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## **Lecture Capture Adds Value to Attending Psychological Research Methods Lectures**

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### **Abstract**

Lecture capture is increasingly prevalent and provides an effective supplement to attending lectures in psychology. Yet, evidence for enhancement of learning is limited to recall of facts in introductory subjects taken within the first year of a psychology degree. The aim of the current study was to explore the generalisability of these effects by assessing whether lecture capture adds value to attending lectures in psychological research methods – a subject some students find particularly challenging. During a core second year undergraduate psychological research methods module, ten traditional one-hour lectures were recorded and made available for online viewing using the ‘Panopto’ lecture capture system. Of 121 students originally registered on the module, 114 took the examination. These students’ grades were cross-referenced with digital records of their attendance, and the extent to which they viewed lecture recordings while logged into the virtual learning environment. Students that viewed recorded lectures were found to achieve higher grades in the examination than those that did not, even when attendance at the lectures was included as a covariate. This effect was not an artefact of differences in motivation, engagement, or ability in research methods. These results indicate that lecture capture adds value to attending lectures in psychological research methods. This finding implies that the enhancement of learning from supplementary lecture capture generalises to novel contexts and is thus not overly constrained by educational level or type of knowledge assessed. Recording lectures may have particular value as a way to support students encountering difficulties studying research methods.

*Keywords:* lecture capture, lecture attendance, academic performance, research methods, educational technology

### **Lecture Capture Adds Value to Attending Psychological Research Methods Lectures**

Globally, an increasingly prevalent practice in Higher Education is lecture capture - the recording of lectures delivered during face-to-face teaching for subsequent online viewing by students. However, this practice has become a 'contested space' between students and academics (Morris, Swinnerton, & Coop, 2019). While students appear to be very positive about this provision (e.g., Groen, Quigley & Herry, 2016; Traphagan, Kucsera & Kishi, 2010), some academics are highly sceptical. Lecturer concerns relate to recordings stifling lecture delivery, and having a negative impact on the behaviour of learners, including increasing non-attendance (Morris et al., 2019). The cost effectiveness of providing lecture capture has also been questioned (Taplin, Kerr, & Brown, 2014). The aim of the current study was to contribute to this debate by assessing, within the context of psychology education, whether lecture capture adds value to lecture attendance.

When surveyed for their opinions, student respondents are generally positive about having access to lecture recordings (e.g., Traphagan et al., 2010), and regard this as contributing to their satisfaction with their course (Groen et al., 2016; Traphagan et al., 2010). Reported uses of lecture capture typically endorsed in surveys include: catching up after absences (Groen et al., 2016; Leadbeater et al., 2013); facilitating learning at their own pace (Cooke, Watson, Blacklock, & Manash, 2012; Groen et al., 2016); filling-in omissions in notes from classes attended (Groen et al., 2016); clarifying difficult concepts (Groen et al., 2016; Taplin et al., 2014), and preparing for assessments, including revision (Copley, 2007; Groen et al., 2016). A recent institution wide survey of students indicates the following order of preference: catching up, revising, clarification, writing assessments, note-taking (Morris et al., 2019). However, the finding that students tend to attach a low monetary value to lecture capture questions the extent to which endorsement using Likert scale items indicates this provision is truly valued (Taplin et al., 2011). Moreover, even if positive attitudes to lecture

capture are associated with increased satisfaction (Cramer, Collins, Snider, & Fawcett, 2007; Franklin, Gibson, Samuel, Teeter, & Clarkson, 2011), it does not follow that introducing lecture capture will have a positive impact on learning.

In fact, evidence that lecture capture enhances student achievement is much more mixed. While some studies show that enhanced achievement is associated with lecture capture use (e.g., Cramer et al., 2007; Traphagan et al., 2010) or availability (e.g., Terry, Macy, Clark, & Sanders, 2015), other studies show no relationship (e.g., Franklin et al., 2011; Leadbeater et al., 2013; Williams, Aguilar-Roca, & O'Dowd, 2016). More nuanced findings have been reported when attendance at live lectures has also been considered. For instance, some studies show that lecture capture supplements attendance (Bos, Groeneveld, van Bruggen, & Brand-Gruwel, 2016; von Kinsky, Ivins, & Gribble, 2009), while others show that recordings partially (Inglis, Palipana, Trenholm, & Ward, 2011) or completely compensates for the negative effects of missing lectures (Traphagan et al., 2010; Wieling & Hofman, 2010). A further complication is that the provision of lecture recordings may reduce attendance, with negative consequences for attainment (Drouin, 2014; Edwards & Clinton, 2019). Thus, in order to evaluate whether lecture capture adds value to lectures it is important to consider attendance.

Bos et al. (2016) have assessed the value added by lecture capture within the context of psychology education. Their study examined how making use of recorded lectures, and attending face-to-face lectures, affected exam performance on a first year compulsory module in Biological Psychology in the Netherlands. Students that accessed recordings without attending at all were not found to differ in attainment from those that were completely non-engaged (i.e., neither attended nor viewed recordings), thus providing no support for the effectiveness of a 'substitution' strategy. However, those that both attended lectures and accessed recorded lectures (i.e., a 'supplementation' strategy) outscored peers that attended

lectures without accessing recordings. This improvement was restricted to assessments of subject knowledge; no improvement was found for assessments measuring higher order application of knowledge. A limitation of this study, acknowledged by the authors, was that the categorisation of attendance patterns was coarse (attend vs. no attend); some students assigned to the 'supplementation' group may have substituted recordings for selected lectures given the variation in attendance present in this group. Furthermore, other characteristics, such as ability, may have mediated the association between choosing to access recordings and higher attainment. Nonetheless, these results suggest that supplementary use of lecture capture may add value to attending lectures for the relatively concrete facts about biological psychology delivered in the first year of a psychology degree.

A more recent study addressed these limitations and revealed broadly similar findings (Nordmann et al., 2019). It examined the relationship between lecture recording use and achievement across the four years of a Scottish undergraduate psychology course, taking into account attendance recorded by registers, as well as ability. For first years taking a general introductory module, both recording use and attendance were found to correlate with attainment on an exam comprising multiple choice questions. In particular, recording use was found to have the greatest benefit for less able students, measured by GPA, provided they were regularly attending. This is consistent with the use of lecture recordings as a supplementary study aid to clarify concepts that were not well understood during the lecture (Groen et al., 2016; Taplin et al., 2014). However, the added value of lecture capture was found to be restricted to the first years recruited onto the study; similar effects were not evident for the modules delivered at higher levels of study. Nordmann et al. also report some evidence consistent with lecture capture having potential as a substitute for attending. However, this was restricted to more able students, measured by average grade on other modules taken. Thus, this study points to a nuanced position whereby the effectiveness of

substitution and supplementation depends upon ability, with no benefit found beyond the first year.

Research methods is a core domain within a psychology degree for which lecture capture might be expected to add value to attending lectures, but has hitherto not attracted attention. Achievement in this domain is underpinned by the acquisition of facts and processes, in common with biological psychology (Bos et al., 2016), and the type of knowledge typically assessed by multiple choice questions (Nordmann et al., 2019). This material is perceived by many students to be technical and complex, holding little intrinsic interest (Ball & Pelco, 2006), and is often considered to be the hardest aspect of a psychology degree (Barry, 2012). Therefore, providing lecture capture may be beneficial to the extent that it facilitates filling-in omissions, clarifying difficult concepts, and learning at the student's own pace (Cooke et al., 2012; Groen et al., 2016; Taplin et al., 2014). Furthermore, lecture capture may offer a useful countermeasure to address lack of confidence with course content, given the prevalence of statistics anxiety on research methods courses (Onwuegbuzie & Wilson, 2003), and its association with lower achievement (Macher et al., 2012). Thus, examining whether lecture capture adds value to attending psychological research methods lectures appears to be valuable in its own right as well as offering a good opportunity to assess the generality of earlier findings.

The current study therefore evaluated whether lecture capture adds value to attending psychological research methods lectures. This was an unobtrusive observational study of educational behaviour in a novel context – a second year undergraduate research methods course. It assessed the influence on attainment of both learning capture use and lecture attendance. An electronic card reader system provided an objective measure of rates of attendance, and other learner characteristics that might mediate these relationships were also examined. If lecture capture is an effective supplement to face-to-face delivery, then

enhanced attainment would be expected even when rate of attendance is statistically controlled.

## **Methods**

### **Participants**

Participants were 121 students enrolled at a post-92 university in London UK and registered on the research methods module during the academic year 2017/18 (i.e., between September 2017 and January 2018). With ethical approval (ETH1718-1742), consent was not obtained in order not to detract from educational objectives, given that this was an unobtrusive observational study of normal learner behaviours.

As no personally identifying data was retrieved for individual students, precise demographic information for this sample is not available, but may be estimated from characteristics of the entry cohort. This indicates that approximately 86% of the sample were female, typically 20 years old, with around 17% mature students (21 years or older at initial registration). About 87% were from the UK, 9% from the European Union (EU), and around 3% international students (i.e., from outside the EU). The mean number of “UCAS” points for this cohort was 116, according to the tariff operated by the Universities and Colleges Admissions Service. This is consistent with entrants achieving the grades BBC at GCE A-level, a common leaving qualification taken in schools and colleges in England and elsewhere..

### **Materials**

The lecture recordings were captured on a compulsory psychological research methods module, taken in the second year by all students enrolled on a British Psychological Society (BPS) accredited BSc Psychology programme. The educational approach employed in the module was to facilitate active learning, with the majority of contact hours scheduled in



small groups for practical work and problem based learning. Nonetheless, ten weekly traditional didactic one-hour lectures were employed, primarily to deliver content related to knowledge and understanding across a range of quantitative (e.g., ANOVA, and multiple regression), and qualitative (e.g., thematic analysis) research methods. It was these sessions that were recorded.

Lecture recordings were made using the 'Panopto' system by the instructor delivering the lecture. Unedited recordings were made available to students via the institutional virtual learning environment (VLE) platform, 'Blackboard Learn', by providing a link to a folder of institutionally hosted recordings. Students were periodically encouraged to use these resources via three Blackboard announcements reminding them that they may provide useful clarification when reviewing their lecture notes. The total recordings amounted to approximately 8hrs and 20 minutes.

## **Measures**

### ***Attainment (%)***

The module is assessed via two elements - a portfolio coursework (weighted at 40%), and a formal closed exam that takes place at the end of the semester (weighted at 60%). The portfolio is intended to be a cumulative record of students' practical work on the module, primarily assessing learning outcomes relating to skills in conducting data analysis.

The examination assesses knowledge and understanding of the analyses covered, incorporating research design, interpretation, reporting, and evaluating relative strengths and weaknesses. It comprises 15 unseen short answer questions (worth 60%), and two seen questions (worth 40%). Examination grade was chosen as the outcome measure for this study, as this assessment focuses most on the application of knowledge acquired from

lectures. Markers were blind to students' engagement with face-to-face or recorded lectures as marking was anonymous.

### ***Viewing Recordings (views vs. no views)***

Students' use of lecture recordings was assessed via lecture capture logfiles (Panopto video analytics). This yielded, for each student, the total number of views and the total minutes viewed including repeat views of the same recorded lecture. Earlier pilot work had found that such raw data were positively skewed, and thus not suited as a continuous predictor measure (Gardner, 2018). Therefore, engagement with lecture capture was operationalised dichotomously based upon whether or not any recordings had been accessed (i.e., views *vs.* no views). Consistent with this approach, best practice guides point out that even brief views can be useful to clarify points that were not understood first time (Nordmann et al., in press).

### ***Attendance (%)***

Engagement with face-to-face delivery of lectures was estimated via the electronic attendance monitoring system 'SEAtS'. This requires students to tap their ID card against a reader at the start of scheduled teaching sessions. The measure used was the percentage of timetabled module events that each student was recorded to have attended.

### ***Other Background Measures***

Log files from the VLE platform delivering the recorded lectures (Blackboard Learn) were used to measure more general engagement with digital learning resources. This yielded the total time the student was logged into the module Blackboard site, expressed in hours.

The overall module grade for the first year research methods module was used to estimate ability in psychological research methods prior to starting the module. Passing the

first year research methods module was a pre-requisite for taking the second year research methods module.

### Results

Figure 1 illustrates how total lecture capture usage for this sample varied throughout the semester. This indicates a relatively low and stable rate of accessing lectures during term, that increased to a peak prior to the coursework deadline, before dropping in the period prior to the exam. This is consistent with prior work in which students report using captured lectures to prepare for assessments (Copley, 2007; Groen et al., 2016). It also demonstrates the potential utility of this technology to support independent study over the vacation period in which academic staff were not teaching.

Records of students' educational behaviours were retrieved, cross-referenced, and anonymised. Of those registered on the module, 114 (94%) sat the examination, and it was these data that were subjected to statistical analysis. Fewer than half these students accessed recorded lectures ( $n = 55$ ; 48%), despite these resources being made available to all via the VLE, and the online prompts to use these resources. As anticipated, usage data were positively skewed, with a long tail of high users but the majority of viewers more selective in their use of this resource (views:  $Mdn = 8$ , maximum = 29; minutes:  $Mdn = 80$  minutes, maximum = 9hrs, 10 minutes).

Table 1 indicates how the measures varied as a function of whether or not students had viewed recorded lectures. The examination grades indicate that those that accessed lecture recordings tended to achieve higher attainment than those that did not by approximately 6 marks. This difference was statistically significant,  $t(112) = 2.11$ ,  $p = .037$ .

Attendance was positively related to attainment,  $r = .43$ ,  $p < .001$ ,  $N = 114$ . Figure 2 illustrates the relationship between attendance and attainment separately for the two viewing

categories. These data appear to indicate that viewing lecture recordings added value to attainment on the exam, irrespective of rate of attendance. This impression was evaluated using Analysis of Covariance (ANCOVA) where viewing recordings (yes *vs.* no) was the grouping factor, and attendance was the covariate. A preliminary analysis found that the interaction between the grouping factor and the covariate was not statistically significant,  $F(1, 110) = 0.98, p = .939$ , indicating that the homogeneity of regression slope assumption was not violated (see Figure 2). Crucially, ANCOVA revealed a main effect of viewing recordings,  $F(1, 111) = 5.16, p = .025$ , despite attendance being a statistically significant covariate (equivalent to approximately 3 marks per week attended),  $F(1, 111) = 26.4, p < .001$ .

It is important to consider whether viewers differed in any other ways from non-viewers. Given that this study employed a natural independent groups design, and participants were not randomised to the views *vs.* no-views groups, potential confounds might offer an alternative account for group differences in attainment. These groups were not found to differ in rates of attendance,  $t(112) = 0.14, p = .89$ . Nor did they differ in prior ability, measured by attainment in research methods in the first year,  $t(109) = 1.03, p = .305$ . An additional ANCOVA with prior ability as well as attendance entered as covariates<sup>1</sup> revealed a main effect of viewing recordings,  $F(1, 107) = 3.98, p = .049$  that remained when the variation attributable to both covariates was partialled out – ability,  $F(1, 107) = 22.5, p < .001$ ; attendance,  $F(1, 107) = 8.34, p = .005$ . The only other measured characteristic that showed a difference between these two groups was time spent on the VLE,  $t(111) = 5.57, p < .001$ .

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<sup>1</sup> The assumption of homogeneity of regression slope was met. This was checked by re-running the ANCOVA with the addition of interaction terms between the IV (viewing category) and each covariate. Neither interaction was statistically significant: IV x attendance,  $F(1, 105) = 0.73, p = .395$ ; IV x ability,  $F(1, 105) = 0.71, p = .401$ .

Exploratory non-parametric Spearman correlations found that neither the number, nor duration, of views was related to examination grade in the 55 students that viewed recordings - views:  $r_s = -.10, p = .452$ ; duration:  $r_s = -.11, p = .398$ . Correlations between these measures and attendance, while also not statistically significant, point towards a potentially higher volume of use by students with lower attendance - views:  $r_s = -.20, p = .141$ ; duration:  $r_s = -.15, p = .277$ . Replication in a larger sample is in order, but these results recommend caution in the use of viewing metrics given that they may not be straightforward uncontaminated measures of online learning behaviour.

Finally, the pattern of engagement of the 55 viewers may be further described through cross tabulating attendance and views for each lecture (cf. Bos et al., 2016). Across the ten recorded events, traditional face-to-face 'visiting' (i.e., attended NOT viewed) was the most frequently adopted type of engagement for the majority of these students ( $n = 23, 43\%$ ). The next most prevalent type of engagement was 'supplementary' use of recordings (viewed AND attended), adopted by 16 students (30%). Only 8 students (15%) engaged with the topics primarily through viewing recordings – i.e., 'substitution' (viewed NOT attended), while 7 (13%) were primarily non-engaged (neither attended NOR viewed), and 1 student demonstrated a bimodal pattern, 'visiting' the same number of sessions as they did not engage with.

### **Discussion**

The present study assessed whether viewing recorded lectures adds value to attending lectures in psychological research methods. It revealed that students that viewed recorded lectures achieved higher attainment in an examination than those that did not. This advantage persisted when attendance at the lectures was included as a covariate, thus statistically controlling for level of engagement with the face-to-face lectures. Those that viewed lectures

also tended to be logged into the VLE for a longer time than those that did not. However, no between group differences were found for either of the other learner characteristics measured - attendance and prior attainment in research methods. Thus, these results indicate that lecture capture may add value to attending psychological research methods lectures, taking into account a learner's level of engagement with face-to-face lectures.

The finding that viewing recorded lectures was associated with higher attainment irrespective of level of attendance is consistent with previous work showing that lecture capture supplements learning from face-to-face lectures (Bos et al., 2016; Nordmann et al., 2019; von Konkys et al., 2009). The present results extend these earlier findings in two ways. First, they demonstrate that supplementation effects can occur in the specific context of psychological research methods teaching. This suggests that lecture capture provision may be a useful countermeasure for some of the potential challenges students encounter when studying this subject, including perceived difficulty (Barry, 2012), low intrinsic interest (Ball & Pelco, 2006), and statistics anxiety (Macher et al., 2012; Onwegbuzie & Wilson, 2003). An avenue for future research would be to examine whether changes in statistics anxiety mediate these relationships.

Second, the present results also extend earlier findings by demonstrating for the first time that the value of supplementary lecture capture extends beyond the first year of undergraduate study. This calls into question the idea that the impact of this technology is limited in some way by the educational maturity of the learner (Nordmann et al., 2019). Participants in the present study had all successfully progressed from the first year of an undergraduate degree, implying that the value of lecture capture is not restricted to providing a second chance to learners encountering difficulties transitioning into higher education. The present results also call into question the idea that benefits may be limited to the type of knowledge acquisition more typically assessed at introductory levels of study (Bos et al.,

2016; Nordmann et al., 2019). The examination investigated here assessed application of knowledge to novel problems, rather than retrieval of facts. Thus, the present study demonstrates that enhancement effects generalise to novel contexts, suggesting that supplemental use of lecture capture may also have a more general positive impact on education.

It is important to consider whether potential confounds might offer an alternative account for group differences in examination attainment, given that participants were not randomised to the views *vs.* no-views groups. The absence of a corresponding group difference for attendance or prior attainment in research methods suggests that this effect was unlikely to be an artefact of differences in motivation, engagement, or ability in research methods. By contrast, the presence of a difference in duration of VLE use could indicate that students viewing recordings tended to spend more time in independent study more generally, including the use of other online resources. However, the association between viewing recordings and VLE use could simply be because recordings were accessed via the VLE. Our preferred account therefore is that lecture recordings complement other digital resources by offering flexible access to learning opportunities that may enhance learning.

It is noteworthy that approximately half the sample did not access any recordings, and it is possible to speculate about possible influences on whether students do, or do not, view recordings. Contextual factors are likely to constrain access to online videos (e.g., quiet places to study or good internet access, see Gorard & Selwyn, 1999), and time available for independent study ('lifeload', such as employment and needs of dependents, Yorke, 2000). Individual differences that may influence study habits include students' self-regulatory learning strategies (Pintrich, 2004), and tendency to procrastinate (Lay, 1986). In addition, the prevalence of recordings in other modules is likely to influence choices about which resources to use. In this respect, it is worth noting that lecture capture was not widely

adopted across BSc Psychology at the time of the present study. As the data collected for the present study does not allow these hypotheses to be examined, a valuable direction for future research would be to assess determinants of lecture capture use, and how it is used.

The present results indicate the prevailing importance of engaging with face to face lectures. First, attendance was found to covary strongly with attainment, consistent with the established finding that class attendance is an excellent predictor of college grades (Credé, Roch & Kieszczynka, 2010). Second, lecture capture appeared only to have partially compensated for the negative effects of missing lectures; the learning gained by watching lectures (average 6 marks) was relatively modest compared to the benefits of attendance (3 marks for every week attended). In the present sample, there was limited evidence for wholesale adoption of a 'substitution' strategy (electing to use recordings rather than attend lectures), given that attendance levels did not differ between the group that watched recordings and the group that did not. More detailed analysis of the pattern of engagement across the ten lectures identified only 8 students that primarily used recordings as a substitute for attending (15% of the viewers, 7% of those that sat the exam). The lectures took place in late morning, followed on the same day by practical work and problem-based learning, an arrangement that is sympathetic to the needs of commuter students. We speculate that the timetable likely moderates whether the educational practice of making lecture recordings available has a negative impact on attendance, with detrimental consequences for attainment (Edwards & Clinton, 2019). In addition, educators may play a crucial role in supporting students to make effective use of lecture capture (Nordmann et al., in press).

A limitation of the present study is that the availability of only an aggregated final exam grade precluded more granular analyses. Study designs that examine performance on individual questions separately could be informative, providing new opportunities for research. One such opportunity would be to examine the relationship between viewing



recordings and marks at the more granular level of lecture topic. This would involve selecting questions for analysis that each assess knowledge of material covered only by a single recorded lecture. Such an approach could be particularly valuable for future observational studies by offering a way to tease apart the specific effect of viewing recordings from the more general influence of any confounds between viewers and non-viewers. A second research opportunity would be to plan a comparison between questions that assess different types of educational outcome (perhaps drawing on Bloom's taxonomy, Krathwohl, 2002). Such a study design could provide further evidence about the relative efficacy of viewing recordings for different types of outcome (cf. Bos et al., 2016), while avoiding the problems of cross-study comparison.

In conclusion, the present study demonstrates that lecture capture adds value to attending lectures in psychological research methods, when made available alongside other digital resources. For psychology educators, this finding has three main implications. First, research methods instructors could use lecture capture as a way to assist students to cope with some of the specific difficulties encountered when studying this subject. Second, lecture capture may supplement learning across a wider range of subjects as its value does not seem overly constrained by educational level, or type of knowledge assessed. Third, it is crucial to disseminate good practice in integrating learning capture (e.g., Nordmann et al., in press), given the prime importance of face-to-face engagement, and risks associated when introducing this practice.

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**Table 1**

*Descriptive Statistics for Attainment, Attendance, and Background Variables as a Function of Viewing Group*

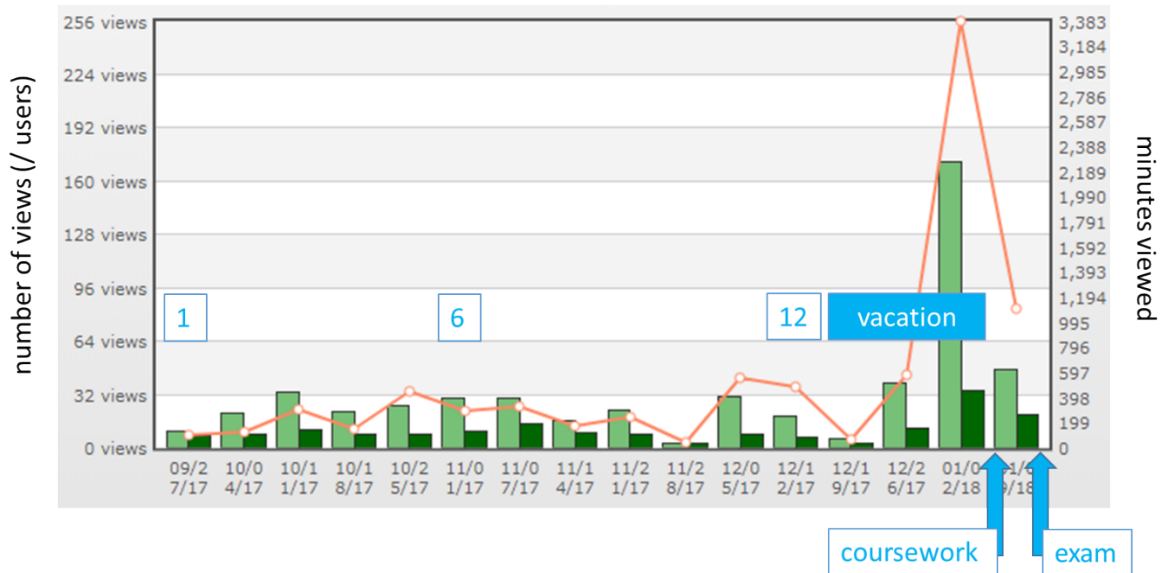
Measure	Views			No Views		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>N</i>
Attainment (%)	63.1	14.0	55	57.4	14.7	59
Attendance (%)	55.0	20.6	55	54.5	17.9	59
VLE use (hrs)	29.6	13.1	55	17.3	10.4	58 <sup>a</sup>
Prior ability (%)	53.2	10.3	55	51.2	10.2	56 <sup>b</sup>

<sup>a</sup>VLE data were unavailable for one student that left the university after sitting the exam but before data extraction. <sup>b</sup>Prior ability data were unavailable for three different students – two that had transferred into the second year from another university, and one that had taken a different pre-requisite module before interrupting studies the year before this study.

**Figure 1**

*Distribution of Lecture Capture Usage Across the Semester Recorded by Panopto Video*

*Analytics*

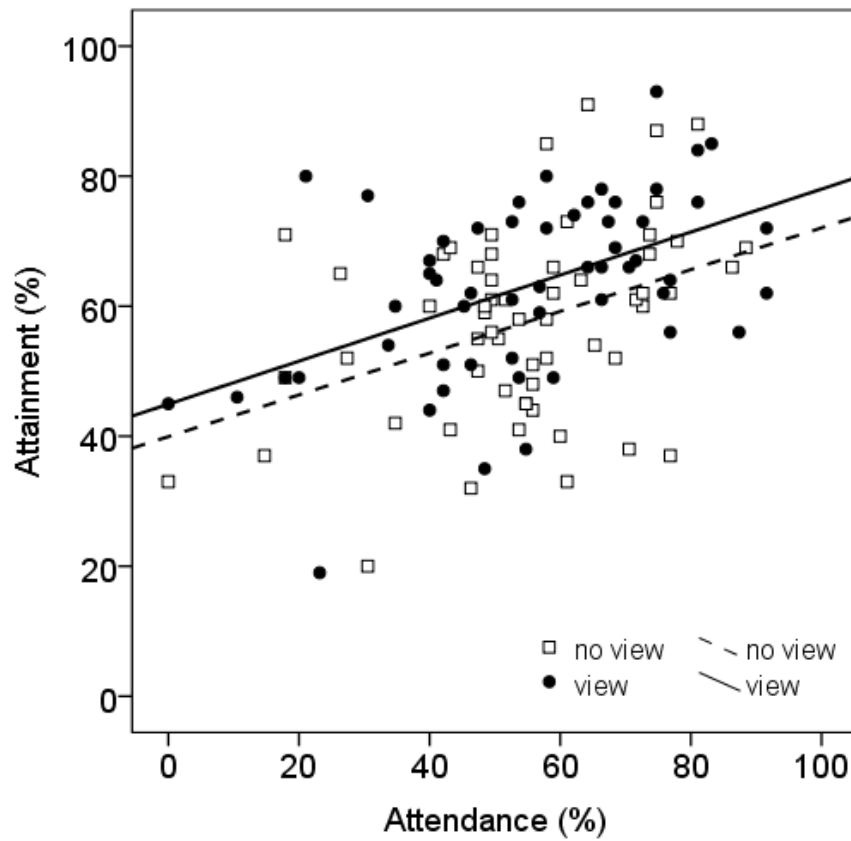


*Note.* The line denotes total minutes viewed, and the bars represent number of views (light shading) and number of unique users (dark shading). System output has been annotated to indicate the first (1) and final (12) teaching weeks, the sixth week which was a reading week (6), the timing of the assessments, and a 3-week vacation prior to the coursework assessment being due.



**Figure 2**

Scatterplot of the relationship between attendance and attainment for the groups defined by whether students had accessed recordings (view vs. no view).



Note. Lines depict linear fit for each group.