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Screencasts: how effective are they and how do students engage with them?

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Abstract

The use of screencasts as an instructional technology is increasing rapidly in higher education. While there appears to be a consensus around students' satisfaction with the provision of technology enhanced tools, there is limited evidence revolving around their impact in terms of knowledge acquisition. Moreover, the reasons why students choose to engage (or not) with these resources remain largely unreported. The study assessed the effect of using screencasts on undergraduate students' understanding and engagement with learning material in one of their modules. Customised screencasts were used as optional additional learning and teaching resources. Grades obtained in a test module (with screencasts) and a control module (without screencasts) were compared to gauge the impact of screencasts on knowledge acquisition. Furthermore, the reasons for students' engagement (or lack thereof) with the screencasts were explored using questionnaires. A modest but significant impact of screencasts on knowledge acquisition was found and students' perception of the screencasts was overwhelmingly positive. Students suggested that screencasts should be kept short to summarise lectures or delve in-depth into complex concepts but should not replace whole lectures. Reasons for not using screencasts revolved around a lack of understanding of what the resources were but also a reported lack of fit between the nature of the tool and self-assessed learning style.

Key words
Instructional technology, screencasts, student learning experience, higher education, learning approach

Screencasting technology in the learning and teaching context

In today's society, described as an 'information society', students are exposed to different types of instructional technologies before they even enter the university. As a result, when they come to university it is argued that "they expect to be able to access information on demand and they arrive on [university] campuses ready to engage information in new ways" (Ford et al., 2012, p.191). This makes it necessary for academic staff in universities to explore the use of different instructional

technologies in order to meet the needs of the new demographics. Bingimlas (2009) explains that "the use of [new technologies] in the classroom is very important for providing opportunities for students to learn to operate in an information age" (p.235). It can be argued that education should be responsive to societal needs for it to be relevant. In the same vein, Mullamphy et al. (2010) argue that as the type of students entering university changes, educators are obliged to adapt their teaching styles to suit the new demographic. This view is consistent with what Prensky (2001) highlighted more than a decade ago when he argued that teachers have to learn to communicate in the language and style of their students. The use of screencasting technology, among others, is on the increase in higher education institutions (Lloyd and Robertson, 2012). This technology enables the lecturers to provide students with online resources that they can access in their own time, anywhere and as many times as they want. Ford et al. (2012) clarify that, "unlike other resources that can be provided in an on-demand fashion (such as textbook website resources or lecture outlines), these materials [screencasts] are both dynamic and perfectly tailored to a particular course" (p.192).

The term screencasting was first championed by Udell in 2005 who was an early advocate of the software's instructional value (Jesus and Moreira, 2009). It involves placing recorded material (the simultaneous recording of a screen and audio file) on a website that students can access (such as a Virtual Learning Environment like Blackboard). It allows lecturers to record what is on the screen (Power Point presentation, film, drawing, specific software) and captures simultaneously the lecturer's voice commenting and explaining the image. Moreover, captions can be added to support the audio file. According to Sugar et al. (2010) such a combination of sound and images within a screencast can be said to enhance online learners' experiences when compared to the more traditional text format, going on to say that, arguably, this medium is a powerful one when it comes to communicating content in an online setting. This view resonates with Mayer's (2001) theory of multimedia learning which suggests that animated presentations that have a corresponding audio component, especially moving picture and sound, provide a more effective learning experience than a more traditional alternative.

There has been an increase in the uptake of screencasting technology in supporting students' learning experience in higher education. However, very little is known so far regarding its effectiveness as a pedagogical tool (Ford et al., 2012). The need for studies to evaluate the effectiveness of this technology with particular reference to its impact on student learning experience cannot be overemphasised.

Studies that have been conducted to date reveal that there are definite benefits in using screencasting technology for instructional purposes. There is some research evidence to show that both lecturers and students see value in the use of the technology in the classroom (Ford et al., 2012). For some students, the technology allows them to learn in a more self-directed fashion, one that suits their style and speed of learning (Educause, 2006). It is noted that rather than simply relying on texts or notes, students can replay class sessions or demos, seeing how an application is manipulated while hearing the lecturer talk. In a study conducted by Mullamphy et al., 2010) in which 55 students (representing 33% of the cohort) were asked to rate the usefulness of screencasts as a learning tool, only less than 1% answered 'not useful at all'. Use of screencasts is associated with numerous positive learning outcomes affecting a wide range of learners across a number of educational settings. These include: enhanced learning, increased satisfaction, motivation and engagement, and positive impact on course-related attitudes and anxiety reduction (Evans, 2008; Hew, 2009; McKinney, Dyck and Luber, 2009). Furthermore, students also appreciate a number of advantages of using screencasting technology such as flexibility in learning including access of learning materials from any internet connection and the fact that the material can be paused, fast-forwarded and played as many times as required (Mullamphy et al., 2010).

Although screencasts provide a convenient method for accessing materials covered in missed lectures, no drop in attendance was observed in other studies (Walls et al., 2010). Where screencasts have been used to supplement traditional lecture-based courses, McGarr (2009) concluded that students viewed screencasts as useful additional resources to support their learning rather than as a substitute for lectures. Screencasts have been shown to be particularly important when tutors are working with large cohorts. Pinder-Grover et al. (2011) argue that in large lecture courses it can be challenging for lecturers to address student misconceptions, supplement background knowledge and identify ways to motivate the various interests of all students during the allotted class time. A study by Heilesen (2010) showed that there was a small but significant improvement in grades when students

make use of podcasts. In the same vein, Smith and Fidge (2008) say high achieving students are more likely to make use of all the resources available to them which in turn results in higher grades. It is not clear whether the same results would be observed with the use of screencasts. No particular studies reported on whether gender is an important variable when it comes to student engagement with screencasts, however, differences in how male and female students engaged with podcasts have been reported (Bolliger et al., 2010) with female students self-reporting higher levels of attention (how the podcasts were able to grab and retain their attention) and relevance (to course curriculum) and students' interests.

There seems to be many benefits associated with the use of screencasting technology in the classroom but it is also clearly shown in literature that a lot more work needs to be done to evaluate the effectiveness of the technology in promoting students' learning experience. For instance, the benefits highlighted earlier in this article rely mainly on descriptive summaries of the perceptions of those exposed and engaged with the screencasting technology. It appears that more focus has been placed on the views of students who engaged with the screencasts and not enough effort has been made to analyse why other students would not engage with the screencasting technology especially when screencasts are used to supplement traditional lecture-based courses. It has not yet been sufficiently brought to light whether there would be any significant differences in the learning experiences of students who are exposed to screencasting technology and those who are not in order to unpack the pedagogical value of the tool. In addition to this, most of the studies conducted to date have been focusing on the use of screencasting technology as a replacement of lectures, for example, in distance learning courses (Ford et al., 2012). There is therefore, need for more studies of an experimental nature to ascertain the impact of screencasting technology on students' learning experience.

There are also very few studies that have focused on investigating the use of screencasting technology as a supplement to a traditional lecture-based course. In light of this, the study described below was, therefore, designed with the primary goal of investigating the effectiveness of screencasting technology as a supplement to a standard lecture-based course using a quasi-experimental design. We sought to understand how students would engage with the additional online resources, and by so doing this would enable the benefits of screencasts to the students' learning experience to be revealed. The study was designed to establish whether students who engaged with screencasts would demonstrate more learning gains compared to those who did not engage with the screencasts. In addition to exploring the impact of screencasting technology on students' academic performance, we also sought to establish the perceptions of students about the use of additional online resources. We wanted to draw some lessons that could be used in future by anyone using the technology to supplement traditional lecture-based courses.

The research questions that guided the conduct of this study are the following. Do students make use of the screencasts provided by the tutor? If they do use them, does this affect the marks they get in the module? What are the perceptions of students who engage with screencasts and how do they differ from those who do not engage with the screencasts? No literature investigating the reasons behind students' lack of engagement with screencasts could be found. However, some have looked at the reasons why some students are unwilling to engage with podcasts of full lectures and found that the main reason was reluctance to work from a computer (Fietze, 2010). It was, therefore, important for us to find out why students would not engage with the screencasts.

Methodology

Participants

This study was conducted during the 2011/2012 academic year in a department at a UK university. A cohort of 108 first-year, full time, undergraduate students (87 females and 21 males) registered on two first semester modules (test and control modules) participated in the study.

Design and Procedure

Two core modules were used in the study: the test module (module with screencasts) and the control module (module without screencasts). All 108 students were registered on both modules and contact time for the two modules was structured in the same way with each module having one hour of lectures every week, one hour of seminar (in groups of 15 to 22 students) and two hours of practicals

per fortnight. Both modules were assessed by a mixture of coursework (consisting of short answer questions focusing on the practical elements of the modules) and an examination (consisting of multiple choice questions focusing on the full content of the modules). The lecture slides and practical handbooks were available on the virtual learning environment (Blackboard) prior to the sessions.

The screencasts

In response to the students' queries around the material covered during the lectures, two screencasts were developed from seven existing lectures for the test module. They were not meant to be a substitute for the lectures but to be used as additional online resources to help students consolidate their understanding by going over the most difficult parts of the lectures in greater detail in line with the perceived students' needs. Slides from the Power Point presentations were synchronised with the audio recording of the lecturer. The screencasts had subtitles added where specific, important notions needed to be highlighted. The content covered in the screencasts could be found from textbooks but it was anticipated that screencasts tailored to the course, using some of the lecture slides and identical terminology would bridge the gap between the lectures and generic textbooks. The first screencast prepared was 15 minutes long while the second screencast was 25 minutes long. This was consistent with evidence in literature which indicated that 20-25 minutes was the optimum length for screencasts (Mullamphy et al., 2010). Furthermore, the screencasts approached the material from a different perspective compared to the lectures: instead of studying each food ingredient in isolation (typically one per lecture), the screencasts deconstructed food systems and looked at the contribution of each component. The screencasts were placed on Blackboard two weeks prior to the examination and the students were informed of this verbally during lectures and practical sessions by placing an announcement on the module Blackboard site and by email. Students were able to access the screencasts by logging onto the Blackboard and downloading the screencasts. Although all the students on the experimental module were encouraged to use the screencasts it was made clear that use of these resources was not compulsory. Statistics tracking was enabled to help us to obtain information on students' access (user by user date, time and frequency of access).

Measures and analysis

A phase test was administered on each one of the two modules and results were compared. The correlation (or absence of) between marks obtained in the control module (module without screencasts) and the test module (module with screencasts) was tested using Pearson's correlation coefficient (Excel, Microsoft). The cohort of 108 students was split into two groups: students who had watched the screencasts and students who had not watched the screencasts. The marks obtained in the control and test modules were compared for both groups of students using a paired t-test using Excel (Microsoft). Significance of gender distribution differences between the group of students who had used the screencasts and the group of student who had not watched the screencasts were tested using a Chi square test (SPSS v20, IBM). P-values lower than 0.05 were considered significant.

Student voice

After the examination period, an e-survey was prepared using esurveysPro.com and the link was sent to all students by email. The overt aim of the survey was to find out whether students had used screencasts in preparation for the examination and to assess their perceptions regarding the use or non-use of the screencasts. Students who had used the screencasts were asked to indicate whether they had found the screencasts unhelpful, informative, helpful or very helpful. Students who had not used the screencasts were asked to indicate the reason(s) why they had not make use of them from the following options: 'you did not have time; you were told they were not useful; you did not know how to download them; you did not know they existed; you did not think they would help your understanding; you were confident that you did not need the extra support; other (please specify)'.

To gain further understanding of the students' perceptions of screencasts, a follow up email with open-ended questions was sent to the students one year later asking them to elaborate on why they chose to use or not to use the screencasts. Different questions were addressed to the two groups of students. The email sent to those students who had downloaded and made use of screencasts probed into how they had used them (access location, number of downloads and why they had returned to the screencasts many times including ideas for improving screencasts in future). Students who had not downloaded the screencasts were asked to articulate why they had not engaged with screencasts and what they thought needed to be done to improve their use of screencasts. The qualitative data that were generated were analysed thematically.

Results

A total of 60 students, representing 56% of the participants in the study used the available screencasts on the module Blackboard site, downloading them 159 times for the first screencast and 158 times for the second screencast. The average number of downloads per student was 2.7 for the first screencast (ranging from 1 to 13 downloads) and 2.6 (ranging from 1 to 10 downloads) for the second screencast.

For the students who watched the screencasts, no relationship was observed between the number of times the screencasts were downloaded and the mark achieved in the subsequent phase test.

There was no significant difference (p=0.514) in gender distribution between students who watched the screencasts (47 females, 13 males) and the students who did not (40 females, 8 males).

A strong correlation (p<0.001) between the marks obtained in the test module and the control module was observed (Figure 1).

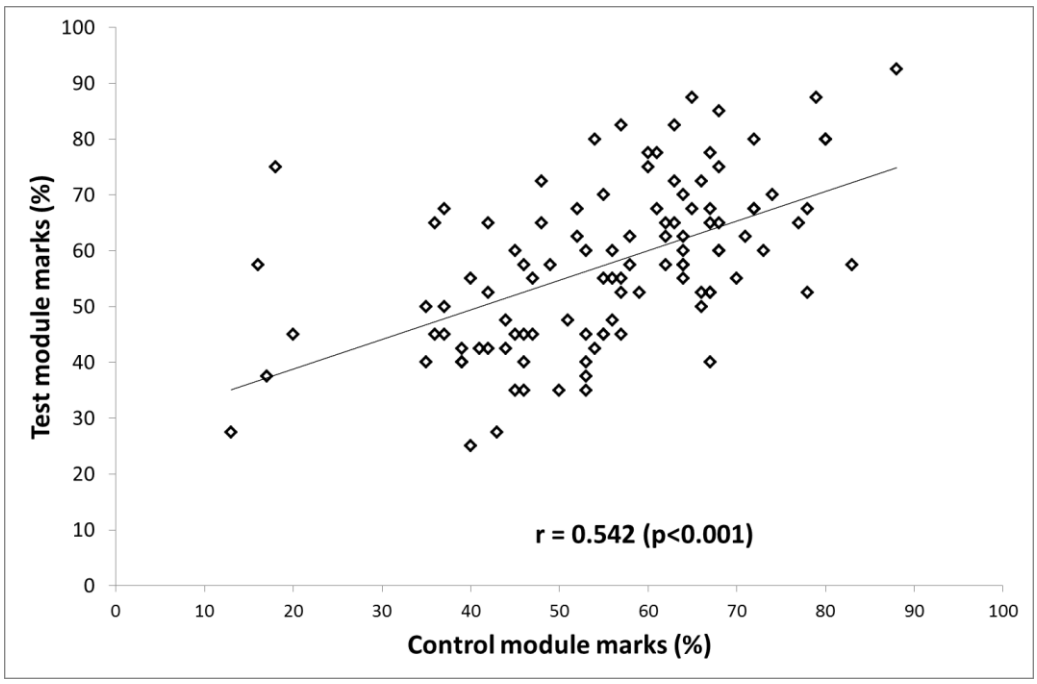

Figure 1: Correlation between phase test marks of the test and control modules for a cohort of 108 students.

The marks of the 48 students who did not watch the screencasts were not significantly different (p=0.78) in the test module (average mark: 52.6%) and in the control module (average mark: 52.0%) (Figure 2).

The marks of the 60 students who watched the screencasts were higher than the marks of the students who did not watch the screencasts in both modules, by an average of 6% for the control module and 8.9% for the test module (Figure 2).

The marks of the students who watched the screencasts were significantly higher (p=0.03) in the test module than in the control module by an average of 3.5% (Figure 2).

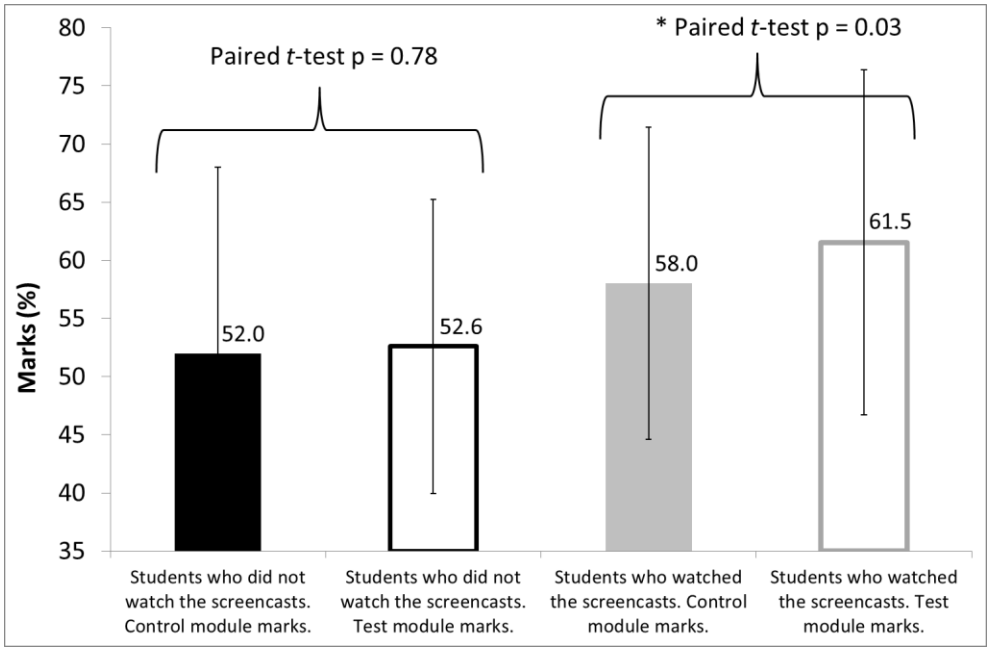

Figure 2: marks awarded for 'Introduction to nutrition' and 'Food composition' to students who did not watch the food composition screencasts (48) and students who watched the food composition screencasts (60). Error bars represent +/- 1 standard deviation.

Thirty-two students (30% of the cohort) completed the online survey. Twenty out of 32 who had watched the screencasts found them informative to some extent (Table 1).

Table 1: Perception of screencasts among students who used them

If you have used the screencasts available on Blackboard, how did you find them?	
Unhelpful	0
Informative	7
Helpful	6
Very helpful	7
Total number of respondents	20

The most commonly cited reasons for not watching the screencasts by the 12 students who had not were: not having the time, not knowing they existed and not thinking the screencasts would help their understanding (Table 2).

Table 2: Reasons why some students did not use the screencasts

Which of the following statements explain why you did NOT use the screencasts available on blackboard? (tick all the applicable)	
You did not have the time	4
You were told they were not useful	0
You did not know how to download them	1
You did not know they existed	3
You did not think they would help your understanding	3
You were confident you did not need the extra support	2
Other (specify)[1]	1
Number of respondents	12

[1] the student commented in the space provided to specify that *'the PowerPoints were fine'*

In the follow up email sent to the 108 students who had participated in the study, 22 students responded to the questions, representing 20.4% participation. Ten of the 22 students had used the screencasts and the other 12 had not used the screencasts.

Overall, the students polled, whether they had watched the screencasts or not, felt that screencasts were best to:

- Provide lecture summaries and help with revisions (17 students out of 22) "to record summaries of lectures → a revision tool"
- Provide demonstration of how to use a software / perform a calculation / use a specific piece of instrumentation (11 students out of 22) "specific software application particularly those used in assessed practical"
- Provide additional or in-depth information on complex topics (4 students out of 22) "focus on areas that are challenging"
- Go over the material several times (4 students out of 22) "extra ways to learn info if forgotten, can use over & over again"

Four students (out of 22) felt that screencasts should not be used to replace lectures "definitely not whole lectures" although one student did not entirely rule this out if "a little more detail if they are to replace lectures".

Five students spontaneously volunteered that screencasts should be kept short "if they were long (above 10 minutes), it would discourage me" and out of the ten students who watched the screencasts, one did so from the University, nine from home and one on the move "from home, but also when on the move from my smart phone (*eg* when on the train back to university)". Interestingly enough, two students commented that having the screencasts in an iPod compatible format would help them make use of them "make them available downloadable for iPod".

Six students spontaneously referred to their learning styles in relation to the use of screencasts, whether because it suited their style: "I found it easier to listen to the information than read it myself in a textbook. I find listening more helpful to me and it allows me to hear the same thing as many times as I need without having to read it" or, the opposite: "I prefer reading data than hearing it, does not suit my learning". The learning style theme was often directly linked to the place of learning "I prefer making my own notes" and "watching them at home isn't the same atmosphere to take notes/concentrate". One of the main reasons cited by students (noted by 5 students) for multiple downloads related to acquiring a full understanding of the topic "I watched them several times. The first time I watched the whole thing in one go to get the general gist of what it was about, then I listened to it again to understand certain parts. The parts which I found the most difficult to understand I listened to many times." Another reason was to "make notes from them".

In line with the online survey results obtained a year earlier, the most commonly cited reason (4 students out of 12 who did not watch the screencasts) for not using the screencasts was not knowing they existed "I didn't know they were available". However, it transpired that not understanding the nature of screencasts may have been problematic too, as some students clearly mistook them for podcasts "I find it difficult to learn from just listening to someone. A video would be better for me". This suggests that a better communication on their nature as well as availability may be fruitful to increase engagement with screencasts.

On the theme of communication, it appears that consistency both within module and across modules / years is primordial. Eight students; both among those who had watched the screencasts and those who had not spontaneously commented on this. From a student who had not watched the screencasts: "make screencasts regular and constant throughout the year" but also from a student who had used them: "[make them] widely available in other modules, raise awareness".

Discussion and conclusion

Gender differences
The findings from our study did not make any connections between gender and student engagement with (or lack of it) the additional online resources provided by the tutor. This means that males and females were almost equally likely to either use or not use the available screencasts. Although this remains an area of research, it appears that the findings from our study contradict with findings from a study conducted by Green et al. (2012) where gender was shown to be an important variable in the way students made use of screencasts.

Impact of screencasts as an additional resource on course grades
The fact that the students who watched the screencasts achieved higher grades than their peers in the control module (without screencasts) suggests that they are a group of high achieving students more likely to use the resources available. This confirms the findings by Smith and Fidge (2008) who found out that high achieving students are more likely to use the available resources than the low achievers.

The significant correlation between the test and control grades, along with the lack of significant difference between marks of students who did not watch the screencasts in both modules indicate that the module without screencast was indeed a valid control. Although no studies have shown any association between use of screencasts as additional resources and course grades, the study described in this article provides some evidence that these additional learning resources can be associated with improved course grades. The high achieving students who engaged with screencasts obtained higher marks in the 'module with screencasts' than in the 'module without screencasts'. The significant difference in marks between test and control modules for the students who watched the screencasts was therefore interpreted as the screencast effect. Improved course scores have been reported before for "blended" teaching (where a part of the teaching material is delivered online) when compared to traditionally taught courses (Lancaster et al., 2012) and a recent review on the use of technology enabled learning tools concluded that it enhanced knowledge acquisition in most cases (Petty, 2013).

Students' satisfaction
The real consensus occurred around learners' satisfaction which appeared to be unanimous (Petty, 2013). The findings from the study described in this article suggest that screencasts used as an additional resource in an undergraduate lecture-based course provide some definite benefits to students' learning experience. All the students who used screencasts found them to be useful in their learning stating that these resources had enabled them to improve their understanding of the learning material. The students cited being able to watch them several times and make additional notes among some of the benefits of these resources. These findings resonate with findings from previous studies (for example, Ford et al., 2012; Mullamphy et al., 2010) which showed that students perceived value in the use of screencasts. However, what was interesting to note was that there was an overwhelming consensus that screencasts should not replace lectures completely which echoes the findings of McGarr (2009).

Screencasts length and students' learning approaches
The study findings revealed that most of the students accessed the screencasts from home and they watched the screencasts several times to gain a full understanding of the topic as it was not always possible to understand everything in lectures. The length of the screencasts appear to be a critical factor. Some students expressed the view that if the screencasts are long (more than 10 minutes) they could not find the time to concentrate on them. In this respect, screencast length appeared crucial to students' engagement and probably reflects the relative learner passivity inherent in the nature of screencasts. Shorter screencasts provide fewer opportunities for mind-wandering and this may benefit students with low levels of attention. A number of students referred to their 'learning styles' with comments suggesting that these students engage in deep approach learning (Biggs, 2001) when choosing to use these screencasts. Both mind-wandering and learning approaches have been linked to Working Memory Capacity (WMC) which, in turn, has been shown to be a reliable predictor of performance on formal intellectual tasks such as tests with high WMC people performing better (Kane et al., 2007; Kyndt et al., 2012). Low WMC people have been shown to be more prone to mind-wandering when their activity required focused attention (Kane et al., 2007) but are also more likely to use a deep approach to learning (Kyndt et al., 2012), presumably as a compensation mechanism (Chamorro-Premuzic and Arteche, 2008). Hence, short screencasts (rather than long)

offering less opportunity for mind-wandering and promoting a deep learning approach (as shown by the students' comments) may be beneficial to low WMC students who are traditionally more likely to under-achieve.

Communication around screencasts
It is important to ensure that lecturers communicate the availability of the additional resources effectively as some students indicated that they did not know that the screencasts existed or did not understand what screencasts were (combined audio and visual cues). Moreover, students have commented that a systematic approach to screencast use as a teaching tool would be welcome and may thus increase students' engagement with screencasts through habit and expectation.

Concluding remarks
Lai et al. (2012) investigated the factors which affect students' adoption of technology for learning. The 3 main determinants identified were: educational compatibility ("the degree to which an innovation is perceived as consistent with the existing values, needs, and past experiences of potential adopters", Rogers, 1983); facilitating condition ("user perceived availability of support in his/her environment that encourages and facilitates technology adoption", Lai et al., 2012) and attitude to technology use ("an individual's positive or negative feelings (evaluative affect) about performing the target behaviour" Fishbein and Ajzen, 1975). This is very much in line with the findings of the study described in this article whereby the educational compatibility dimension is reflected in the students' comments on their learning styles which have been linked to students' preference for and confidence in technology use (Ames, 2003). The facilitating conditions dimension was clearly reflected in the students' comments surrounding communication and systematic approach to screencasts use. The attitude to technology use dimension did not come out strongly in this study and this may be due to a relative homogeneity of the students who replied to the questionnaires (full time, first-year students).

In conclusion, the study described in this article provides evidence that screencasts used as additional resources can improve course grades and that students have clear expectations regarding the way screencasts should be used in their learning. For instance, for students to engage with the screencasts they should be short, easily accessible and downloadable on devices such as iPods. They should be used to capture summaries of lectures or to explain difficult aspects of lectures and not to replace whole lectures. Finally, a systematic approach to their use within the course is likely to improve students' engagement with the resource.

With regard to assessing the impact of screencasts on grades, there are technical difficulties in the planning of a robust experimental plan to test the hypothesis that screencasts improve knowledge acquisition. In this study, using two modules (a control module and a test module) with the same students was preferred over studying two different cohorts of students taking the same module taught with or without screencasts so as to minimise subject variability. However, despite the precautions taken to ensure that the module without screencast was indeed a valid control, it could be argued that direct comparison is not entirely straightforward. The students for whom the screencasts were developed were first-year students in an institution where screencasting uptake is growing but remains low and they may differ in their engagement with screencasts from students who are routinely exposed to the technology. Given that our study was conducted in a single department at a single UK university, it is not possible to make broad generalisations from the findings. Future work should therefore focus on expanding the sample to include students from different universities or students at different levels of study and/or students from different disciplines. In addition, future work should concentrate on learning approaches and how these affect students' use of screencasts in order to enable tutors to prepare screencasts targeting students who need them the most.

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