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Lecture capture technology – technically possible, but can it be used effectively?

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It is now fairly straightforward to capture live lecture content for later distribution. This may be audio [1], perhaps linked to PowerPoint slides [2], or video recordings [3]-[10]. Preston et al. [8] notice in the literature a pattern of universities introducing these technologies to "adapt to the changing needs of their students". That students are positive about this technology (for a typical example, see [6]) is worth noting but, as Preston et al. observe academic staff struggling with the technology, it is important to ask what one aims to achieve and whether this technology can be effective against those aims.

For example, Cramer et al. [4] found that 73% of their students agreed that their use of a lecture capture system "would enhance their learning", 54% agreed it "would improve their grades" and 93% agreed it "should be offered in other courses" (pp. 111-112). However, they found "no significant relation between expected grade and both the number of accesses and duration" (p. 112). Perhaps, then, student positivity is not sufficient to recommend wider use of the technology.

It is also important to consider a possible negative effect on student learning. If the technology improves learning it may be judged a success (probably this is an aim), or if it makes no difference it may be a waste of time (although it may improve student enjoyment, and therefore feedback, retention, etc.). If instead the technology causes some unseen disadvantage to some students then that makes it potentially damaging.

What do lecturers intend?

Loch [11] remarks that "new technology is often used the same way old technology was used, and not to its full potential, because of lack of knowledge and comfort of familiarity on the user's part" (p. 236), suggesting a default mimicking of the replaced method without considering whether this approach is most effective. It is important to define why a new technology is being considered and how such technology is used, so a judgement can be made about whether that technology can be effective against the aims of its introduction.

Such aims may be general, perhaps to help students "achieve better results" or to make it "easier for students to learn" [9], or may be specific to a single aspect of student behaviour, such as solving tutorial problems [3], "improving student note taking and note use" [5] or to establish a "baseline of knowledge" ahead of lectures [2].

How do students use these resources?

Technology is often not used in a way that was predicted by its initiator. For example, Grabe and Christopherson [5] were surprised at the low rate of use of recordings to

review lecture content in their research. They speculate that reviewing written notes is far quicker, so more efficient, than listening to the lecture (p. 7). Brindley et al. [3] made content available for mobile devices but found that 83% of students "accessed the videos via their home PC, with only a small number using a mobile device" (p. 5). When planning to use a new technology it is useful to consult such studies of what students typically do with resources.

White [1] and Yoon and Sneddon [10] found students using recordings to supplement lectures they had attended. White found that students "do not expect to understand the lecture completely when they first hear it" so review "difficult material several times" (p. 25). Yoon and Sneddon report this as the "most common reason for viewing recorded lectures", with "a secondary emphasis" on revision for tests and exams (p. 439). These findings are in line with those reasons found by Gosper et al. [6] in a survey of students across four universities in Australia.

Are these methods effective?

Let us say, for the sake of argument, that assessment performance is a good measure of 'success' in learning. Yoon and Sneddon [10] found that "the specific intentional use of recorded lectures as a back up resource to go over something that the student did not understand during the live lecture" was "weakly significantly associated with higher grades" (pp. 441-2).

von Konsky, Irvins and Gribble [9] say that students "may feel that listening to complex material multiple times will allow it to 'sink in'". Yoon and Sneddon found that "watching recorded lectures more than once", a practice observed also by White [1] and Gosper, et al [6], was not associated with grade (p. 442).

McFarlin [2] found that introducing an online component to a lecture course "was associated with a significant improvement in student grade performance" (p. 90). However, not all studies find similar results, for example von Konsky, Irvins and Gribble [9] found their system, while "a useful learning strategy for some", was "not required to achieve a successful academic outcome", "did not guarantee that learning would always take place" and "could not be used to predict the level of scholastic achievement." Stanca [12] highlights the problem that the students using the recordings may be those more inclined to do well in any case, meaning any difference in assessment performance may be inherent in providing some new learning opportunity. In that case, we must ask whether the students who are using the new opportunity would learn equally well from an alternative, and whether the students who are not engaging with the new opportunity are being disadvantaged more than they would by an alternative offering.

Many studies report usage; perhaps the nature of the technology makes this an easy to access metric. Of course, this approach can have measurement problems (some are discussed in [1]). In addition, Yoon and Sneddon [10] report "merely watching recorded lectures was not significantly associated with grades" (p. 441). von Konsky, Irvins and Gribble [9] note that, just as "physical presence during a lecture does not mean that a student is paying attention, synthesising new information in the context of prior understanding, or developing insights that will foster learning", so "playing a lecture recording does not necessarily mean that learning will take place". They warn that "sitting in a room while a recording is playing, perhaps while simultaneously engaged in other activities, may lead some students to the incorrect view that learning must be taking place".

Is there an effect on attendance?

Preston et al. [8], quoted an academic interviewee:

> ***"I think it can help [students] to justify not coming to lectures. They think, 'it's OK not to go, I'll listen to the iLecture later.' I fear later never comes or comes too late and they cram for assessment."***

Stanca [12] suggests links between attendance and measurable performance may be found to be correlated (see, for example, [13]) simply because the students more likely to do well are also more likely to engage more fully (p. 252). Still, does the availability of recordings have an effect on attendance?

Several papers ([1], [4], [5], [7], [9]) find no link between availability of recordings and absenteeism. Yoon and Sneddon [10] found most respondents "attended the majority of those live lectures for which recorded lectures were available... and caught up with some of the lectures they had missed by watching the recorded lecture" (p. 438).

Preston et al. say lecture capture systems may have acted to focus attention of the existing trend of decreasing student attendance. They found that 55% of 155 academics "felt the [lecture capture technologies] had resulted in decreased lecture attendance". They listed lecturers' concerns about the impact on students, "including their ability to keep up with crowded curricula, engagement with the content and the continuity of lectures and tutorials". They note that "this concern was not shared by the students in the study", finding 68.3% of 331 students "agreed or strongly agreed with the statement 'I could learn just as well using [lecture recordings] as face to face'." Just 5 out of 155 academics agreed with this statement. Regardless of who is correct, this is clearly a discord between staff and student expectations about lectures and learning.

On assessment-driven working, White [1] and Brindley et al. [3] both reported large increases in downloads corresponding to exams, leading to concern about cramming.

Some respondents on one of the courses studied by Yoon and Sneddon "still missed 10% of lectures completely, by neither attending the live lecture nor viewing its recording" (p. 438). Considering the reason for this, they note that 40% of respondents from that course "intentionally missed some

live lectures due to the availability of recorded lectures" and 52% "said they had intended to watch more recorded lectures but did not get around to it" (p. 438). They suggest "the availability of recorded lectures may in fact contribute to students watching fewer lectures" (p. 438).

How might lectures be changed by this technology?

One problem with recordings was identified as far back as 1968 by McConnell [14]. Students "clearly preferred" being in a live lecture, whether this was small or large group, or taught by an experienced or inexperienced teacher, to watching a recording of an experienced teacher giving the session (p. 479). The reason given was that the recording lacked "direct question-and-answer and classroom discussion" (p. 479).

The studies reported above may differ in level of interaction. For example, while White [1] found "no significant association between attendance and download frequency", he used a personal response system in classes and assigned "points" for answering questions with this system in lectures (p. 27). This may have provided a greater level of interaction and strong incentive to attend. Yoon and Sneddon [10] note that the lectures in their study, for which decreased student attendance was observed, were "largely non-interactive". They suggest that the recording "mimicked the lack of interaction in the lectures" which meant a faithful recording of the lecture was an appropriate replacement. Further, they hypothesize that a high level of interaction and participation would mean the recording could only supplement, and not replace, the live lecture (p. 443). The question of attendance then becomes: what are students getting out of lectures? Some answers are given in [6], [7] and [15].

Preston et al. [8], report "a range of lecturers' responses to changing attendance patterns... including restructuring units to replace lectures with more interactive tutorials or workshops, replacing some face to face lectures with additional tutorials and providing the lecture materials as pre-recordings. In contrast, one interviewee had introduced roll taking to encourage students to attend lectures." They note that the introduction of this technology could act as "the catalyst for change" of "the whole teaching and learning context", but report that of the academics in their study: "43.2% of staff respondents had not changed their lecturing style; 36.7% had not changed what they do in their lectures; 74.9% had not changed the structure of their unit."

Discussion

Lecture capture technology clearly has some potential for having a positive effect on student learning. As seems usual for technology intervention, however, it seems that the positive benefit is observed when the technology introduction is associated with some change in the course delivery or design. The studies reported here are usually small scale, and this sort of curriculum intervention is naturally going to be hugely affected by contextual effects such as institution, discipline, method of instruction and instructor.

Availability of recordings may lead to cramming for assessments, but it seems reasonable to suggest that wholesale re-watching of lectures is not the most effective form of exam revision. Worse, it is possible some students are skipping lectures and watching them for the first time just before the exam, or not at all. Yoon and Sneddon identified a positive behaviour as: attending live lectures and using the recording shortly after the lecture to re-examine any parts they had not understood. After all, White reported that students do not expect to understand everything the first time they hear it.

If we would like to allow students to re-watch lectures as a reinforcement tool shortly after attending the live lecture or to catch up on lectures missed, but not for re-watching over and over or for revision, there may be some merit in making recordings available for only a short period[1]. Brindley et al. released recordings of particular parts of the material and this approach may be a more appropriate alternative.

Instead, it might be fruitful to provide students with a summary of the findings given in the literature to allow them to make an informed decision about the best way to make use of this new technology. Yoon and Sneddon give an example of such advice (p. 444).

This technology seems to cast a light on the existing problem of non-attendance. A punitive approach to non-attendance – taking a register, or withholding recordings from students without a good reason for non-attendance – seems ill-advised. Instead, we might examine what lectures can deliver and how course delivery might be adapted to improve learning in light of the opportunity offered by using this new technology.

[1]This was suggested to me by David Hodge when I gave a talk on this topic at the Media Enhanced Teaching and Learning workshop on 27th May 2011 at the University of Nottingham.

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Methods to produce flexible and accessible learning resources in mathematics

Project leaders: Emma Cliffe and Jane White, University of Bath

A curriculum barrier for students with disabilities is the delivery of mathematical learning resources such as lecture notes, problem and solution sheets in inaccessible formats. The current practise of repeatedly re-typesetting notes to produce particular formats is expensive in the long run. We will develop methods, instructions and examples by which a single master copy may be used to automatically produce a variety of formats. Thus all resources are updated from a master enabling departments to make proactive adjustments. The methods will be appropriate for use by individual lecturers/departments with access to a small range of mathematical/assistive technologies.

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