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# THE PRODUCTION OF HIGH-QUALITY VIDEO FOR E-LEARNING

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## ABSTRACT:

As video capture, editing and transmission capabilities become more accessible, video is increasingly being considered when developing e-learning content. However, the skills required for video production are not commonly part of many e-learning developers backgrounds. This paper presents the experiences of academics from the spatial information sciences when developing high quality video content for an on-line e-learning module in Global Navigation Satellite Systems (GNSS). Video comprises one element of the module and is designed to, as far as possible, address the lack of ‘hands-on’ experience of GNSS equipment and observing procedures. The video element of the module was used by a cohort of post-graduate students at the Dublin Institute of Technology and the feedback was favourable. While acknowledging its advantages, the authors conclude that the cost, time and complexity of producing high-quality video should not be underestimated. Also, they note that keeping multimedia-rich courses current, particularly in an area of rapid technological change, is a challenge. E-learning course developers considering using video should carry-out both a pedagogical- and a cost-benefit analysis to establish if the inclusion of video is worthwhile. The most important component in producing an active learning experience continues to be the quality of the instructional design and content, not the media itself.

## RÉSUMÉ:

Comme la capture vidéo, les capacités de transmission et d'édition deviennent plus accessible, la vidéo est de plus en plus considérée lors de l'élaboration de contenus d'apprentissage en ligne (e-learning). Toutefois, les compétences requises pour la production de vidéo ne font pas couramment partie de la panoplie de connaissances de nombreux développeurs de cours d'apprentissage en ligne. Ce document présente les expériences du corps enseignant des Sciences de l'Information Spatiale lors de l'élaboration de vidéo de haute qualité pour un module d'apprentissage en ligne sur le Systeme Global de Navigation par Satellite (GNSS). La vidéo est un élément du module et a été conçue pour remédier à l'absence d'expérience sur le terrain de l'équipement GNSS et des procédures d'observation. La vidéo a été utilisé par une cohorte d'étudiants de troisième cycle à l'Institut de Technologie de Dublin et les réactions étaient favorables. Tout en reconnaissant ses avantages, les auteurs concluent que le coût, le temps et la complexité de la production vidéo de qualité ne doit pas être sous-estimée. En outre, ils notent que le maintien de l'utilisation de moyens multimédias pour les cours représente un challenge, particulièrement dans un contexte d'évolution technologique rapide. Les utilisateurs potentiels de la méthode d'apprentissage en ligne qui envisage de recourir à la vidéo devrait réaliser une analyse de coûts-avantages et pédagogique afin de déterminer si l'inclusion de la vidéo se omtrerait bénéficielle. La composante la plus importante dans la production d'une expérience d'apprentissage active continue d'être la qualité de la conception et du contenu pédagogique, pas le support lui-même.

## KURZFASSUNG:

Seitdem Videofestnahme, Videoverarbeitung und Videouebertragung immer zugänglicher werden, findet die Video-technik auch immer häufiger bei der Entwicklung von e-Learning Programmen Anwendung. Jedoch gehören die für die Videoproduktion erforderlichen Sachkenntnisse im allgemeinen nicht zum Hintergrundwissen vieler e-Learning Entwickler. Dieses Papier gibt eine Übersicht über die Erfahrungen von Akademikern der ‘spatial information sciences’, die bei der Entwicklung eines qualitativ hochwertigen Videos für ein on-line e-Learning Modul in Globalen Navigationssatellitensystemen (GNSS) gesammelt wurden. Das Video ist ein Element des Moduls und dient dazu, soweit möglich, den Mangel der praktischen Erfahrung im Umgang mit der GNSS Ausrüstung und Beobachtungsverfahren zu adressieren. Das Videoelement des Moduls wurde von einer Gruppe von Postgraduiert-Studenten am Dublin Institute of Technology angewandt, und die Resonanz war positiv. Die Entwicklung qualitativ hochwertiger Videos bringt viele Vorteile mit sich, doch weisen die Autoren darauf hin, dass die Kosten, Zeit und der Aufwand einer solchen Videoproduktion nicht unterschätzt werden sollten. Außerdem weisen sie darauf hin, dass multimedia-reiche Veranstaltungen, besonders in einem Gebiet in dem sich Technologien schnell weiterentwickeln, eine besondere Herausforderung an die Entwickler von e-Learning Kursen stellen. Vor einem Einsatz der Videotechnik sollten sowohl eine Pädagogische als auch eine Kosten Analyse erstellt werden, um zu entscheiden ob dies lohnend ist. Der wichtigste Bestandteil im Produzieren einer

## 1. INTRODUCTION

Video, with audio, can be an excellent means of communication. As video capture, editing and transmission capabilities become more accessible, video is increasingly being considered when developing e-learning content. However, the skills required for video production are not commonly part of many e-learning developers backgrounds. This paper presents the experiences of academics from the spatial information sciences when developing video content for an e-learning module on Global Navigation Satellite Systems (GNSS) (McGovern *et al.*, 2007). The issues that arose and the decisions taken will help inform others considering using video for e-learning.

There are, currently, many developments taking place in the GNSS area including the modernization of existing systems and the development of new systems. With these developments comes an increasing demand for knowledge, training and upskilling of professionals engaged in this field (Martin *et al.*, 2003). Previously, a part-time evening course in GPS was run at the Dublin Institute of Technology (DIT) by the Department of Spatial Information Sciences (DSIS). This was a city campus-based course and many potential participants were precluded from attending because of access difficulties. The course is now being replaced by two e-learning modules in GNSS designed for remote, on-line delivery and will form part of a suite of e-learning modules under development at DSIS (Mooney & Martin, 2004). The first module comprises GNSS for navigation and Geographical Information Systems applications while the second module will cover GNSS for higher-accuracy applications such as geodetic surveying and geophysics. The design challenge is to develop modules that maximize the advantages of e-learning while maintaining a sound pedagogical approach. A significant issue was identified as no 'hands-on' experience of GNSS equipment and observing procedures. The use of a video element within the course was proposed to, as far as possible, address this issue. Available on-line sources of GNSS-related video material were examined including YouTube®, the popular video-sharing website, and the websites of leading GNSS equipment manufacturers. Content from these sources was considered unsuitable for the academic and professional learning requirements of the proposed modules for reasons of quality, content and/or emphasis and so it was decided to develop original video content.

## 2. VIDEO PRODUCTION

From the outset, it was decided that the content should be of high quality to complement other multimedia elements of the modules and to ensure that the expectations of a potentially disparate client-base would be met. Quotations from professional video production companies were sought but proved prohibitively expensive and it was decided that the video content should be produced "in-house". The creative, technical and logistical issues that then arose, and the decisions taken, are presented as follows:

(i) Narrative – the learning outcomes were identified and narratives were developed, based on a series of data collection tasks involving GNSS equipment, to achieve the learning outcomes while maintaining relevance and interest.

(ii) Location – an objective was to replicate 'real-world' conditions and, accordingly, a variety of outdoor environments

were selected for filming. This option introduced issues such as variable lighting, background noise, interruptions by pedestrians and passing traffic, and resulted in a desirability to 'get it right on the day' in the interests of realistic continuity.

(iii) Story-board – story-boards were written that broke the content into discrete clips, set-out the individual actions therein and described how they should be captured. Although tedious this was very important as it formed the link between the intentions of the module designers and the realization of those intentions by the production team.

(iv) Script – fully scripting dialogue is very time-consuming and filming outdoors meant that some script flexibility would inevitably be required. Accordingly, it was decided to improvise the dialogue during filming.

(v) Presenter – using an actor as presenter was, in some ways, desirable but had significant cost implications and would require full scripting. Accordingly, academics familiar with the technology and, therefore, capable of improvising were used.

(vi) Camera operator – besides basic camera operation, important issues such as lighting, timing, framing and sequencing need to be considered when producing high-quality video and, accordingly, it was decided to employ a professional camera operator.

(vii) Audio – live voice recording can be more realistic than voice-over but can be affected by background noise and, especially when unscripted, various pauses, verbal ticks, etc. Voice-over is clearer but can sound less engaging and is quite time-consuming as it often has to be carefully synchronized with associated video. Voice-over is, however, useful for scene-setting and for providing supplementary information. Accordingly, both options were employed as appropriate.

(viii) Props – a particular video scene introduced the range of GNSS receivers from hand-held to high-end, carrier-phase based units. This had logistical implications as many of the units were not immediately available.

(ix) Video editor – sophisticated professional software and video editing skills are required for high-quality video production. Accordingly, it was decided to engage a specialist to carry-out the video editing in liaison with the course designers.

(x) Costs – high-quality video can be expensive to produce. In this case, costs were kept to a minimum by utilizing services and skills available within DIT wherever possible. The only direct cost was for the camera operator.

(xi) Time – the process of video production is very time-consuming and the course designers found that the production of 45 minutes of video content took *c.* 300 man-hours in total, broken down as 150 man-hours for design and preparation, 25 man-hours for filming and 125 man-hours for editing. With an experienced crew, it is estimated that these figures could be reduced by 25%.

## 3. ASSESSMENT

To assess the quality and effectiveness of the video content, it was used to replace the practical element of the GNSS section of the Masters (M.Sc.) in Spatial Information Management at

Dublin Institute of Technology. This is a part-time, taught Masters programme aimed at mid-career professionals working with spatial information. Programme participant experience with GNSS equipment and data collection ranged from virtually none to reasonable. As such, the participants were quite representative of the intended market for the GNSS e-learning modules. Having received a lecture on GNSS theory and its applications, the participants then watched the streamed video content which introduced and categorized the variety of GNSS equipment on the market and then proceeded to demonstrate GNSS data collection in typical scenarios for stand-alone and differential GPS (DGPS). At the end of the video presentations the participants completed a questionnaire which was divided into four sections dealing with learning outcomes, video as an instructional tool, the quality of the video and some general questions relating to online video delivery. The questionnaire and a summary of the responses are shown in Table 1.

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## 4. CONCLUSIONS

From the responses summarized in Table 1 it is apparent that video can be an effective learning tool and can, to some degree, substitute for practical work. However, the technical quality of the streamed video is an issue and solutions will clearly depend on host and local information technology (IT) infrastructures.

Video content for the first module of the GNSS e-learning course under development at DIT is near completion. Initial reaction from a pilot group selected to assess the efficacy of the video material is positive and more rigorous assessment will take place in the context of the completed e-learning module. While acknowledging its advantages, the cost, time and complexity of producing high-quality video should not be underestimated. Also, it should be noted that keeping multimedia-rich courses current will be an on-going challenge. E-learning course developers considering using video should carry-out both a pedagogical- and a cost-benefit analysis to establish if the inclusion of video is worthwhile. The most important component in producing an active learning experience continues to be the quality of the instructional design and content, not the media itself.

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**GNSS Questionnaire**

**E-learning Video  
Global Navigation Satellite Systems**

In each section please tick the appropriate box for each question,  
where 1 = very poor; 2 = poor, 3 = fair; 4 = good, 5 = very good

**Section A**

Having watched all three videos please comment on the following with regard to the learning outcomes

		1	2	3	4	5
1	Rate your awareness of the range of GPS/GNSS equipment				X	
2	Can you distinguish well between the three main categories of equipment				X	
3	Appreciate how a hand held GPS unit could be used for practical purposes				X	
4	Appreciate how a handheld GPS unit can be used for route mapping				X	
5	Appreciate how Data Dictionaries are set up in pathfinder Office				X	
6	Appreciate how an inventory survey for GIS purposes is carried out			X		

**Section B Presentation Media**

Having watched all three videos please comment on the following with regard to using video as a learning tool

		1	2	3	4	5
1	How usefull would you rate video as a means of imparting practical information				X	
2	How do you rate video as a substitute for practical demonstrations			X		
3	Do you think the video clips were too lengthy	Y			X	
4	Do you think the video clips contained too much detailed information	Y			X	
5	Would you like to see more technical information disseminated using video as a medium	Y	X			

**Section C HEANET Video Streaming**

Having watched all three videos please comment on the following with regard accessing the video through the www

		1	2	3	4	5
1	How do you rate the speed of the connection for video files				X	
2	How do you rate the resolution of the video files			X		
3	How do you rate the quality of the video imagery		X			
4	How do you rate the physical size of the video on screen				X	
5	How do you rate the sound quality of the video material			X		
6	How do you rate the speed of dialog			X		
7	How do you rate the functionality of the streamed video material (i.e. - capability of pausing the video and jumping ahead/back)				X	

In Section D please give a brief answer to the relevant questions.

- 1 **Did the content of the video meet your requirements from a knowledge perspective?**  
Yes - up to a point
- 2 **Did the content of the video meet your requirements from a WORK perspective?**  
Generally yes but considerable variation in response
- 3 **What suggestions would you make to improve the current video material.**  
Considerable variation in response
- 4 **Taking each Video Clip in turn can you make any recommendations for improvement, in either content or structure.**  
Considerable variation in response
- 5 **General comments**  
Considerable variation in response

Table 1. GNSS video assessment questionnaire with summary of responses.