videos) is shown, as well as the accession numbers for the video components presenting that powerpoint. There are more accessions in the month of the teaching session (month 1) than subsequently, but resources do continue to be accessed through the following month (month 2), and leading up to the module examination (month 3). What is significant for months 2 and 3 is that the number of accessions is identical for the powerpoint and each associated video, suggesting that students were accessing the powerpoint and watching the whole of the lecture (i.e. all three videos) at the same time, and therefore completing the learning for that lecture session in full in the same sitting.

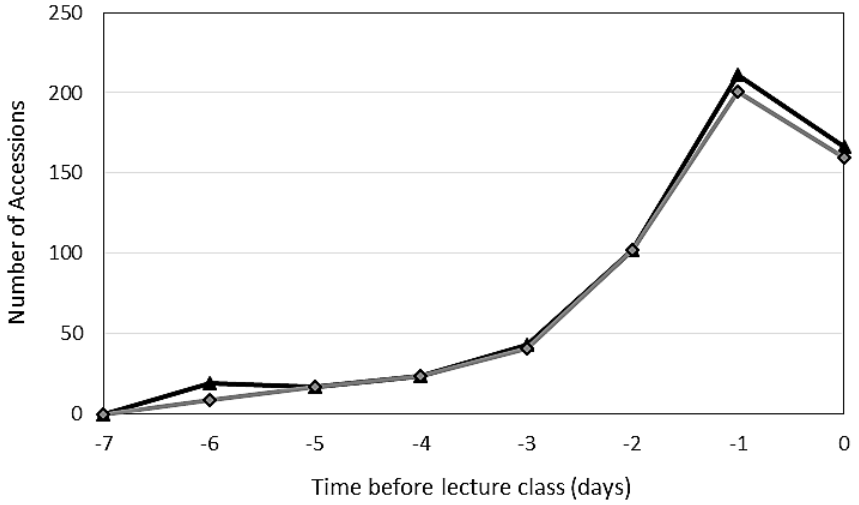

Figure 1. Timeline of accessions of pre-learning video resources. The data represent accessions of two of three 15 minute videos that comprise the content of Lecture 1 of a 4-lecture series of teaching sessions for a Year 1 biosciences module. Data are total number of accessions per day, from 7 days previous (when the videos were uploaded) to the day of the live session (time point 0). The black line represents video 2, the grey line video 3 (no data available for video 1).

Table 2. Summary of accessions of pre-learning video resources by month. Each lecture video was divided into 3 shorter video clips of 10-15 minutes each. Data show the total number of accessions in either month 1 (the month of the live teaching session), month 2 (the following month) or month 3 (the month containing the run-up to the examination, and the examination itself).

	Month		
	1	2	3
Powerpoint 1	759	109	392
Video 1.2	777	109	392
Video 1.3	757	109	392
Powerpoint 2	552	78	289
Video 2.1	566	78	289
Video 2.2	546	78	289
Video 2.3	552	78	289

An analysis of the accessions of differential media was undertaken for the first two sessions in a Year 2 Biosciences module. The optional media available were video, an audio version of the video narrative, a written document, a Prezi of the information, and the powerpoint. Data in Figure 2 suggest that video was a favourite, compared to the powerpoint and Prezi, and these were in turn favoured over the written and audio resources. However, the difference was moderate. The resources accessed for the second session were in general less well-used compared to the first session, but the same trends of video being the favoured resource were observed. The interesting difference between sessions 1 and 2 was the observed reduction in the number of accessions of the Prezi for the second teaching session. For the second session, Prezi was the least favoured medium by a substantial margin.

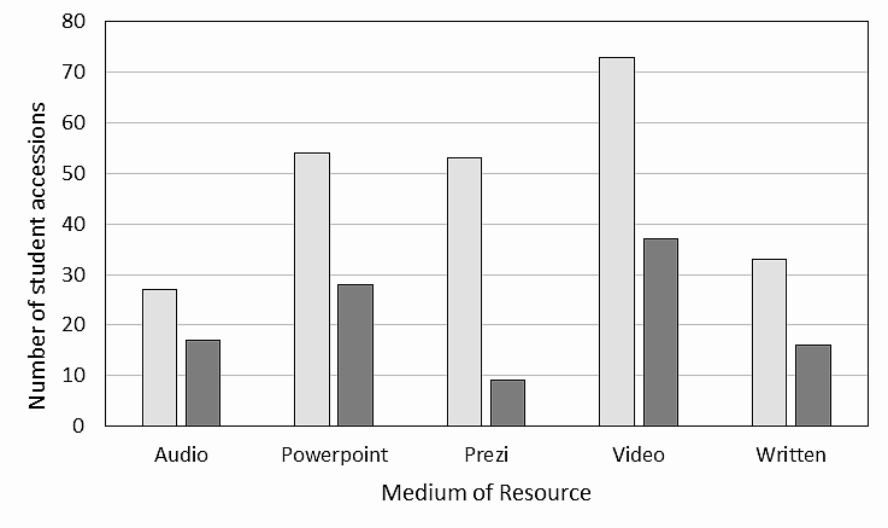

Figure 2. Number of accessions across differential media. Teaching materials for two sequential teaching sessions were delivered via a range of media. The data show numbers of accessions for each medium for lecture 1 (light grey) and lecture 2 (dark grey).

Discussion of Preliminary Findings

These preliminary data, as well as feedback from the students themselves in the flipped sessions, suggests that there was engagement with the flipped learning resources. However, this engagement is not complete, and there are substantial proportions of the class who did not engage with the pre-learning media. This findings suggests that the use of the pre-learning material in flipped classes is not always of the required level for what one might consider effective learning. It should be noted, however, that the metrics only measure access of the resources by an individual, not engagement with the resources. For example, the metrics do not capture instances where one student might access the resource for themselves and several peers to watch collaboratively. Anecdotally, this was observed to have occurred in the History flipped course, where students made active social events of watching the pre-lecture videos together, prior to the live sessions. The data of accessions in months following the live session strongly suggest that students are watching the lectures in full, with the accompanying powerpoint slides for reference (and perhaps making notes). Further qualitative research is required to investigate the specific activities of the students in their engagement with flipped media – how they used them, what approach was taken for making notes, and the reasons why they selected the media they chose.

The preliminary data suggest that video may be the most popular medium for content delivery, with students quickly becoming disaffected with Prezi as a medium. However, these are very preliminary findings, and more comparisons from other teaching sessions are required before robust conclusions may be drawn. There does seem to be engagement in general with the flipped approach, although these data do not, as yet, identify whether the flipped teaching method has a significant impact on the students' learning in this study. However, surveys undertaken by Wanner and Palmer (2015) suggested that students found that students were broadly positive towards the pedagogy of flipped learning as a whole. A meta-analysis of the literature into blended and flipped learning by Margulieux et al. (2015) suggested that flipped learning is associated with more significant learning gains than any other form of blended or technology-enhanced education. Tune *et al*. (2013) also identified significant positive effects of flipped learning on physiology teaching outputs, as did Weaver and Sturtevant (2015) regarding chemistry teaching. Weaver and Sturtevant's study suggested that the impact of flipped learning was greater in conceptual subjects than arithmetic ones. Ryan and Reid (2016) also noted differential impacts, with the greatest impact on low-achieving students. The range of subjects covered in this project, as well as the collected data on student personality and learning strategies should provide further information regarding differential impact of the approach for students with different approaches to learning.

Anticipated Future Outcomes

Future analysis beyond these preliminary findings should reveal the extent to which students engage with flipped media, and further investigate the level of engagement with differential media that these primary findings suggest may be of significance. As yet we do not have any data analysed to identify potential correlations between students with varying personality traits or learning strategies. One might expect, for example, deep learners to engage more with the flipped learning resources. Similarly, one might feasibly expect that extrovert or introvert individuals, or those who are more or less conscientious, to engage to differing extents with this methodological approach.
It is anticipated that the findings of this project will help inform our understanding of how and why students engage with flipped media (and why some do not do so), and to highlight what the preferred media are for flipped learning, and why. Similarly it will be potentially interesting to evaluate differential engagement with flipped learning and/or delivery media between students of diverse discipline areas, from health sciences, to science, humanities, to languages. These findings may have potential impact on how we design flipped learning approaches so that they are inclusive and equally accessible and impactful for all learners in diverse groups and learning communities.

Acknowledgements

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