Screencasting and its effect on the traditional lecture

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Abstract

The use of screencasting at James Cook University (JCU) has increased heavily over the last five years, and we have extended our resources to include complete sets of live lecture recordings captured via annotations and commentary on a tablet computer. At JCU, screencasting is now used extensively in mathematics subjects at all year levels both as lecture support and lecture replacement for entire subjects. The aim of these screencasts was to create greater flexibility for our students, engage them through a familiar medium and to encourage them to work outside of the usual lecture and tutorial times. However, many lecturers have expressed concern that increased flexibility will result in a reduction in lecture and tutorial attendance. In order to address this concern, a study was carried out on the second semester first year engineering mathematics class at JCU. A survey was used to determine the students' perspective of the impact of screencasting

on their own study methods, as well as their attitudes to attendance at traditional lectures and tutorials. The results of this survey should provide some reassurance that total flexibility is not ideal and the traditional lecture still remains a valuable resource for our current body of students.

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1 Introduction

The use of technology in the teaching of mathematics is now a necessity as lecturers and students adjust to a world with access to an enormous amount of information via the internet. From the use of electronic course materials such as notes, tutorials and worked solutions to podcasting, students have begun to demand almost total flexibility in the courses they are given. Many articles have been written on the need to embrace new technologies in teaching

such as Galbraith [1] and Sturdivant, Durham and Jardine [2]. These articles discuss how technology can be used to enrich the learning experience for the student. Work by MacDougal and Karadag in [3] also discussed the connection between the use of technology and student learning. These studies are not uncommon and have been carried out across the world in countries such as Canada [3], the USA [4] and the UK [5]. Over recent years, lecturers have become accustomed to the line of MP3 players at the front of the room keeping a verbal record of each lecture. Hence the introduction of podcasts was not surprising and these audio recordings, along with the written notes, combine to give a richer overall learning experience. Some lecturers were keen to utilise this technology and over the last seven years there was a significant amount of research carried out on the use of these podcasts [6, 7, 8]. However, although this technology has been seen as useful in many disciplines, it was not utilised by many mathematics lecturers. This may be because the teaching of mathematics appears to require a visual, as well as audio, recording of the lecture. This was difficult to achieve until recently when tablet computers became accessible to academics with average skills in media production. Now it is relatively easy for a lecturer to create an audio and visual recording through the use of screencasting, hence creating a richer learning environment for the student.

Although there are many reasons for the popularity of screencasts I will concentrate on the two reasons which I believe are the most important. The first is that they engage students using a medium which is almost second nature to them, and the second reason is that the screencasts can be reviewed many times, allowing for concepts to be clarified or reinforced.

From the use of texting to social media such as Facebook, students have become very comfortable using technology to communicate or obtain information. With the introduction of the iPod, iPhone and iPad, students are now adept at the use of touch screen technology and are willing to download and view subject material on these media. This technology not only improved the ease at which materials can be downloaded but also increased the demand for these materials.

There is a perception amongst lecturers that the current cohort of students find it difficult to concentrate throughout an entire fifty minute lecture. In my experience the students appear to have difficulty taking notes during a lecture as well as concentrating on the content of the lecture itself. In a recent study in a New Zealand article by Yoon and Sneddon [9] it was established through observations and student surveys that:

> Students in large undergraduate classes often feel that the pace of the lecture and the difficulty of the content requires them to split their attention between trying to understand the content of the lecture, and writing down detailed notes to make sense of later.

This is where the use of screencasts has made a significant impact. With all audio and annotations being recorded, a student does not need to write notes during the lecture, but instead may concentrate on the lecture itself. Also, as screencasts can be rewound and viewed multiple times, students are comfortable using this technology to reinforce concepts which may have been missed during the lecture.

2 Terminology and creation of screencasts

Although both forms of recordings discussed in this article can be regarded as screencasts, there are major differences with the way each screencast is created, as well as important differences in the way they are utilised by the students. I refer to the two separate recordings as either a "lecture recording" or an "extra screencast" and the differences are explained below.

The "lecture recordings" referred to in this article are not video recordings of a face to face lecture, but involve the recording of a live lecture with the use of a tablet or tablet PC. The recording is a screencapture of annotations made on typed lecture notes or directly onto a blank PDF. These recordings are then edited on the lecturer's computer to remove errors or pauses and to minimise the size of the output file. The lecturer's aim in creating these recordings

is to allow students to revise the lecture for a better understanding of the concepts. The additional benefit is that students who missed the lecture will be able to review the recording instead of seeing the lecturer to obtain notes or explanation.

The "extra screencasts" in this article refer to recordings that were created on a tablet or tablet PC in the lecturer's office at a time of their choosing. They involve screencapture of either lecture material or worked tutorial examples with heavy attention paid to giving complete and clear explanations. The "extra screencasts" were predominantly created for students to observe worked examples appearing line by line and clarified by the use of verbal explanations. They were usually aimed at routine tutorial problems but were also created to cover additional lecture material to extend the more able students. Solutions to tests or past examinations were also supplied via screencasts and were very popular.

For both sets of recordings the audio and screencapture were obtained using Camtasia and the annotations were made using PDF Annotator. The original Camtasia lecture recordings were of the order of 200 Megabytes but this size reduced significantly when converted into Flash or MP4 format. For a 50 minute lecture the resulting files were typically of the order of 15 Megabytes and 21 Megabytes for Flash and MP4 formats respectively. Although these file sizes were seen as very large in 2007 they now appear to be reasonable as many students chose to download the files at home. Overall the "extra screencasts" were of a cleaner quality as no time restrictions were placed on their creation and hence it was substantially easier to produce clear and error free recordings. Options also exist within Camtasia to improve the sound quality after recording as well as incorporating some high quality visual introductions or transitions. Camtasia also allows markers to be set throughout a recording which allows an index to be automatically created at the start of the recording. This indexing is very useful as it allows the student to go to the portion of the screencast that is of interest to them. This is particularly important for large screencasts where students may have difficulty locating the relevant section.

3   Screencasting at JCU

Over two hundred screencast recordings were created over the last five years covering thirteen of the fifteen undergraduate mathematics subjects taught at James Cook University (JCU). Initially only three mathematics lecturers were involved in the creation of screencasts but by 2009 this number increased to include all five of the mathematics lecturers at JCU. The use of these screencasts has varied between lecturers as agreement could not be reached on the best use of these materials. Lecturers at JCU employed the following strategies across entire subjects:

- face to face lectures with supplied lecture recordings;

- face to face lectures with additional screencasts to cover tutorial work;

- face to face lectures with lecture recordings and additional screencasts;

- no face to face lectures but lecture recordings supplied with additional face to face tutorial sessions.

Although the results of these strategies varied, some common trends appeared. In general, subjects that used screencasts as support material had positive student feedback, whereas subjects which used screencasts as a lecture replacement received poor student feedback. These results are not unexpected and are supported by the survey carried out by Mullamphy [10] , which showed that 87% of students surveyed stated that screencasts should be used as a supplement to lectures while only 39% believed that they should be used as lecture replacement. This comparison may not be completely fair as some subjects had as many as forty recordings while other subjects had less than ten.

There has been a reluctance in lecturers in the School of Engineering and Physical Sciences to embrace tablet technology. At the school level we are facing this challenge by running workshops to demonstrate the creation of a simple screencast. These workshops are run in the hope that lecturers from

other disciplines will see the ease with which screencasts can be created and embrace the new technology. The university is also supporting increased flexibility by supplying funds for equipment and teaching relief to significantly increase the amount of screencasting within the Faculty of Science and Engineering. The Deputy Vice Chancellor of the Faculty has specifically asked for the creation of screencasts to cover blockmode (three week intensive) subjects in mathematics. In 2013, all five blockmode mathematics subjects were listed to be taught with no face to face lectures but with the use of screencasts and face to face tutorial sessions.

4   The survey

The survey was conducted on the first year engineering mathematics subject during the second semester of 2010. The subject used the full complement of face to face lectures along with lecture recordings and extra screencasts. The lecture recordings were created during that semester and the extra screencasts were created for the same subject by a different lecturer one year earlier. The survey was not compulsory and was placed on an external site to ensure anonymity for the students. It consisted of ten multiple choice and three written questions. The main aims of the survey were to determine the effects of screencasting on student engagement outside of the usual contact hours as well as the effects on both lecture and tutorial attendance. The particular questions of interest were:

- what was the optimum length of a screencast?

- the "lecture recordings" encouraged me to work on this subject outside of the usual contact hours;

- the "extra screencasts" encouraged me to work on this subject outside of the usual contact hours;

- the use of "recorded lectures" had a negative effect on my attendance at lectures;

- the use of "extra screencasts" had a negative effect on my attendance at tutorials.

Students were given the opportunity for written comments on positive and negative aspects of both the recordings and screencasts. A section was also included for students to make general comments about the use of the screencasting materials. Finally there were a number of "housekeeping" questions included to determine how often students viewed recordings, where they were downloaded, as well as general questions of their audio and visual quality and accessibility.

5 Results and discussion

There were 34 responses to the survey which constitutes 20% of the total class. This response rate is considered reasonable for this cohort of students as they had already been surveyed three times during that semester. While many results were not unexpected the student response to the question about the optimum length of a screencast was surprising. Almost 60% of the respondents stated that 10–20 minutes was the ideal length, where from anecdotal evidence we expected that 25 minutes would be considered optimum. After further consideration, this should not have been a surprise as most screencasts on sites such as Camtasia are typically 10 minutes long. Students are also very familiar with accessing information via YouTube, where again most videos are quite short.

Both the lecture recordings and extra screencasts were successful in engaging students outside the usual contact hours. For the recordings and screencasts, 85% and 82% respectively either agreed or strongly agreed that the material encouraged them to work outside of the face to face contact hours. The case was strongest for the lecture recordings where 57% of respondents

strongly agreed. This was not unexpected as anecdotal evidence and written responses suggest that students would review the lecture material again to reinforce concepts which may have been missed during the face to face lecture. The results obtained for the extra screencasts were still strong with 22% of respondents strongly agreeing that the screencasts encouraged them to work outside the usual contact hours. Although these results are not as strong as for the lecture recordings they are still good and the discrepancy between the response to the two kinds of screencasts may be due to the extra screencasts being created by a staff member who was not currently lecturing the course. The positive results for engagement outside of normal contact hours for both types of recordings are very encouraging and are supported by the student comments. The written responses for lecture recordings were also very positive overall and some typical responses are given below:

- "Made it easy to add notes and pick up points that were missed during the lecture";

- "They show more examples with extra explanation, which is quite useful";

- "Useful if the lecture was confusing the first time around and you needed to revise the topics covered";

- "A great resource when studying or re-covering material as text rarely gives an insight into the working".

An area of concern for lecturers creating screencasts is that they may result in a large drop in attendance at lectures and tutorials. However, this belief is not supported by the survey which showed that 91% of respondents stated that the screencasts did not have a negative effect on their attendance at tutorials while 85% of students felt that lecture recordings did not affect their attendance at lectures. Although attendance data does not exist for the first year engineering mathematics class, data was collected in week ten of semester for the last six years for the first year preparatory mathematics class. In 2006 this course was taught without screencasts and recordings were

added over the next six years until approximately 60% of the lecture notes were available as screencasts in 2012. This is the largest mathematics subject taught at JCU and lecture attendance remained steady at 45±3% from 2006 to 2012. Although further investigation is required, these results lend support to my experience that the availability of screencasts has minimal effect on lecture attendance. The benefits of flexibility were obviously appreciated by students and are summed up by the response:

> The pace at the lectures themselves is pretty fast, and it is not always possible to understand everything on the first go, so having the recordings and being able to watch it at my own pace is invaluable.

One negative aspect of increasing flexibility is the change in the expectation levels of the students. Once students are supplied screencasts for some subjects they expect to have full screencasts and lecture recordings available for all subjects. This unrealistic expectation places an additional burden on the lecturers involved. This burden is substantial as the initial creation of the complete set of screencasts is quite time consuming to record and produce. Having said this, once screencasts are created, they should remain useful for a number of years.

6   Conclusion

With the increased demand for flexibility the use of screencasting will almost certainly continue to increase over the foreseeable future. After five years of screencasting at JCU we are in a much sounder position to determine the usefulness of this technology as well as the potential problems. Screencasts remain very popular and are heavily downloaded, accessed from numerous locations and at unusual times.

The screencasts are not only popular for their flexibility but for their ability to engage students through a medium which is familiar to them. The survey

comments suggest that the engagement was different for the two types of recordings. The recorded lectures are typically used to reinforce concepts raised during the lecture or to attend the lecture without taking notes but to review the recording and annotate notes at a later time. However, the extra screencasts are more example based and predominantly used for problem solving or bridging the gap between theory and application.

Although a detailed examination into lecture attendance has not yet been carried out, there is some evidence that the use of lecture recordings had minimal effect on the attendance at lectures. This is supported by student responses as well as anecdotal evidence from the lecturer involved. This result is also supported by the findings of Yoon and Sneddon [9], whose survey on university students in New Zealand showed that the use of screencasts had minimal impact on lecture attendance. The use of extra screencasts also had minimal effect on student attendance at tutorials as students appeared to value the screencasts as support for the tutorials. These are two very important results as they give a strong indication that face to face contact with students through lectures or tutorials is still valued very highly by the students.

Another major area of debate between lecturers is the question of the ideal length of a screencast. The survey indicated that the ideal length was 10–20 minutes which is substantially less than we anticipated. This result led lecturers at JCU to create smaller screencasts which students find easier to digest. This will also result in students being able to download smaller files and better target their specific needs. For larger screencasts we decided to provide heavy indexing so that students can easily navigate the screencast to enable them to concentrate on their particular needs.

Finally, there was some debate at JCU on whether to create more screencasts or simply direct students to the large amount of materials that are already available on the internet. Although there are libraries of screencasts available to the public, the major benefit of creating your own screencasts is that they may be tailored to cover material that is specific to your own cohort of

students. Creating your own screencasts allows you to pitch the lecture at a suitable level of difficulty for the students involved and to use terminology that is familiar to them. Overall screencasts appear to be a useful tool but their greatest value lies in their ability to support, but not replace, the traditional lecture.

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