**Lecture Capture: Friend or Foe?**

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**Abstract**

Lecture capture (LC); a recording of the live lecture provided as a supplementary resource, is accepted as a standard provision in UK higher education. Previous research has shown it to be very popular with students, although there have been conflicting findings in terms of its impact on attendance and attainment, and suggestions that student engagement with this resource varies depending on their own preferences and approaches. The aim of the present study was to determine the impact of LC on students in a wider sense, encompassing pedagogic and pastoral aspects of student development. This mixed-methods study analysed focus group and questionnaire data from first- and second-year veterinary students at one UK university. Results demonstrated the student belief that LC is important for learning and wellbeing, but highlighted the facilitation of passive and surface learning that this resource offers. More worryingly, this study identified a group of students for whom this resource may be particularly unhelpful. This group relied almost wholly on LC for learning, limited attendance and learning approaches, felt overwhelmed by workload despite working fewer hours and experienced poorer mental health and academic achievement. A key theme in this negative relationship appeared to be low self-efficacy. The findings enable educators to consider how resources are provided, and encourage implementing mechanisms to help students to make better choices and take control of their learning.

**Keywords**

Lecture capture; learning approach; wellbeing; workload; resources; self-efficacy; student engagement; academic achievement

**Introduction**

*Lecture capture and the present study*

Lecture capture (LC) is a recording of a live lecture presented as an additional resource after the class alongside other “standard” resources such as slides and notes. Access to LC used in this way is optional, unlimited and at the student’s behest.

LC has become a near-standard supplementary resource across higher education – it is the “new norm”. Despite its increasing provision in the higher education sector, and popularity among the student body, LC is by no means an educational panacea. It is clear that students consider that LC improves their learning1 and supports their mental wellbeing2, and provision of this resource has been shown to improve student satisfaction3–5. On balance it seems that the benefits of LC probably outweigh the drawbacks, when used well, but research is beginning to suggest that whether LC is “good” or “bad” is not a binary issue6; LC has been shown to facilitate strategic learning7 and there are differences in its impact on students’ academic development depending on their learning approach8,9 and type of access10. The impact on student wellbeing is likely to be equally complex and dependent on the individual. There is a need to consider the impact of LC more holistically and in the context of the individual student, from both a pedagogic and pastoral perspective, to better inform their usage.

This study presents an initial investigation of the impact of LC on the wellbeing and learning of year 1 and 2 undergraduate veterinary students at one UK veterinary school. This cohort consists of 78% students who started their veterinary studies aged 18-19 years following completion of secondary school education, 15% graduate students and 7% older students (>21yrs) who have non-traditional qualifications and have taken foundation courses for university entry. Veterinary students, while by no means a homogenous group, present some features which make them a useful focus for this research.

*The UK veterinary undergraduate student body*

Graduates, and particularly those entering clinical professions, require deep learning approaches11 and strong lifelong learning skills12. An intrinsic factor underpinning the success of a learner is their ability to self-regulate13 and audit their own learning14. They need to be able to think critically, reflect on their progress and manage their learning15. Key to this is the possession of a degree of self-efficacy; the belief that they possess the ability to determine and enact the tasks required to achieve their goals16.

Undergraduate veterinary students in the UK tend to be highly motivated, high-achieving and driven, and the majority progress through their studies with few academic issues. Veterinary students have, however, been characterised as often highly strategic in their learning approach17, tending to focus on activities they think likely to yield the most reward rather than developing intellectual curiosity and learning skills.

Veterinary students and professionals are also widely recognised as experiencing increased levels of mental ill health and risk of suicide compared to the general population18. Veterinary students often have perfectionistic tendencies19 and experience excessive levels of stress and anxiety20–22 during their studies and through their careers23,24, exceeding that of other comparable professions (such as medical students) in some studies20,25.

There are several factors contributing to the development of mental distress in any individual, and to the increased levels seen among veterinary students18,20,26. Stress has been shown to be more prevalent in those who achieve lower academic grades26, and both workload20 and expectation (personal and that of others)19,27 have been shown to be key factors linked to stress, anxiety and depression.

*The veterinary curriculum: workload and resources*

The veterinary curriculum, in common with other professional degrees, demands a high degree of commitment and presents a consistent and high workload, both in terms of contact hours and personal study requirements. This demand is essentially equal for all students in a cohort, yet it is recognised that a proportion of students consider this workload to be overwhelming28, while others manage it well. It is the perception of workload which is key, and a high perceived workload has been shown to have a negative impact upon academic achievement29,30 and wellbeing20,31.

At the University of Liverpool School of Veterinary Science (LSVS), much attention is given to making learning as accessible and inclusive as possible. To this end, it is now routine for each lecture to be supported by online provision of lecture slides, lecture notes, links to relevant websites or eBooks, revision quizzes and a recording of the live lecture, all presenting the same content in different formats. Considering that year 1-3 students can expect around 13 hours of lectures in a 26-hour timetabled week, this amounts to a significant bank of resources. Informal feedback at LSVS suggests that provision of so many resources, even replicating the same material, causes some students to feel anxious and disengaged, and to rely heavily on recorded sessions for learning.

*Conceptual framework and current study*

While students who already possess positive qualities and approaches are likely to make good choices and progress well both academically and personally, the authors were concerned that students who are not self-efficacious, who struggle to self-regulate and exhibit surface learning approaches may be adversely affected by, or at least not be assisted by, provision of LC due to the ease of access and apparently low cognitive demand they offer.

The considerations above yielded a conceptual framework which links workload and LC with wellbeing, learning skills and academic achievement [Figure 1].

[Place figure 1 here]

This can be encapsulated by the question “Is lecture capture a friend, or a foe?”, and the hypothesis that struggling students may rely on LC more and benefit from it less.

**Aim and Research questions**

This report aims to determine the variable impact of providing lecture capture on student wellbeing and learning in a high-stakes, high workload environment.

How does the impact of LC provision vary between students, in terms of:

1. Wellbeing, based on student experience of stress, workload, anxiety and depression
2. Learning skill development, based on evidence of deep, flexible learning approaches and self-efficacy
3. Academic achievement, based on examination results

**Methods**

This two-stage project employed qualitative techniques, to explore individual experiences and gauge strength of feeling and beliefs regarding use of LC, and semi-quantitative techniques, to identify trends and relationships between attitudes to LC usage and academic achievement, perceptions of learning and stated wellbeing. Data gathering utilised focus groups and questionnaires. Ethical approval was gained from LSVS Research Ethics Committee, prior to commencing data collection.

Students in years 1 and 2 of the 5-year BVSc were invited to join the study; these cohorts were selected as they had the most exposure to LC. Data gathering ran from February to May 2016, ensuring 1st year participants had experienced at least one semester and 2nd year participants has experienced three semesters of study.

Focus groups were run as stage 1 of the project. Volunteers were sought, and 17 first year and 11 second year students were assigned by the authors to one of six focus groups each containing 4 – 6 students. Each focus group contained students who self- declared as low/zero, medium and high users of LC and were further subdivided into four first-year groups and two second-year groups. The focus groups each lasted 60 – 75 minutes and were chaired by an experienced, independent facilitator who structured the discussions to ensure equal participation of all individuals.

Focus group questions and prompts were developed from the conceptual framework, formal course feedback and informal interviews with individual students. The facilitator received an in depth briefing prior to the focus groups. Table 1 shows the major questions used to frame discussion in the focus groups.

[Place table 1 here]

The focus groups were recorded and independently transcribed. Simple inductive thematic analysis was performed independently by the three authors who then identified themes which were used to develop questions for the questionnaire. This initial analysis was superseded by the framework analysis described below, hence is not presented here. There were no clear differences in the focus group themes derived from the 1st and 2nd year cohort and so these data are pooled.

The final stage of the project was a questionnaire consisting of thirty-four Likert-type questions, which was distributed for voluntary completion to years 1 and 2 in May 2016; prior to the summative examinations. Students were requested, on a voluntary basis, to give their student identification (ID) number at the start of the questionnaire, to enable correlation with academic achievement and background. The questionnaire and corresponding student academic data were pseudonymised using a numbering system to protect identity during data analysis.

*Data analysis*

Qualitative analysis of the focus group data was performed in NVivo qualitative data analysis software (QSR International Pty Ltd. Version 10, 2012). A framework analysis approach was used, enabling comparison of the views and experiences of participants in different self-stated usage groups [Table 2]. Data were independently coded by the three authors to reduce bias and, through iterative discussion, organised into minor, major and overarching themes [Figure 2]. Focus group analysis was validity-checked by triangulation with the facilitator reports written contemporaneously with the running of each group.

Exam scores were not normally distributed (as ascertained by Shapiro-Wilk tests) and so, in order to examine whether summative exam results differed in relation to questionnaire responses, Kruskal Wallis tests were performed on multiple groups. Mann-Whitney tests were performed to test differences between two independent groups of data. Exam score data are presented as median and associated interquartile range.

To explore associations between learning behaviours and student wellbeing from the questionnaire responses, we determined Spearman’s correlation coefficients from the Likert–type questions.

 Statistical significance was taken at p<0.05 throughout. Statistical analyses were conducted using SPSS software version 22.0 (IBM Corp., Armonk, N.Y., USA).

**Results**

*Focus group data*

Initial coding yielded 13 major and three overarching themes. Several of the major themes were further coded for whether they pertained specifically to LC, or not, generating minor sub-themes [Figure 2].

[Place figure 2 here]

Each participant was assigned an attribute based on their self-identification as a high, moderate, low or non-user of LC, enabling comparison of data from these groups of students during the framework analysis. Table 2 shows a summary of the results of this analysis and interpretation.

[Place table 2 here]

*Questionnaire data*

222 questionnaires were returned; 112 from year 1 and 110 from year 2; a response rate of 68% of eligible registered students. Of these, 88% (195 respondents) chose to give their student ID, which enabled us to link their summative exam result with their Likert responses.

Most respondents used LC for 1 – 3 hours per week with reported usage as follows:- 25.7% didn’t use it at all, 64.9% used for 1 – 3 hours per week, 6.8% used it for 4 – 6 hours per week and 2.7% students used LC for over 7 hours per week.

Of the respondents who used lecture capture, 79.2% stated that they used it to fill specific knowledge gaps and 16.5% listened to the whole lecture again.

*Comparing summative exam data to student questionnaire responses*

 Relationships identified between questionnaire responses and summative exam data were consistent in both cohorts, so these data have been combined.Students who self-identified as good learners had significantly higher summative exam results than those who identified themselves as average or poor learners, and those who acknowledged spending the least amount of time in private study achieved lower marks in summative assessments [Table 3].

[Place table 3 here]

Students achieving lower results were more likely to limit their learning to LC and acknowledge that other methods would be needed if recorded lectures did not exist [Table 3]. This limiting of learning extends further than relying on the LC, for some students: 25% of respondents acknowledged that they ignore a learning outcome if it is not covered in the recorded lecture.

Academic achievement also linked to student wellbeing in many areas [Table 4].

[Place table 4 here]

The majority of participants agreed that an excessive workload is a cause of stress [Figure 3], but perceptions of their current workload varied; lower-achieving students were much more likely than high achieving students to perceive their workload as excessive [Table 4], despite in fact undertaking fewer hours of study [Table 3].

[Place figure 3 here]

Reinforcing the apparent link between wellbeing and academic achievement, lower-achieving students were more likely to acknowledge experiencing anxiety or depression than higher-achieving students. This lower-achieving group were also more likely to perceive external pressure; from peers and staff [Table 4].

*Associations between LC, learning behaviours and student wellbeing*

Students in both first and second year perceived a reduction in stress with their increasing usage of LC and acknowledged that LC was likely to reduce their attendance in live lectures [Table 5a].

There were clear differences between the responses of first- and second-year students. Second year students who felt that LC reduced their workload were more likely to limit their learning to LC, and to state that they had suffered from anxiety and low mood (Tables 5a & 5b). Furthermore, second year students who had feelings of anxiety and low mood were also more likely to state that they had an excessive workload and used LC for an increasing number of hours [Table 5a & b].

 [Place table 5a and 5b here]

Most students did not consider that LC reduces their workload [Figure 3], but those who believed that LC did reduce workload were limiting their learning [Table 5b] and reducing attendance to classes [Table 5a]. There was also a clear positive correlation between those students who used LC for increasing hours per week and a feeling that it reduced their workload, particularly second year students [Table 5a]. First year students who perceived an excessive workload were also more likely to limit their learning to material covered in lectures. There were clear links with perceived workload and external pressure, with students in both cohorts likely to link their workload with the provision of plentiful resources, and second year students more likely to experience pressure from peers and staff [table 5b]

These data, linking Likert-type question responses to summative assessment results, highlight a potentially vulnerable group of students, most clearly identified within the second-year cohort, and, which alongside the focus group findings, suggest the role LC may play in facilitating negative behaviours in these students.

**Discussion**

In the present study it is clear that students consider LC an essential resource, although the ways they use the recordings differ widely.

In common with findings from other authors, most students in this study used LC to revisit difficult concepts, viewing specific sections of the lecture to fill gaps in knowledge, or to “attend” missed lectures1,3,32.

The focus groups agreed that most students use LC on their own, whether in their own study time or in place of attending classes. There is therefore no contact between the student and the lecturer or peers, during viewing, meaning there is no imperative for students to engage in interactive elements, and no “risk” to the student of potentially being asked to contribute to the discussion. The focus group discussions within the present study further highlighted that LC particularly lends itself to passive viewing.

 “It's nice, easy, it's like Netflix isn't it, you can do it from your bed” *Low user*

This seems to offer a low stress option, but creates potential for students to avoid cognitive engagement with the learning opportunity. It also precludes the student from questioning the lecturer, and prevents the lecturer from identifying and addressing confusion regarding the concepts being learned. Reduced student interaction has been noted as a negative aspect of LC by other authors2. These issues are particularly pertinent when LC is used in place of attendance, which is a more common behaviour among weaker students8.

There are many aspects of LC that can be viewed as very positive, particularly for learners who have a developed, insightful and proactive approach33,34. For these students, it appears that LC provides a valuable safety-net, and can be used actively and socially:

 “A group of my friends organise group revisions and we find that really beneficial because we'll get up the PowerPoint with the learning objectives and we'll go through it as a group ….. and go okay, we misunderstood that as a group and then we'll go and ... re-listen to a particular part of the lecture...” Moderate user

Students who are academically stronger tend to use LC as an adjunct to other learning resources and attendance35, and are even able to use it to improve their in-class learning by allowing them to fully engage and interact rather than worry about writing everything down.

“…I'll take a moment just to think about something that the lecturer said and I won't like stress out about missing the next thing she said” Low user

In contrast, some students in this study relied very heavily on LC as their main resource for learning. While a subgroup of these students still demonstrated good learning behaviours and insight, there appears to be a link between a heavy reliance on LC and several undesirable student outcomes in these areas:

* learning approach
* attendance/engagement in class
* workload and wellbeing
* academic achievement

In identifying these links, it is important to be clear that no causative relationship between LC and poor performance or wellbeing can be claimed based on the findings in the present study. That said, students in this struggling group do articulate an excessive reliance on LC and, whether cause or effect, this is unlikely to be wholly helpful. This echoes the findings of other authors, who demonstrated that use and impact of LC differs between students of differing academic ability33,34. It is particularly concerning that these negative relationships were most marked in second-year students in the present study. As this study did not track cohorts across years, it could simply be a difference between the two cohorts, but it behoves us to consider that, for these students, their learning approach and habits may be failing to develop during their studies and, potentially, even worsening over time.

* *Learning approach*

In the present study, the strong students exhibited a high degree of self-efficacy and self-belief; students who believed they were good learners were in fact more likely to achieve well.

A key negative theme that emerged from the data presented above, however, was dependence. Students across the LC usage spectrum demonstrated a concerning tendency to rely entirely on the delivered curriculum and the gospel word of the lecturer. This was most evident in the focus groups, when students were asked what they would do differently if they did not have LC:

“Without [LC], more people would be emailing lecturers” Moderate user

“If I didn’t have [LC] I wouldn’t have any notes or anything; I wouldn’t have anything to revise from” High user

“If they haven’t recorded it, I just record it myself, like I would record them anyway” High user

This apparent lack of self-regulation was often discussed alongside evidence of very passive learning approaches, particularly among the high usage group, to the extent that students even stated that they expect to be spoon fed:

 “I feel with the amount of stuff we need to cover ... we need to be spoon fed” High user

When used passively, LC may lull weaker students into a false sense of security by giving them a sense of familiarity with the material without challenging them to evaluate their learning. The potential contribution of LC to this “lecture-centric” dependent approach was also suggested by Leadbeater *et al.* in their 2013 study36.

In the present study, not only were some students highly dependent, they were limiting their learning; most students (57%) believed that all the information they need is in the LC, and 25% of students actually ignored a learning outcome if it was not covered in the LC. This suggests that these students are not auditing their learning; limiting it to that which is directly presented to them, rather than ensuring they can meet the requirements of the curriculum.

There was evidence in every usage group of active and mature learning approaches, but it was clear that the prevalence of these increased as claimed LC usage decreased.

It was not simply that these students were using fewer LC recordings, but that students in the lower usage groups were more likely to describe deep, active learning approaches and reflective practice; all factors which contribute to good academic achievement37,38.

“I learn better by answering questions and seeing where I have gone wrong so sitting and watching a whole lecture again wouldn't help” Moderate user

“[LC is] exactly the same as the normal lecture so if you didn't understand it there you're obviously going to need help somewhere else aren't you” Low user

In the highest usage group, conversely, students were quick to claim that learning would be impossible without LC; a feeling which reflects the findings of others, that students think LC increases their performance1,39:

“I'd fail my degree if I didn't have [LC]” High user

Previous studies are undecided as to the impact of LC on learning approach. Some authors have suggested that LC generally benefits learning by enabling students to make better notes and more deeply digest the subject matter, due to the option to pause the recording4,40,41. Others have highlighted that replacing attendance with LC is associated with surface learning strategies8. In the cohort studied here, in common with other cohorts on densely timetabled courses, it could be argued that the negative aspects may be more prominent due to the limited time available outside timetabled sessions, meaning that high usage of LC requires lower attendance.

* *Attendance/engagement*

All focus groups agreed that LC has impacted upon attendance in general, although there is no quantitative data to confirm this. The high user group acknowledged reduced attendance in recorded sessions, and also demonstrated evidence of selectively attending classes and filtering out certain subjects.

The stated reason for choosing to miss these classes was the perception that they are less important, but there is a suggestion that a lack of self-efficacy may be an equally material factor. Some students were clearly reluctant to learn core material that had not been recorded, even when the original learning opportunity was an interactive and discursive session rather than a lecture format.

[Regarding an interactive discussion session] “they might want to repeat it in exams and stuff, but surely if we haven't got it [recorded] to start with, how are we ever going to answer it in an exam if we needed to?” Moderate user

There is good evidence that attendance is linked to academic achievement35,42, and it also appears that LC viewing fails to compensate for the negative impact of low attendance on attainment43. As noted above, students with surface learning approaches tend to replace, rather than augment, attendance with LC8; a picture that is supported by the present study.

Low LC users were more likely to perceive the value of attending the learning activity;

“..actually going to the lecture structures my day, it structures my week and then forces me to concentrate and be motivated in the lecture” Low user

While moderate and high users were more likely to view the learning activity simply as an information gathering exercise while the learning takes place later.

“you don't actually absorb the information because you’re just getting it down so that you've got the notes” Moderate user

These students demonstrated a desire for all sessions to be recorded, whether lecture, practical, tutorial or interactive discussion. This reinforces the theme that some students are adopting a passive approach to learning with little self-regulation.

The authors expected that provision of LC may enable students to engage more actively in class, by reducing the pressure to take notes, and that for some students a recorded lecture may prove more engaging than the classroom or written resources. Certainly, these aspects were discussed in the focus groups, particularly in the low user group, but this fails to reflect the full picture. There was a highly split opinion on the effect LC has on student engagement in class, drawn from unprompted discussions around the impact LC has on disengaged students. On one side, students felt that provision of LC meant that students who don’t learn well in the classroom environment would stay at home, thereby reducing disruption and allowing engaged students to learn better:

“..if people who don't want to be there can do learning in different ways that's going to benefit people that do want to be there” Low user

This is an interesting counterpoint to the findings of Hall and Ivaldi, who found students in their study actually resented non-attending students, considering it unfair that these students attained the same grades and degrees as those who physically engaged with the learning activities7.

On the other hand, in the present study, there was a contrasting opinion that providing LC takes the pressure off so people stop concentrating and disrupt the class by chatting with classmates or browsing online:

*“*But I've found, like everybody else, if its lecture captured I won't pay attention” High user

“[The lecture] was really, really complicated and she was there watching this cake video and I was just watching it with her because I couldn't take my eyes off it.” Moderate user

Distractions during learning activities, such as those described by the students in this study, have been shown to negatively affect learning gains, even in high interest lectures44,45 and more work is needed to specifically investigate the impact of LC on the frequency of distraction. The balance of opinion in the focus groups tended towards considering that LC increased the likelihood of distraction, although some students felt distraction was simply to be expected, and that the draw of social media and other online activities may be a generational feature which they were already working hard to manage:

 “...oh I think we as a generation, that it’s so important with social media that people don't lose these personal skills and lose respect for people” Moderate user

 “I used to take my laptop to the lecture at one point and I've given up with laptops because I can easily divert straight onto Internet Explorer, Facebook, Twitter.” High user

* *Workload and wellbeing*

This study presented a complex interplay between perceptions of workload, student wellbeing, and use of LC. Higher-achieving students were less likely to consider their workload excessive, despite in fact undertaking more hours of self-study, reinforcing that perceived workload is only weakly related to time spent studying29. The students who did consider their workload to be excessive were more likely to limit their learning, experience negative mental health and achieve poorer academic results. This is in common with findings from some other authors, who demonstrated that excessive perceived workload can be associated with poor learning approach, short cuts and surface learning29,30, and can contribute to stress which can in turn lead to anxiety and other mental health issues46,47. The effect of excessive workload differed between the two cohorts under scrutiny in the present study; first-years were more likely to limit their learning, while second-years were more likely to experience anxiety or depression. Naivety may play a part in the first of these findings – the first-year students had only completed one semester of study and no summative assessments – and perhaps chronicity of the high perceived workload, and the requirement to build on the previous year’s knowledge, may go some way to explain the negative effects on the year 2 students’ wellbeing, as suggested by Siqueira Drake *et al.* in their 2012 study48.

The role played by LC in students’ perception of workload is contradictory and highlights the heterogeneous nature of the student population. The vast majority of students in this study agreed that LC does not reduce workload, which agreed with the focus group data that students of all usage levels agreed that LC is time-consuming to use. Those in lower usage groups considered that use of LC as a major resource would have a negative effect on their wellbeing as a result. A significant minority of students in this study did, however, consider that LC reduces their workload. These students were also more likely to limit their learning and heavily rely on LC over attendance and other learning methods. It is perhaps unsurprising that these students consider their workload lower when they choose not to attend and limit their learning, but this is a false impression since, as stated above, LC is a poor replacement for attendance8,43. The perception that LC reduces workload also correlated with feelings of depression and anxiety among the second-year students in this study. Poor mental health is known to have a negative impact on learning approach19, which may shed some light on this potentially contradictory relationship; students experiencing negative mental health may be more likely to make learning choices which seem easy but which in fact perpetuate, rather than improve, their struggles.

The way in which students utilise LC is likely to have an impact on workload. A group of students in this study mainly re-watch the entire lecture when using LC. Given that the focus groups largely agreed that LC is inefficient as a major resource, it seems likely that this approach may negatively affect these students’ perceived workload.

 *“*it could potentially be very useful to me but because of its length, I can't” Low user

“..it's just like postponing the stress because then that evening not only do you have to go through all the lectures … you actually have to listen to something.” Moderate user

In planning this study, the authors were concerned that provision of plentiful resources may in itself present a source of pressure for some students, and indeed this theory was borne out among those students who perceived an excessive workload. This serves to further highlight the heterogeneity of the student cohort, since it is known that, generally, students prefer a variety of resources49 for learning, and in the present study the low users in the focus groups felt that provision of comprehensive resources actually improves wellbeing. The role LC plays in this perceived pressure is not clear; the students who viewed rich resources as a source of pressure did not seem to consider LC as contributing to this, and in fact the first-year students in this group were likely to view LC as reducing their workload. The perception of external pressure among second year students with excessive workload extended beyond resource pressure, with these students also experiencing a sense of pressure from staff and from their peers. This is in common with several other negative outcomes for year 2 students identified in this study, which highlights a need for longitudinal research to establish whether there is indeed a worsening in wellbeing and learning approach for a subgroup of students.

Students in the focus groups were consistent in their view that access to LC reduces their anxiety and stress, in its capacity as a “safety net”. There was a variation in views regarding the impact of routine LC use on mental health. High users clearly viewed LC as beneficial despite acknowledging that it is time consuming and may contribute to isolation. Moderate and low users felt that good attendance was the better way to manage stress. This provides an interesting counterpoint to those students who felt that LC reduces workload. It is pertinent to note here that the heaviest second-year LC users in this study were more likely to suffer from anxiety and depression and yet consider that LC reduced their workload. A causative relationship cannot be asserted, but it is an observation which is worthy of further research.

Given LC is a time-consuming resource to use, a heavy reliance on this resource cannot be beneficial to struggling students. Students experiencing anxiety and low mood were more likely to be perceiving external pressure, heavy workload, exhibiting naïve, passive learning approaches and achieving poorer academic results. This presents somewhat of a chicken and egg situation – anxiety and low mood reduce concentration and lead to procrastination19. These students’ desire to reach for a non-challenging resource is therefore not surprising, but their engagement with the LC may suffer as they may be more prone to distraction, and their feeling of excessive workload is likely to be worsened.

* *Academic achievement*

The factors described above were all linked to lower-achieving students. Higher-achieving students tended to exhibit good learning approaches, attend and engage well, consider their workload reasonable, and have better mental health. The way in which students use LC had no demonstrable relationship with their academic achievement, so perhaps it is the extent to which they rely on this resource, rather than how they use it, which is more important. This is in contrast to findings from other authors, who demonstrated that higher-achieving students tended to mainly use targeted sections of recordings whereas poorer students would tend to re-watch the whole thing33.

Considering the above as a whole, the group of struggling students appear to be in a vicious circle with each factor impacting upon the others. There is a concerning suggestion that this phenomenon may be worsening over time, with year 2 students exhibiting poorer learning approaches and more indications of negative wellbeing. The role LC plays in this appears to be largely positive in the eyes of the students, but is more likely to be negative when the evidence is weighed. A time-consuming resource, easy to use passively, creating a feeling of ease and facilitating procrastination, permissive of disengagement or non-attendance, is unhelpful to students with poor learning approaches and low self-efficacy or those struggling to manage their mental wellbeing.

**Limitations of this study**

*Participants*

This study focused on students at a single site, and in the early years of the veterinary curriculum. This confers some strengths to the study in terms of consistency and response rate, but also limits the available sample size.

As with any self-selecting study, the representativeness of the sample cannot be guaranteed; students may have brought their own agenda to influence their answers. It is also important to note that the first year cohort had only studied at university for a single semester and so their responses may have been more influenced by their previous academic experience.

*Data and results*

It must be acknowledged that the statistically significant correlations discussed above are small. This is to be expected in such multifactorial issues as learning, academic achievement and wellbeing, hence the authors consider them meaningful in this context.

As with most research of this type, much of the data is derived from the assertions of the participants. This is particularly pertinent in terms of students’ claimed usage of LC; participants in the focus groups were asked to classify themselves as high, moderate or low users, without guidance as to what was meant by these categories – it is possible that two students using LC in exactly the same way could have self-classified differently. Future research would give descriptors for these categories, to enable students to select a category that better reflects their usage.

The lecture capture software which was used for this study did not enable analysis of LC use, hence the researchers could only rely on the claims of the participants. Future research will utilise software which has enhanced learning analytics capability.

**Conclusions**

This study examined the impact of LC use on 1st and 2nd year undergraduate vet students at one UK veterinary school. This allowed examination of a population of relatively naïve students with nascent learning approaches. Findings agreed with other authors, in that students viewed LC as an essential resource, whether or not they actually use it. They view it as supportive for their learning and their wellbeing, and value it as a key resource.

Used well, LC offers students a supplementary resource to cater for additional learning needs, illness and to offer another chance to hear that crucial explanation. Used poorly, LC is time-consuming, passive and too easy to use in place of more challenging learning activities.

This study highlighted a group of students who appear to be in a vicious circle, where their academic development, achievement and wellbeing intertwine in a negative relationship. These students tend to view LC as a lifeline; an absolutely crucial resource without which they could not progress. This study suggests that these students’ reliance on this resource is certainly unlikely to be helpful, and may be damaging, and it behoves educators to consider this group particularly, when devising teaching plans.

Consideration must be given to actively helping students develop the skills needed to make good choices. Suggested actions arising from this study were:

* Ensure attendance is valuable – ensure that attendance offers something that the LC does not.
	+ Increase use of interactive and student-centred activities, to replace didactic lectures
* Include learning skill development as a core part of the curriculum.
	+ A developmental and personalised approach to self-efficacy should be fostered, providing students with the opportunity and support to take ownership of their learning

To shed further light on the relationships suggested by this study, further research should employ usage analytics from the streaming software to quantify the link between LC usage and the factors discussed here. In addition, research into the impact of LC on in-class distraction would be valuable, and investigation of the relationships between mindset, perceived workload and engagement with resources would clarify the broader picture underpinning the poorer outcomes experienced by the struggling minority. It would be interesting, furthermore, to compare contrasting student cohorts to see if the findings of this study are consistent among students with different motivations and abilities, and to track cohorts across years to identify changes in learning behaviours and wellbeing as students progress through the course.

**Figure captions**

FIGURE 1: Conceptual framework

FIGURE 2: Thematic development

FIGURE 3: Response frequency; workload and LC

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