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GeoLearn - Multi-Media Resources

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ABSTRACT

This paper examines the potential of pedagogically designed video demonstrations in supporting the learning requirements of students in the Spatial Information Sciences (DSIS). Currently, over three hundred full and part-time students in the College of Engineering and Built Environment undertake a module in Land Surveying each semester and although these students range in discipline and academic level (NQAI 6 - 8), they all share a need for basic information and instruction in the area of practical land-surveying techniques. To accommodate this highly practical subject area, fifty per cent of contact time is normally dedicated to group-based field exercises, the results of which are formally assessed. To enhance the students' practical learning experience in Land Surveying modules and provide a mobile (m)learning resource a number of short videos with voice-over instruction have been developed. These YouTube clips, of approximately three minutes in duration each, show the correct use of automatic levels and digital theodolites and can be directly accessed in the field via a web and video enabled mobile platform. This study highlights the effectiveness of designing high quality mlearning 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 in terms of learners' potential for mlearning, learner motivation and also perceptions of understanding and retention with regard to course content for both fulltime students and professional learners. Outcomes of the study indicate that the use of videos hosted on YouTube is very positive as it presents few barriers to learners in terms of access and useability.

OUTLINE OF FELLOWSHIP PROJECT

This study aims to investigate the potential of fine-grained instructional video clips to engage adult learners across a number of courses in active learning. Similar to a study carried out by Choi and Johnson (2005) the learning (comprehension and retention) and motivation of a sample of learners were examined by comparing learners' perceptions of video-based instruction with traditional class-based instruction. This study differs significantly from previous studies in that the sample size was large (n=93). Furthermore, as a number of independent courses constituted the population these were assessed both collectively and independently. Of additional interest to this study was the fact that a number of different tutors were engaged with varying cohorts, thus the ability of video-based instruction in standardizing messages and thereby increasing the fidelity of implementing instruction as proposed by Dusenbury, Hansen and Giles (2003) was informally assessed. To achieve the aim of this study four research questions were identified:

1. Evaluate learners' potential for mlearning.
2. Measure learners' motivation.
3. Evaluates learners' perceptions of understanding and retention with regard to course content.
4. Assess student engagement with the mlearning resource.

METHODOLOGY

1. Collaborative Design Process

Development of the most appropriate mlearning video materials was based on analysis of the module content of seventeen modules listed in Table 1.0. There are currently five independent module authors delivering Land-Surveying modules. Additional demonstration support is provided for fieldwork activities which constitute fifty per cent of contact time across the gamut of disciplines within the College (Table 1.0). Thus, whilst the content in each module was similar, localised differences reflected particular student cohorts' academic requirements. Independent consultation with each module author resulted in the establishment of a number of learning and teaching criteria. Subsequently, module coordinators collaboratively agreed on two fundamental survey operations - levelling and theodolite work - as the most appropriate mlearning material.

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 |

¹SSPL = School of Spatial Planning, ²CONS = School of Construction; ³DSA = Dublin School of Architecture; ⁴CBS = School of Civil and Building Services

*ECTS European Credit Transfer System; **NQAI National Qualification Authority Ireland

[†] FT = Full Time, ^{††}PT = Part-time

2. Video Production

The approach taken during the design stage of the instructional video clips is briefly summarized here. The seven-step approach adopted is illustrated in Table 2.0, it includes the four core processes of micro-level instructional design (processes 4-7) as outlined by Snelson and Elison-Bowers (2009). 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 elearning, these are not discussed here.

Table 2.0: Instructional Video Clip Design

| | Process | Description |
|----|--------------------------------|--|
| 1 | Module content analysis | Evaluation of seventeen module descriptors from four Schools: Spatial Planning, Construction, Architecture, Civil and Building Services. |
| 2 | Module author consultation | Consultation with module authors with regard to student cohort characteristics, learning objectives and module outcomes. |
| 3† | Core Skills identification | Mapping of instructional demonstrations to achieve educational objectives within a primary learning domain (cognitive, affective, psychomotor). |
| 4† | Chunk information | Design of instructional content in small chunks to demonstrate specific tasks which can stand-alone or be combined to illustrate complex skills. |
| 5 | Apply relevant learning theory | Application of cognitive theory of multimedia learning (Clarke, 2008) and constructivist theory (Jonassen, Peck and Wilson, 1999). |
| 6‡ | Manage the technology | Production of ten video clips of 3-5 minute duration, from storyboard to final cut which was then uploaded to a dedicated YouTube channel. |
| 7 | Evaluate the product | Module coordinators informal evaluation undertaken and used to modify the video clips before going live to students. |

† Collaborative processes

‡ Technical support in video production provided by Roy Moore at the DIT's Telematics Facility.

In total ten 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 carryout field exercises, thus 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 more complex tasks. Each clip lasts no longer than five minutes, this is to maintain interest and to allow for ease of review of the specific tasks. The videos were uploaded to YouTube 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/O3Dp1kjl8gY>
- 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>

EVALUATION

Evaluation of the fellowship project focused on the four research objectives as outlined and are reported here:

1. Evaluation of learners' potential for mLearning

A phone usage questionnaire was administered to assess learners' mobile learning potential, i.e. the technical capabilities of their current mobile devices and their willingness to engage with the digital materials. Participants in the study (n=93) included both full-time students (n=55) and professional learners (n=38) from the four Schools mentioned in Table 1.0. Of the ninety-three, only one learner was found not to own a mobile phone, sixty-two percent of learners' phones were under one-year old and twenty-three per cent were less than two-years old with the remainder greater than three-years old. A slightly higher prevalence of older phones was found in the professional learner population but was not found to be significant. As both learner groups were found to own relatively new mobiles, issues related to poor quality data streaming and slow internet access was not perceived to be problematic for the study.

Current learner mobile internet habits were also analyzed and it was found that seventy-two per cent had used their phones to access the internet with forty-one per cent having previously accessed YouTube. The lower percentage of learners using the internet on their phones to stream live video material via YouTube was explained by the significant cost of mobile charges which can be incurred using this medium. Therefore to prevent the learning platform becoming an obstacle to the learning process, permissions to download the videos for viewing offline were given.

2. Measure learners motivation

An assessment of the impact of multi-media material on learners' motivation (i.e. attention relevance, satisfaction and confidence) for the different learner groups in a practical environment was evaluated using open questions ranked in a four-point Likert type scale

(Likert, 1932). All student cohorts had experienced traditional text-based instruction within their respective modules before the video-based demonstration therefore a post-test only instrument was administered to evaluate perceptions of understanding, attention, relevance and satisfaction with the online instructional information. The study found that seventy-eight per cent of all learners preferred video materials to traditional class notes with seventy-one percent finding that video provided more detailed information than traditional class materials and sixty-six per cent of learners stated that they paid more attention to the video material than traditional class notes. No significant difference was found in the results between professional learners and full-time students.

Over ninety percent of all learners found the material to be directly relevant to their module, with no difference between the learner groups. This was an expected outcome as the collaborative design process ensured very high consistency of materials with all module descriptors and learning outcomes. Learners' confidence in their abilities to emulate the skills demonstrated in the videos and incorporate them into real-world situations was very high and measured at eighty-nine per cent. As before no significant difference in results was found to exist between full-time students and professional learners.

Qualitative feedback on student satisfaction with the video materials indicated that learners were very comfortable with video as an instructional tool and found the medium easy to use and very beneficial when used together with traditional forms of teaching. It was found to be a good revision tool and more useful than traditional notes in real-world situations. There were no negative comments on the use of video as a support tool for teaching and learning and students have subsequently requested additional mlearning resources in video format.

3. Evaluates learners' perceptions of understanding and retention with regard to course content.

Assessment of the advantage of embedding video in the course material in terms of understanding and retention with regard to course contents was analyzed using a pre- and post-test instrument. Factual recognition was evaluated using eleven closed questions ranked in a four-point Likert type scale. Results from the questionnaire showed an average increase in understanding of twenty-four per cent in the basic survey methodologies presented across all learner cohorts irrespective of NQAI level or discipline.

Evaluation of the learning skills specifically enhanced by the video materials was evidenced through formal assessment of learners during their practical field sessions whereby the authenticity of assessment ensured a link between academic knowledge and 'real-world' application required. A test cohort (Geomatics - DT112/1) undertook an open-book practical assessment in module SSPL1012 whereby access to the video material was available on-site. Practical assessment of this nature is of particular benefit to the Geomatics cohort as their sixth semester is spent on placement with a survey company where knowledge of practical survey skills is considered a prerequisite. Students were not graded on this assessment but had a requirement to meet the learning outcomes as specified in the module descriptor i.e. they had to be able to successfully undertake a horizontal angular survey and return a set of reduced calculations. Of the twenty-eight students assessed only one student failed this exercise on the first attempt.

4. Assess student engagement with the mlearning resource

On completion of the semester an assessment of the effectiveness and appeal of mlearning, its ease of use and the pattern of mlearning resource use during the semester was undertaken. The effectiveness of YouTube videos in a mobile environment was evaluated using closed questions ranked in a four-point Likert type scale for a population of seventy-six students. It was found that eighty-two per cent of students found the use of the videos either very effective or effective in correctly applying their knowledge to practical scenarios which on repeated viewing helped reinforce their learning. Eighty-four per cent of learners felt that it was advantageous to view the videos in advance of field classes where the equipment would be used. The videos were accessed by thirty-four per cent of learners as a revision tool from their home environment whilst sixteen per cent of learners used the videos to recap on the skills required while undertaking work on-site.

FUTURE RESEARCH AND RECOMMENDATIONS

Findings of the study indicate that learners are very receptive to mlearning 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 mlearning material. In addition, such mlearning resources provide very useful bank of standardized material on which tutors can depend to support their class-based teaching and practical demonstrations.

The proposed future work is to increase the bank of mlearning resources within the discipline of Geomatics and Surveying incorporating the lessons learned from this project. The positive student engagement and their specific requests for additional resources will inform the materials developed into the future. The instructional video clip design process as outlined in this study could be used as a template for other designers when considering mlearning resources. However, it should be noted that production of high quality video is slow process very much dependent on interdisciplinary support. Therefore a recommendation from this work is to establish an interdisciplinary mlearning team with the specific disciplinary knowledge and digital media acumen necessary to develop mlearning resources which have a broad spectrum audience. The author would like to acknowledge the technical support afforded her by Roy Moore in Telematics and the also the pedagogical and financial support from the Learning Teaching and Technology Centre in DIT.

OUTPUTS

1. Ten online YouTube videos.
2. Martin, A. (2012) GeoLearn – Multi-Media Project. DIT Annual Showcase of Learning and Teaching Innovation. Aungier Street. January 11th 2012.
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