Video: An Effective Teaching Aid? An Architectural Technologist's Perspective

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Abstract

Video as a tool for teaching and learning in higher education is a multimedia application with considerable promise (Whatley and Ahmad, 2007). Including video to supplement more traditional text based resources within online support material has the potential to encourage students to become more active learners. This paper reports the preliminary experiences of a project which used screencasting to produce online videos. The purpose was to investigate if the concept would be embraced by the students, encourage active learning and have a positive impact on results. The paper details the innovation, assesses the use of screencasting technology and looks at the potential for the use of video technology in other learning scenarios.

Keywords: Video, e-Learning, Interactive Learning

The Use of Video as a Teaching Aid

In many institutions, recorded videos have been used, and continue to be used, to illustrate theories in practice, highlight real examples of graphical representations, provide access to guest experts, and show experiments, scenarios and situations which would not be possible to show in the classroom (Whatley and Ahmad, 2007). This is particularly relevant in Built Environment education as acknowledged by a participant in a study by Frank (2005, p.24) who stated that 'some aspects in built environment education are difficult to visualise from a mere verbal account in a classroom and are better understood by seeing them first hand'. Due to larger class sizes and health and safety issues, it is becoming increasingly difficult to implement as many construction site visits as would be liked. The use of video could act as a substitute, enabling the students to see the practicalities without the associated risk.

One downside of showing video in class is the singular nature of the activity – students can view the clip only once in-situ, without the opportunity for review, while students who miss the lecture may miss out on the video altogether. Recordings can be made available via the university library, but access is limited by the popularity of the recordings against the number of copies available. In most instances, educational videos were created by professional producers, who worked with academic staff to produce television-quality recordings. Educational videos can be expensive to produce, limiting its uptake; however this is now changing as academics are increasingly making their own recordings for online dissemination (Palmer, 2007).

The growth of the internet saw initial interest in online video, however the limitations of PC technology, coupled with poor access to broadband, ensured a continuation of using recorded videos for in-class use. Continued advancements in technology have led to a review of the ways in which video is now used in higher education (Bennett and Glover, 2008). The birth of user-generated video sharing, through sites such as YouTube and Vimeo, has led to an explosion of interest in ad hoc, user-generated content which can be placed online and watched by students on-campus, off-campus, or anywhere worldwide. The benefits of this new means of video sharing have been documented by several authors, such as Kelly *et al.* (2009) who highlighted how online video resources can be watched repeatedly by students, in their own time. McKinney *et al.* (2009) point out how in a traditional lecture the lecturer cannot be paused, rewound or asked to repeat an explanation until the student finally understands the concept. Online however, students can take more time to analyse and consider the content of the video and its application to their study, rather than focus upon fact acquisition like they would in a traditional lecture scenario (Goldberg *et al.,* 2006; Parson *et al.,* 2009).

Changing student demographics have led to an increased number of part-time students, increasing numbers of students who live at home and commute to university, and a general increase in the number of applications for student places (Parson *et al.,* 2009). Educational resources are most effective when they are readily available to the

student (Mayer, 2008; Wieling and Hofman, 2010) so it's not surprising to see increasing uptake in the use of video and other online resources for educational purposes by students who are perhaps unable to get to university as often as their predecessors. Audio recordings, such as podcasts, have also been used in recent years to enrich the learning experience, while text-based documents can also be made available to students online. The main advantage of online video in comparison to these resources is the richness and complexity of the medium to communicate information (Leijen *et al.,* 2009).

Whilst text-based resources or audio recordings provide students with a single mode of learning, video adds a new multimedia dimension, incorporating visual aids such as body language cues, graphics and other visual representations, combined with audio inputs such as voiceovers, sounds and music (Whatley and Ahmad, 2007). This multimodal presentation has been found to be more beneficial to the learner than simply text or audio alone (Shaktikumar, 2009). Rather than simply read about a process, theory or principle, students can review a real-life example in their own time and at their own pace.

Using online video is not without issues. Preparing, recording, editing and producing materials can be time-consuming, especially for people unfamiliar with the technology. In addition, not all students will have experience of online learning, so it may be necessary to provide training and support to ensure unfamiliarity with the technology is not a hindrance to the learning experience (Vogt *et al.,* 2010). Online video resources seem to be used most for revision, especially before exams (Bennett and Glover, 2008; Belanger, 2005; Earp *et al.,* 2006). A study by Whatley and Ahmad (2007) indicated students benefit from watching lectures they have participated in, however, several other studies indicate students prefer shorter, 'bite-size', additional information which supplements the lecture, rather than simply repeats what they have already heard (Parson *et al.,* 2009; Griffin *et al.,* 2009; Kelly *et al.,* 2009; Palmer; 2007). Online video is not a replacement for traditional lectures, but when used to supplement the traditional experience, the resource has been found to be a useful tool to aid the learning experience (Bennett and Glover, 2008).

To gain a deeper insight into the use of video as a teaching aid, a pilot project was undertaken at the University of Ulster. The project focused on BSc (Hons) Architectural Technology and Management students learning to use an essential Computer Aided Design (CAD) package. This paper deals with the project's three objectives:

Objective 1: To solicit student feedback on the potential benefits or disadvantages of integrating video as a teaching aid.

Objective 2: To ascertain if this medium encourages the students to become self-sufficient or active learners as discussed by Whatley and Ahmad (2007).

Objective 3: To discover if the implementation of video as a learning material has an impact on student results.

Project Methodology

Pilot project

A pilot project was carried out in semester two of the academic year 2008/09 for the CAD Applications module within the BSc (Hons) Architectural Technology and Management undergraduate degree programme. The learning outcomes for the module required the students to become familiar with different software programs used for the production of CAD building related drawings. The module is divided into two distinct sections; one examines three dimensional CAD software, while the other places the emphasis on developing the students' skills using Adobe Photoshop and Google Sketch Up. The two sections are delivered by different lecturers. This paper deals solely with the teaching of the three dimensional CAD program.

The module content required the students to create presentation plans, elevations, sections and a site plan for a hypothetical building. In the 2008/09 academic year the students completed their assessment work using AutoCAD Architecture software. The cohort, consisting of 23 students, were provided with text based notes to supplement the weekly lectures. They were directed to online tutorials which were created externally and hosted on YouTube. It was the responsibility of the individual students to view these at their own convenience. Qualitative feedback in the form of a group discussion was held at the end of the twelve week period to gain feedback on the use of text based notes compared to the video tutorials.

Student comments from this discussion overwhelmingly favoured the use of video technology in the module. Many stated that they had previously "relied on the notes provided by the lecturer" and "didn't bother" viewing the tutorials to which they were directed, as they were created externally, and didn't think they would be relevant. Some, who viewed the videos, expressed the view that they were an ideal learning medium, but needed to be "more relevant" to the learning outcomes for the module, and "used to supplement the text based notes".

Several commented that at the beginning of the module they found it difficult familiarising themselves with the software and didn't want to "hold everyone else back" by constantly asking the lecturer for assistance.

The overarching feeling from the cohort was that more relevant videos to demonstrate the basic concepts of the program should be used as a teaching aid. This seems to support the suggestion that 'recent fast changes in technologies have not been adopted by educationalists, despite the fact that the technologies such as video recording have become easier for non-technical people to use' Phelps and Tidmarsh (2005) as cited by Whatley and Ahmad (2007 p.186). If a more active approach to

learning is to be adopted by students, there must be an emphasis on the educationalist to embrace the technologies available.

Project delivery

On the back of the pilot study it was decided to incorporate video support material into the delivery of the module in the 2009/10 academic year. This decision was also driven by the fact that the average mark for the module in the 2008/09 academic year was 59%. Considering this module was assessed entirely by means of project work based on CAD, an area in which Architectural Technology students should excel, the average mark was lower than would be expected.

In addition to the objectives previously stated, a further reason for trialling the use of video technology was the increasing cohort size. The number registered for the module in 2009/10 was 50, more than double the 2008/09 intake. The lecturer was conscious of the difficulties in giving support to all students in a three hour weekly slot.

Teaching week one of the semester commenced with the students being given a module introduction, an overview of the assessment requirements and a demonstration of the software. It should be noted at this point that the Revit Architecture program was used for assessment work in the 2009/10 academic year. A set of support notes and a short video tutorial were made available at the end of the session via Web-CT (the university's online proprietary virtual learning environment), highlighting the main areas covered in week one, this allowed the group to revisit the material at their own convenience.

The videos typically contained a demonstration on how to use the software to create various building components. In week one, a demonstration on how to create walls was shown. Each week's video looked at a different building element (walls, floors, roof, windows, doors etc.) until the students had enough information to create an entire building. An example of a typical video for the module can be found at the following link http://www.youtube.com/watch?v=6CnsLxSXap0

Weeks two to twelve followed the same format. The lectures commenced with an explanation of the module content for that particular week. A demonstration was provided and any questions relating to the demonstration answered. Support material was then made available via Web-CT. The students were presented with a blend of text based notes and video files to support the demonstrations carried out in class. The weekly lecture schedule is shown in Table 1.

The concept of implementing video support material was to encourage less reliance to be placed on the supporting documentation provided by the lecturer, which the cohort had become accustomed to. It was hoped that by raising awareness of other mediums available to them, further investigation on an individual basis would be undertaken, thus supporting student centred learning. Sparrow *et al.* (2000) recognise that this change in responsibility from teacher to student is common in contemporary pedagogy.

Gibbs (1992) as cited by Sparrow *et al.* (2000) offers a useful definition of student centred learning. He stated that student centred learning 'gives students greater autonomy and control over choice of subject matter, learning methods and pace of study' (Sparrow *et al.,* 2000, para. 2). This is particularly relevant to a module in which the pace of study for each student varies due to their previous experience of the software programme.

Table 1: Weekly lecture schedule

Teaching Week	Month	Content	Support
1	January	Introduction to Revit Architecture 2010 - Template drawing & creating external walls.	Notes & Video
2	February	Creating interior ground floor walls.	Notes
3	February	Adding levels, constraints and roof.	Notes & Video
4	February	Adding floors, ceilings and sections.	Notes
5	February	Adding curtain walls and stairs.	Notes
6	March	Adding windows and doors.	Notes & Video
7	March	Adding fascia, guttering and downpipes.	Notes
8	March	Adding furniture and drawing sheets.	Notes & Video
9	March	Creating site plans.	Video
10	March	Creating site plans.	Video
11	April	Presentation and plotting.	Video
12	April	Overall review.	n/a

The lecturer in this study cites personal experience as the driving factor in the search for a new way of encouraging student learning. Hogan (1996) as cited by Sparrow *et al.* (2000, para. 6) voices the concern that university courses as they are modelled are more focused on teacher responsibility, control and effort than on student learning. Indeed he goes so far as to say:

> I was struck by the irony that I did an enormous amount of reading and thinking about education in order to prepare my lectures, plan effective workshops and select readings and texts for my students, while the students did relatively little. I was the most active learner in my class.

The lecturer in this study could relate to Hogan's experience and as a result was hoping to make the students less reliant on material provided for them. The theory was to give text and video based support at the beginning of the semester. Midway through the semester the content in the video would be reduced with the anticipation that the students would continue using this medium to actively seek additional resources.

This concept would use video as the bait to capture the student's attention, raising awareness of this teaching and learning medium. The process hoped to help make the transition from teaching to active learning.
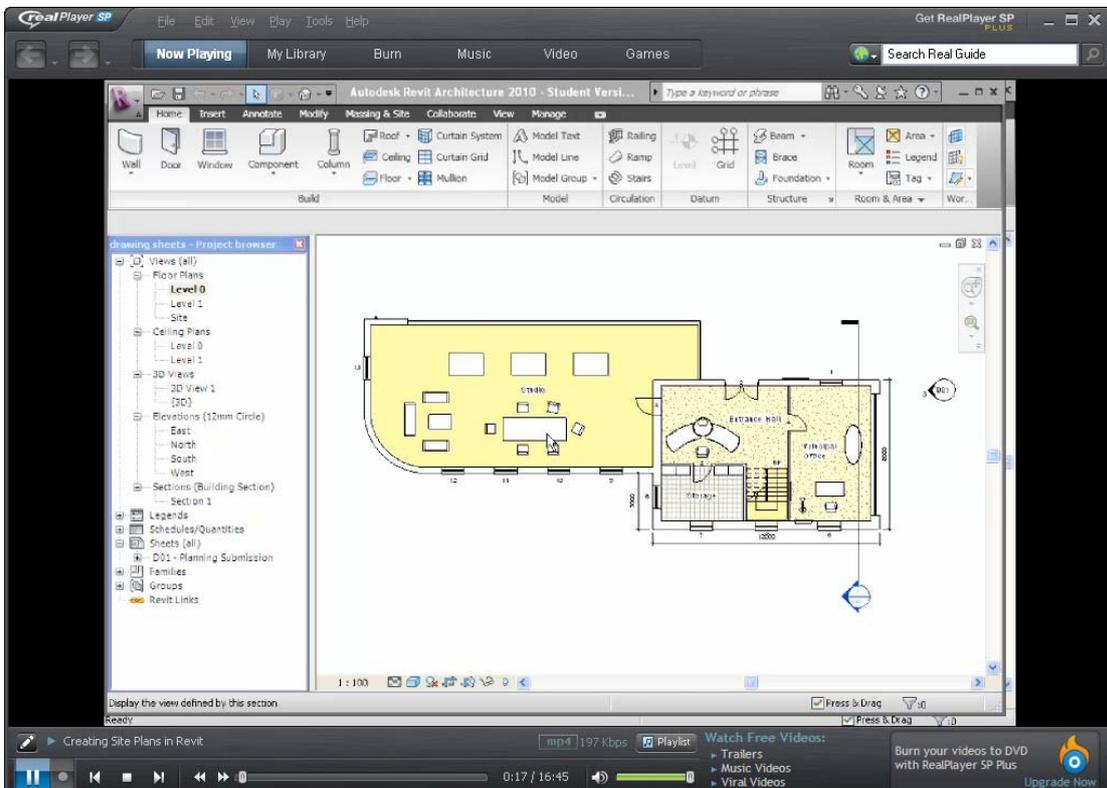

Figure 1: Sample video

Screencasting

The use of screencasting was crucial to aid the production of the online videos. Screencasting involves recording the computer screen, along with a voice narration, to create an online video which captures exactly the actions of the computer user. Rather than present students with static images or screenshots of a computer application, screencasting enables the user to produce exact replications of any computer sequence. In this way, the viewer sees exactly where the mouse clicks on-screen, or where to add text or data to a programme, or where to go online to view related materials and resources. This concept is particularly relevant to Architectural Technology and Management students as they are expected to gain basic knowledge of architectural software programs in a relatively short period of time, in preparation for their period of industrial placement. Using screencasting the students have the facility to revisit demonstrations at a time and place suitable to them.

Screencasting can also be used to record a presentation, providing students with an audiovisual recording rather than text or audio resources unaccompanied. These dynamic presentations have been found to be more effective than simply providing

students with text handouts or audio alone (Griffin *et al.,* 2009). Experience of students not fully engaging with text handouts in previous years prompted the search for a new delivery method.

There are several screen capture technologies available to assist the would-be screencaster, including; Adobe Captivate, MS Expression Screen Capture and Screen Toaster for Mac users. In this study, Camtasia Studio was used to create and produce screencasts. Camtasia Studio is a screencasting tool which can record the screen, incorporate audio/video, and import graphs and images to create a unique learning resource consisting of both two-dimensional drawings and representations as well as real-life examples of the representations.

Camtasia Studio was chosen for several reasons. Firstly, the software is user-friendly and requires a short learning curve to acquire the skills to use the application effectively (Schnall *et al.,* 2005). In addition, while some screencasting software packages output video in proprietary formats of their parent company, Camtasia Studio can produce for Apple, Adobe, Microsoft and other players, ensuring the widest audience can view the recordings when they are released.

Project Evaluation

Student feedback

Feedback was obtained through two direct methods: (i) individual class feedback using Survey Monkey and (ii) small group 'SWOT' analysis. At the end of the session in week eleven of the semester the students were asked to complete a survey relating to the module. Of the 46 students 22 participated (50 students were registered on the module with 4 not completing). A summary of the responses to the questionnaire is provided in Table 3.

The responses of the students show that 96% (i.e. 21 out of the 22 respondents) agreed or strongly agreed that the Web-CT videos were beneficial in helping them understand the Revit Architecture program and complete their assessment. This evidence is also reflected in their responses to a question asking if they would like to see similar videos for other modules in which software programs are being taught: 91% agreed or strongly agreed. This demonstrates a demand for this medium to be used in other modules.

In week twelve, an in-class paper based focus group discussion was organised. During this, the students used a SWOT template to offer their perspectives on the use of the technology in enhancing their learning experience (Table 2). This qualitative feedback confirms many of the earlier findings reported in the published literature, but clearly identifies some of the problems with the video files, namely the sound quality not being acceptable and problems experienced with Web-CT in the computer suite. These are

minor issues which could be addressed by using a better quality microphone for future audio recording and making the technical staff aware of any problems when they arise.

Some of the more interesting comments were that the video files "raised awareness of this teaching and learning medium" and led to a more "professional approach" to the lectures. One group noted a potential opportunity for students to be given the chance to "create our own video files to share with classmates".

Initial analysis of the data suggests that providing these videos proved beneficial. The students made use of the videos and watched them in their own time to reinforce what had been covered in class. Some students who missed a particular lecture, said that it was an excellent resource as they could catch up at home before the next week's session. Su *et al.* (2005) as cited by Abdulai (2010, p.54), acknowledge the change in student learning 'The rapid development of computer and other internet technologies has dramatically increased the ways in which teaching and learning is done'.

With this rapid development likely to increase in future, the onus must be on educators to take a proactive approach and develop appropriate delivery methods to meet the students' changing needs.

Table 2: SWOT Analysis

Strengths	Weaknesses
accessible and visual resource to reinforce text – if required	sound quality inadequate
ability to pause and rewind	Web-CT issues in the computer suite
clarity	
accessible	you can print out notes for reference, this can't be done with video
no confusion	
easy to catch up if lecture was missed	even more videos would have been useful
raised awareness of this teaching and learning medium	
feel involved	video/moving image instructions always difficult to follow at the same time as 'hands on' use of application
diversity	
helpful for assignments	
professional approach	

Opportunities	Threats
made available in different formats so that videos can be used at home/outside university	YouTube
use more often	inadequate hardware
use in other classes	non-attendance at class
students create their own and share with class	

Table 3: Summary of Responses

| Questionnaire | Responses in % Rankings | | | | |
| | Strongly Disagree | | Agree | | Strongly |
	1	2	3	4	5
(1) The Web-CT videos were beneficial in helping me understand the Revit Architecture program and complete the assignments.	-	-	4.5%	50.0%	45.5%
(2) I would prefer video files over text based notes.	-	13.6%	45.5%	27.3%	13.6%
(3) The Web-CT videos complemented the text based notes for the module.	-	-	13.6%	36.4%	50.0%
(4) I would like to see similar style videos for other modules in which software programs are being taught.	-	-	4.5%	36.4%	59.1%
(5) The length of the videos was adequate for the material covered.	-	-	9.1%	40.9%	50.0%

NB: 1 - Strongly disagree; 2 - Disagree; 3 - Indifferent; 4 - Agree; 5 - Strongly Agree

(6) Please provide additional comments on how you felt the video files worked.

They were clear and to the point, more videos please.

I felt the video files were easier to follow than text based notes.

They were helpful. I could see on the screen clearly how to do things step by step, then pause and go and complete a task on my own drawing. Overall a good method of teaching new software programs.

Very useful but quite quiet to listen to.

Videos were a great help, easy to follow, clear and precise.

I believe the video files were very beneficial because if I missed something in class I could go back and get a walkthrough on the topic.

Very helpful, made learning Revit a lot easier.

The videos were a great help, but very quiet to listen to even when fully turned up.

I did not look at the videos very much. I prefer to work from book/text notes next to the work screen. However, the videos were well put together and will be of great benefit for those who like that type of learning medium.

They were good guidance for using the software.

They showed clearly how to do things in Revit.

I think they worked very well.

Left Revit very easy to learn.

Lecturer reflection

Objective 2 of the research sought to ascertain if this medium encourages the students to become self-sufficient or active learners as discussed by Whatley and Ahmad (2007). The intention was to keep a lecturer's diary as the weeks progressed, noting the observations during the class in order to critically reflect at the end of week twelve on whether the use of video files engaged the students and encouraged more active learning. The outcome of the study would provide a useful analysis to the suggestions of Sparrow *et al.* (2000, para. 18) that 'if one is to follow a student centred approach to learning then careful thought must be given to the use of teaching techniques such as web based learning'.

The diary input focused on the lecturer's observations to determine if the students developed active learning tendencies as the sessions progressed. The observations were made during the weekly sessions and recorded at their end. In the first week, once the demonstration was complete the students were given time to look at the program individually. They tended to consult the text based notes provided rather than view the video file. This was not unexpected as the video tutorials were new and they seemed content to learn in a medium they were most accustomed to.

As the weeks progressed a noticeable change occurred with more and more students beginning to use the video files. In week four the lecturer noted that when he had gone to the computer suite to prepare for the upcoming session a number of students were already there viewing the video files. When approached they stated that they were recapping on what had been covered in the previous week's session. These observations tend to support the suggestions of Littlejohn and Higginson (2003) as cited by Abdulai (2010, p.53):

> e-learning can improve the flexibility and quality of learning by: giving control to students over when and where they study; allowing the students to study at their own pace; provide a student centred learning environment, which can be tailored to meet the learning needs of individual students and creating an environment that promotes an active approach to learning.

The diary entry in week seven noted that more of the students were beginning to use videos in class which they had sourced independently. A number were also observed using discussion forums to aid their use of the software. This was a marked change in attitude. Indeed on one occasion a student actually e-mailed the lecturer with a potential solution to a problem which had been encountered in class. He had used video tutorials hosted online to find the solution. This was by no means concurrent with all of the students, with some happy to simply use the notes provided. For the lecturer, the key to the success of the technology was giving the students sufficient information in the video to engage them, once this was achieved the majority actively sought further information to enhance their knowledge.

The videos did encourage a number of the students to engage in active learning but for others it seemed to be an excellent resource to encourage the opposite. They had enough information in the videos to complete the assignment task and felt that they didn't need to do individual research.

Module Evaluation

Objective 3 of the research sought to discover if the implementation of video as a learning material had an impact on results. As mentioned previously, the average mark for the module in the 2008/09 academic year was 59%. Interestingly, the average mark for the 2009/10 academic year increased to 70%. When reflecting upon this percentage increase other factors in addition to the implementation of the video tutorials needed to be considered. The software used for the 2009/10 academic year was Revit Architecture while in the 2008/09 academic year AutoCAD Architecture was used. In both years the essentials of the programs were taught, with both being used to produce floor plans, elevations, sections and perspective views of the buildings created. The change in software should not have been a significant factor in the overall increase in average marks.

Due to the increasing cohort size between 2008/09 and 2009/10, it would have been reasonable to assume that the average mark would have been consistent or indeed fallen due to the class size effectively doubling, meaning less individual time being dedicated to each student.

The average attendance for the module also increased from 48% in 2008/09 to 66% in 2009/10 (Table 4). It should be noted that some of the students did point out that the use of the video files meant that they could keep up with the class and not fall behind. They felt that this enabled them to progress steadily from week to week. As the videos were hosted on Web-CT they could be accessed outside the university, but interestingly the attendance stayed consistent throughout the semester.

Table 4: Student attendance and average marks

Academic Year	Student Attendance %	Average Mark %
2008/09	48	59
2009/10	66	70

A useful feature of the videos being hosted on Web-CT meant that usage could be monitored. Table 5 shows a comparison between the video usage and the usage of the text based notes provided. Web-CT hosted other documentation, such as the module booklet, assessment documentation and web references. The percentages shown in Table 5 are for the usage of the text and video files only.

In January it can be seen that the viewing percentage of the notes was 33% compared to just 3% for the video. This was not unexpected, as the students were used to

accessing text based notes for their modules and it was expected to take time for them to become accustomed to viewing the video. In February the usage of the notes increased to 49%, there was also a small increase in the video usage.

March shows that the total percentage usage of text based notes dropped to 38% with the video viewing again steadily increasing. April's most interesting statistic was the text based notes not being viewed at all, with the video files usage increasing again to 39%. This was the month that the coursework for the module was due to be submitted and consequently the month that the Web-CT folder received the most visits from the students. This makes for interesting analysis, as the month in which the students were under pressure to complete their assignment tasks none of them accessed the text based notes, with the video tutorials having their highest viewing percentage. This resonates with the previously stated work of Bennett and Glover (2008), Belanger (2005) and Earp *et al.* (2006) who make the point that online video resources seem to be most used for revision.

Table 5: Usage of video files and notes

Month	% Usage		
	Notes	Video	User Sessions
January	33	3	181
February	49	16	475
March	38	23	564
April	0	39	572

Conclusion

This paper has evaluated the effectiveness of video technology as a teaching aid. The feedback from the students corroborates the view that used in the correct manner this medium can have a positive influence on the learning process. The vast majority of the students considered the video technology to be a positive learning experience. Although the findings from this study are positive and show that the medium did encourage a large number of the students to engage in active learning it is by no means concurrent with all students.

As educators, we are constantly looking for ways to enhance our teaching practice and help students in their learning. The greater implementation of video technology could help to address both issues. This delivery method has a wider relevance to built environment disciples in general, as nearly all built environment courses involve students learning to use a new software program. More research into the link between video usage and active student engagement is necessary, but if this link were to prove consistent in other research studies it could have a significant impact into the way such classes are taught, not just in the UK, but in the wider international context.

An interesting proposal from the students themselves was the possibility of them having access to the screencasting software to create their own short videos on a

particular element of the software which could be shared with the cohort. This is an interesting proposal, which if successful, could lead to a shift in the way teaching and learning on similar modules is approached. More research into the use of screencasting and video technology as a tool to provide student feedback would also be worthwhile. The opportunity to provide the students with feedback in 'real time' on their coursework submissions could help in the learning process more so than traditional text based feedback weeks after the submission deadline, usually when they have forgotten about the coursework and moved on to the next piece.

With the technology readily available, the use of videos, especially in modules which introduce the students to new software applications, has the potential to become widespread. In this project, the feedback received from the students indicated that there is certainly a future for this learning medium, and while it may be time consuming to produce the videos, the benefits found by the students certainly make it worthwhile.

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