Video Supports the Lecturing Star

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Key words: m-Learning, Video, u-tube, Land Surveying

SUMMARY

This paper examines the potential of pedagogically designed video demonstrations in supporting lecture and tutorial notes in the Spatial Information Sciences. In the Department of Spatial Information Sciences (DSIS) in the Dublin Institute of Technology (DIT) Land Surveying is taught across a wide variety of disciplines. Typically such modules have an equal weighting between written examination and field based project learning. To accommodate this highly practical subject area, 50 % of contact time is normally dedicated to field exercises whereby students, in groups of no more than five, receive demonstration on diverse surveying instrumentation and subsequently complete practical project work as part of their formative assessment.

To enhance the students' practical learning experience in the Land Surveying module and provide a mobile (m-) learning resource a number of short videos with voice over instruction have been developed. These u-tube clips, of approximately three minutes in duration each, show the correct use of automatic levels and digital theodolites. The videos are intended as an enhancement rather than a replacement to the more traditional forms of demonstration and notes based instruction and combined provide an easily accessible multi-media approach to learning.

This study highlights the effectiveness of designing high quality m-learning resource material for use in a wide range of disciplines by undergraduate students during their basic Land Surveying modules. Furthermore, it evaluates the effectiveness this student-centric approach to practical learning.

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1. BACKGROUND

The Department of Spatial Information Sciences (DSIS) in the Dublin Institute of Technology (DIT) in Ireland currently supports the learning requirements of over 300 students per semester in the area of Land Surveying. These students range in discipline from pure Land Surveying (Geomatics) to students of Architecture, Construction and Engineering and in academic level from 4-year Honours Bachelors Degree to 3-year Diploma as shown in Table 1.0. They all however share a common need for basic information and instruction in the discipline of Land Surveying. Currently, these needs are met by diverse lecturing and demonstration staff with on average, four weekly semester hours over two semesters (Table 1.0). These contact hours generally translate into 100 learning hours per semester which equate to a 5 credit module whereby the credits are defined by the European Credit Transfer System (ECTS), thus making them transferrable across the Institute and Europe.

Table 1.0: Land Surveying Modules in DIT

School	Course /Year	Module	ECTS*	NQAI**	Student	Semester	Contact Hours			
							Lecture	Practical	Tutorial	Total
[1]SSPL	DT112/1	SSPL1001	5	8	FT†	S1‡	2	3	1	6
SSPL	DT112/1	SSPL1012	10	8	FT	S2‡‡	2	3	1	6
[2]CONS	DT117/1	CONS1008	5	6	FT	S1	2	2	0	4
CONS	DT133/1	CONS1008	5	6	PT††	S1	2	2	0	4
CONS	DT117/1	CONS1009	5	6	FT	S2	2	2	0	4
CONS	DT133/1	CONS1009	5	6	PT	S2	2	2	0	4
CONS	DT117/2	CONS2009	10	6	FT	S1/S2	2	2	0	4
CONS	DT133/3	CONS2009	10	6	PT	S1/S2	2	2	0	4
CONS	DT149/2	CONS2022	5	6	PT	S1	2	2	0	4
CONS	DT149/3	CONS3025	5	6	PT	S2	2	1	0	3
[3]DSA	DT105/2	FT102/SP/2	1.5	7	FT	S1/S2	1	1	0	2
[4]CBS	DT004/2	SURV2020	5	7	FT	S1	2	2	0	4
CBS	DT032/2	CIVIL2601	5	7	PT	S1	2	2	0	4
CBS	DT024/2	CBEH2108	5	8	FT	S1	2	2	0	4
CBS	DT004/2	SURV2021	5	7	FT	S2	2	2	0	4
CBS	DT032/2	CIVIL2602	5	7	PT	S2	2	2	0	4
CBS	DT024/2	CBEH2109	5	8	FT	S2	2	2	0	4

[1] SSPL = School of Spatial Planning, [2]CONS = School of Construction; [3]DSA = Dublin School of Architecture; [4]CBS = School of Civil and Building Services
*ECTS European Credit Transfer System; **NQAI National Qualification Authority Ireland
† FT = Full Time, ††PT = Part-time, ‡S1 = Semester 1, ‡‡ S2 =Semester 2

Generally, in the four Schools in DIT where Land Surveying is taught as a module both summative and formative means are used to evaluate the learning outcomes. The summative assessment is defined by a closed book examination at the end of a module and the formative assessment usually takes the form of a number of projects which may or may-not be group based. Students often experience difficulties when carrying out project tasks due to the relatively short one-on-one field demonstration time and it has been found from previous examination histories that students who do not engage in or understand the field procedures generally do less well in the summative elements of module assessment (Martin, 2011).

Video as a teaching, learning and training tool has been successfully adopted by many educators in recent decades (Zubert-Skerrit, 1984; Ellington, Percival & Race 1993; Maier & Warren 2000 and Macurik *et al.,* 2008). When learning complex skills, Anderson et *al.,* (1989) and Overbaugh (1995) found that visual components tend to be more memorable. A critical attribute of video was found by Baggett (1984) to be its ability to use both auditory and visual systems whereby learners could construct quite a detailed mental representation of the material provided. Of particular interest to this study, where a number of different tutors are engaged with different cohorts, is the ability of video-based instruction in standardizing messages thereby increasing the fidelity of implementing instruction (Hansen and Giles, 2003).

In recent years, developments in ICT have provided new opportunities for streaming digital data for learning and teaching support. In DIT these development opportunities have been exploited for both traditional and professional (CPD) learners alike (Martin, 2005; Martin *et al*., 2006, McGovern *et al*., 2007). Many ICT developments have been referred to in detail in the FIG Commission 2 publication 'Enhancing Surveying education through e-Learning' (Groenendijk & Markus, 2010). The most recent development as identified by Groenendijk & Markus (2010) is the advent of mobile devices such as internet enabled smart phones which can now deliver the real potential for m-Learning on site at the appropriate time.

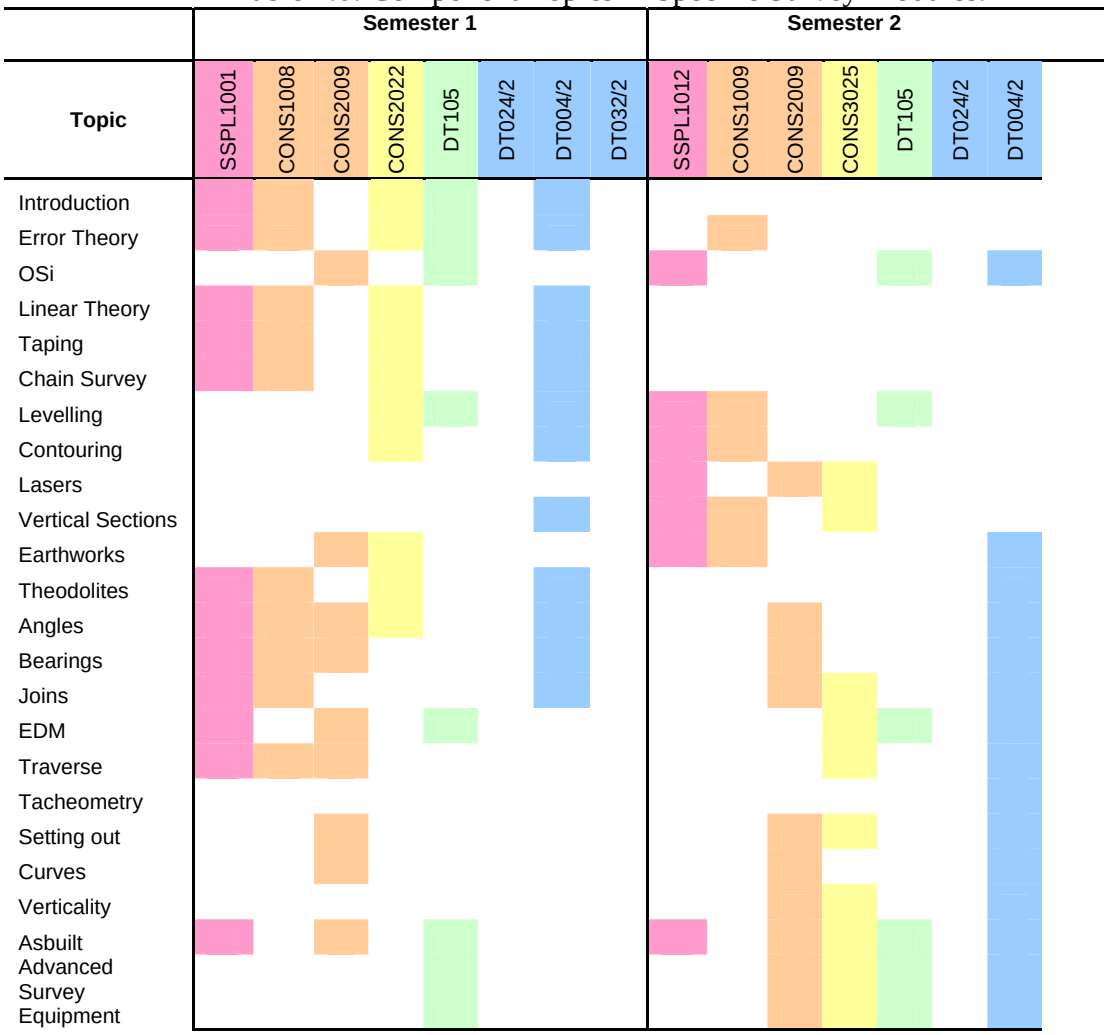
2. METHODOLOGY

2.1 Collaborative Design Process

In this study initial investigations into the developement of the most appropriate m-Learning video material began with an analysis of the module content in each of the modules shown (Table 1.0). It should be noted here that there were five independent module authors with additional tutorial support delivering college courses and demonstrating field procedures across the gamit of disciplines. Therefore, whilst the material in each module identified in Table 1.0 was similar, localised differences reflected the particular student cohort. In each case the module author was consulted and a number of learning and teaching criteria established. Additionally, all module coordinators came together for a number of discussions whereby the most appropriate field demonstration material for videoing was identified. As can be seen from Table 2.0 a wide range of components are taught across all modules

however, a number of core skills which require knowledge of levelling operations for height control and theodolite work for positional control were found to be fundamental to many components. It was therefore decided to focus on additional m-Learning resources to all students in these basic survey skills. It should be noted here that the video material was not designed as a replacement for hands-on demonstration by the relevant tutor but as a support resource to accommodate large student groups awaiting instruction in the field.

Table 2.0: Component Topics in Specific Survey Modules.



2.2 Video Production

The skills required for video production are not commonly part of an academics background and in the case of this video development considerable technical support was provided by Roy Moore at the DIT's Telematics Facility. Previous research carried out by McGovern, Martin and Moore (2008) clearly outlined the creative, technical and logistical issues that arise when designing online video material for e-Learning. These issues include considerations into the

following: Narrative, Location, Story-board, Script, Presenter, Camera operator, Audio, Props, Video editor, Costs, Time (McGovern, Martin & Moore, 2008).

In total 10 short video clips were completed, a student demonstrator was used in each clip and a voice over provided instructional information. All videos were filmed on location in the Kings Inns Park where DIT students usually carryout field exercises, therefore ensuring familiarity with the surroundings. The film quality was very high to ensure clarity when viewing the content in-house on larger screens. Individual video clips were designed to demonstrate very specific tasks which, when combined, show the viewer how to use a level or theodolite correctly. Each clip lasts no longer than 5 minutes, this is to maintain interest and to allow for ease of review of the specific tasks. The videos were uploaded to u-tube to enable students to view them directly on site when required and can be found at the following www addresses:

Levelling Demonstrations

i. How to set up a survey tripod
http://www.youtube.com/user/MartinBondzio#p/u/9/O3Dp1kjI8gY
ii. How to set up an automatic level
http://www.youtube.com/user/MartinBondzio#p/u/8/IIYAoNHPEao
iii. How to level the pond bubble in an automatic level
http://www.youtube.com/user/MartinBondzio#p/u/5/v8-xGcBYAts
iv. How to remove parallax in a survey telescope
http://www.youtube.com/user/MartinBondzio#p/u/7/AIBJILxQ3cE
v. How to read a levelling 'E' type staff
http://www.youtube.com/user/MartinBondzio#p/u/6/o8d-5S1z0e8

Theodolite Demonstrations

i. How to centre over a point:
http://www.youtube.com/watch?v=EKE3ZwYaMms
ii. How to roughly level a theodolite over a point:
http://www.youtube.com/watch?v=sA3ubs8vaug
iii. How to finely level a theodolite over a point
http://www.youtube.com/watch?v=0hAOD4OGMGY
iv. How to carry out the Plate Level Adjustment on a theodolite
http://www.youtube.com/watch?v=kvkXR-hKG04
v. How to measure a horizontal angle using a theodolite
http://www.youtube.com/watch?v=7aYsAwXlZkg

In addition to the videos being streamed for u-tube they are also hosted on the HEAnet server. HEAnet is Ireland's National Education and Research Network and provides high quality Internet Services to Irish third-level colleges and other educational and research organisations. Fast Streaming from the HEAnet server delivers instant start, fast playback with speeds automatically optimized for the student's network, automatic reconnection in the event of interruption and immediate playback from any portion of a clip. This enabled individual students to also access the video resource information via the DITs online learning platform Webcourses through their respective modules.

3. EVALUATION

Evaluation of the m-Learning resources focused on a number of issues including mobile phone usage to assess the student capability of accessing the materials, student engagement with the materials, the effectiveness of the video material in supporting field based learning and instruction and the enhancement of learning skills.

3.1 Mobile Phone Usage

In advance of the material going live on u-tube, students were assessed as to the technical capabilities of their current mobile devices. Assessment of mobile phone usage was an important step in the initial evaluation as it highlighted the student mobile capabilities and willingness to engage with the digital materials. A phone usage questionnaire was administered to 93 students from across all modules. Of the 93 only one student was found not to own a mobile phone. The age of the phone was also considered, as the ability of phones to stream data from u-tube quickly is directly related to this. It was found that 63 % of students' phones were less than one year old and 23 % were less than two years old with the remainder (14 %) greater than 3 years old. Thus data streaming would not generally be an issue when viewing the online material. In total 57 % of students expressed an interest in the online material however, over 70 % believed that such m-Learning material would be beneficial in a practical environment. Figure 1.0 illustrates the current student phone usage relative to internet access.

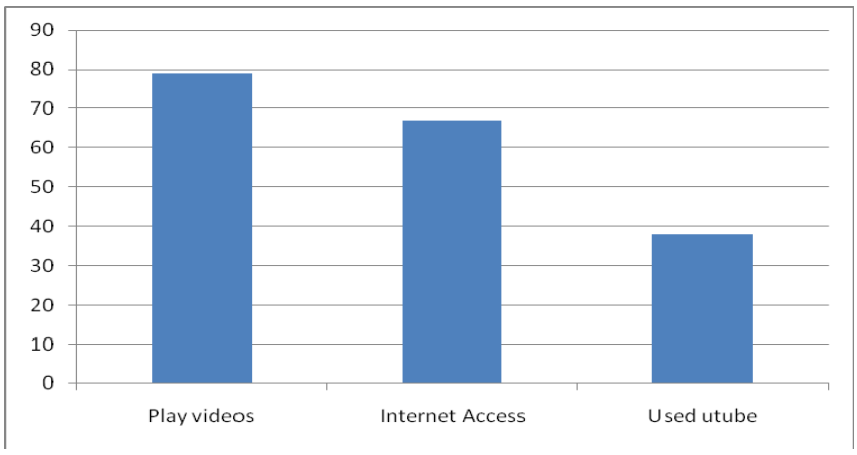


Figure 1.0: Student phone usage (n= 93)

From Figure 1.0 it can be seen that less than 50 % of students currently access u-tube from their mobile phones. This was considered significant as students would be required to access u-tube to use the materials developed. The small percentage of students streaming live video material via u-tube can be explained by the significant mobile charges which can be incurred using this medium. Therefore to prevent the learning platform becoming an obstacle to the learning process, and as DIT own the copyright, students were given permission to download the videos to their own mobile devices for viewing offline.

Further analysis of student phone usage and also mobile device used was undertaken on a school by school basis to ascertain if any significant differences could be identified between different student cohorts, these were found to be insignificant and not presented here.

3.2 Student Engagement with the Materials

An assessment of the impact of multi-media material on the learning process and outcomes for different learner groups in a practical environment is currently being evaluated using open and closed questions ranked in a Likert type scale (Likert, 1932). Both pre- and post-video questionnaires have been administered to over 120 students to evaluate perceptions of understanding, attention, relevance and satisfaction with the online instructional information. Preliminary results from these questionnaires indicate that there is a significant increase (50%) in understanding of the basic surveying methods material across all student cohorts irrespective of NQAI level or discipline. Students have found the material to be directly relevant and have requested additional m-Learning resources in video format. In particular, students have requested that similar resources showing basic survey computations be developed. This was an unexpected result however it indicates the high level of engagement with video as a learning resource.

Quantitative evaluation of the student usage of online video materials will be undertaken at the end of semester two when all students have completed their respective surveying modules. This will be facilitated using the tracking feature of DITs' online platform webcourses and also number of u-tube hits of the material. It is envisaged that a comparison of student engagement across different programmes and/or schools will then be possible and the effectiveness of asynchronous learning evaluated.

3.3 Effectiveness of the Video Material

Preliminary results from analysis of feedback from course tutors indicate that the video material is useful in supporting class based teaching and learning as it provides additional standardized resource material on which tutors can depend. All course coordinators and tutors willing engaged with the material and facilitated collaborative design thus providing a high quality resource with high re-usability value. This is an important aspect as the considerable time spent on designing and developing appropriate online material as found by Martin, Mooney & McGovern (2007) means that to be economically effective it should have a wide audience and a long shelf life. Therefore it can be said that high quality m-Learning resources of this nature should concentrate on the fundamentals or building blocks of knowledge. It is expected that further analysis of the effectiveness of this video material will inform multi-media resources development into the future.

3.4 Enhancement of Learning Skills.

Evaluation of the learning skills specifically enhanced by the video materials is currently in process. This will be evidenced through formal assessment of students during their practical field sessions whereby the authenticity of assessment will ensure a link between academic knowledge and 'real-world' knowledge required. A test cohort (Geomatics - DT112/1) will undertake two open book practical assessments in module SSPL1012 whereby access to the video material will be available on site. This will constitute 10 % of the marks for this module. Practical assessment of this nature is of particular benefit to the Geomatics cohort of students as their sixth semester is spent on placement with a survey company where knowledge of practical survey skills would be considered a prerequisite. Data for perceived information retention will also be analyzed at the end of the second semester with all student cohorts using an open-ended questionnaire. This will determine if a direct correlation between the use of videos and the level of practical learning outcomes achieved by each student can be found.

4. CONCLUSIONS

The video material presented in this study focuses on the fundamentals of good survey practice and is therefore applicable as content in a wide range of existing programme modules at varying NQAI (National Qualification Authority of Ireland) levels in the College of Engineering and Built Environment in DIT. The content has been padegogically designed and is packaged in a flexible student friendly format that can be accessed on demand in different learning environments thus responding to the changing needs and expectations of learners. Additionally, adoption of the material developed has encouraged a more cohesive approach to curriculum design in basic Land Surveying by bringing together lecturers from different programmes within the College at both the planning, delivery and assessment stages.

Initial findings of the study indicate that learners are very receptive to m-Learning and increasingly expect it as a resource. Students have the personal resources to access the materials in a mobile platform and are willing to engage with well designed m-Learning material. In addition, such m-Learning resources provide very useful standardized material on which tutors can depend and thus supports class based teaching and practical demonstrations. Levels of learning enhancement as evidenced by student surveys show a significant improvement (50 %) in understanding of the basic survey skills required in the field having viewed the video material. This was found to be irrespective of academic level or discipline. It is expected that further analysis of student engagement and enhancement of learning outcomes will facilitate the development of additional m-Learning resources.

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BIOGRAPHICAL NOTES

Dr. Audrey Martin is a lecturer in the Department of Spatial Information Sciences in the Dublin Institute of technology (DIT). Her area of expertise is Global Navigation Satellite Systems (GNSS) and she is actively involved in the design and delivery of blended learning modules. Audrey holds a DIT Teaching and Learning Fellowship for 2011 and was awarded the 2010 Teaching Excellence Award in the College of Engineering and Built Environment.

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