"I'd rather be watching the telly…": Do rich media approaches offer real teaching and learning benefits for GIS software tuition of digital natives?

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1. Introduction

Interest in effective approaches to teaching and learning in the spatial sciences is evident through recent funding of major initiatives such as the Spatial Literacy in Teaching (SPLINT) centre of excellence (University of Leicester, University of Nottingham and University College London). Indeed, SPLINT is concerned with the challenges and opportunities facing geographical information science educators including; (1) the increasing recognition of our students as 'digital natives' (Prensky, 2001), (2) the ease with which media-rich materials (e.g. audio and video podcasts) can be now created and distributed (Mount and Chambers, *in press*) and, (3) the pressures from universities and organisations such as the Higher Education Academy (HEA) and Quality Assurance Agency (QAA) to improve teaching and learning quality through technology adoption. To this end, it is involved in investigating the pervasive view within Higher Education that sees the adoption of the latest technologies in teaching and learning materials in any subject discipline as a positive goal, with learning benefits following such developments.

Too often it assumed that learning benefits will be inevitable and this view can be traced back to elements of the education literature in which a causal link between media richness and learning outcomes has been asserted (e.g. Kozma, 1994). Given this background, it is surprising that approaches to software tuition in GISc modules often remain locked in the production and use text-based manuals and screenshots: a very low-technology teaching solution to a very high-technology discipline. The questions of whether these traditional materials represent best practice, what alternatives exist, and what the learning benefits of these alternatives are must surely be considered.

In this paper the arguments surrounding rich media and improved learning will be reviewed and the experiences of adopting rich-media materials (video-podcasts) for

GIS software tuition in the University of Nottingham's Introduction to GIS module will be considered.

2. The media richness debate

Placing the above questions into the educational literature requires consideration of the media-richness debates of the last 25 years. These debates centre on whether learning is influenced more by content and instructional strategy than the medium of delivery or, indeed, whether the richness of the media used to deliver instructional material has any learning benefits at all (compare Kozma, (1998) and Clarke, (2001a) for very different views). Indeed, the notion of a simplistic, positive causal relationship between media richness and learning is now broadly considered to be false, with more complex questions about how the capabilities of media should be used to influence learning for particular students, tasks and situations being of crucial importance.

This is a much more helpful approach to the problem, and one which implies the importance of using media to influence cognition and the cognitive process. Several cognitive studies show, the traditional manual does not integrate information sources well and the effort required to achieve such integration can cause difficulties for many learners (Clark, 2001b). For example, Mousavi et al. (1995) show cognitive improvements in understanding integrated information for complex scientific concepts and Sweller (1999) identifies benefits in terms of data redundancy.

The debate also extends to considerations of student motivation and studies investigating the motivational benefits of media-rich, televisual instruction versus print. A positive relationship between media-richness and student motivation to learn would appear an intuitive outcome for the contemporary, digitally-native student. However, evidence from classic educational psychology studies (e.g. Salomon, 1984) highlights the fact that a student's motivation is influenced by their expectations about their chances of learning from a given media, rather than the media alone.

Whilst a simplistic link between media richness and learning does not exist, the capability of media-rich materials to improve cognition via improved information integration, reduced information redundancy and improved learner efficiency has been shown to be beneficial. Coupled with this, engagement with rich media is likely to improve student motivation, not through the media itself, but rather because of learner expectations.

3. Introduction to GIS: module strategy.

The University of Nottingham, requires all of its undergraduate students in geography programmes (between 180 and 200 students each year) to complete a compulsory level 1 module in GIS. The module, covering 10 weekly sessions, comprises a weekly lecture (approximately 1 hour) in which the emphasis is on theory, and a weekly practical (approximately 2 hours) in which emphasis is placed on linking and embedding theory through practical experience whilst gaining skills in using and applying GIS software.

Prior to 2006/07, teaching materials for the module comprised text and screenshot manuals. Student feedback indicated that practical classes were unpopular, with the text-based materials perceived as difficult to follow. Students lacked confidence about their ability to meet practical learning outcomes and had poor motivation. In response to these concerns, a strategy was developed (figure 1), centred on the replacement of text-based manuals with video podcasts, (note that the term *podcast* is used in a loose manner with no RSS delivery required).

In total 24 separate video podcasts were produced, totalling 136 minutes of viewing. These replaced 60 pages of paper-based manuals and 45 screenshot illustrations. The key benefits to learners were recognised as centring on:

1. improving student cognition through improved information integration, reduced information redundancy and an improved representation of the dynamics of software operation;
2. improving teaching material flexibility by offering rewind and recap functionality and the ability to access learning materials flexibly through web-based streaming or as MP4 downloads to PCs or mobile devices;
3. improved student motivation through engagement with the mobile devices and podcasting technologies which are an integrated component of contemporary student's lives.

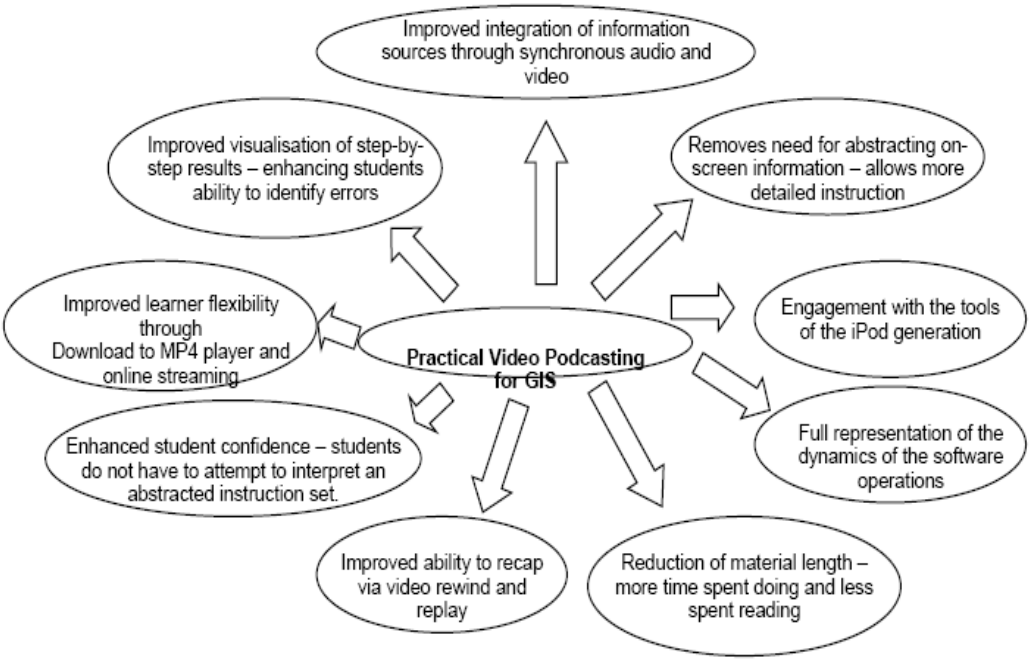

Figure 1. The perceived benefits of video podcasting in the practical elements of the Introduction to GIS module, created as part of the strategy developed during the re-design of the module.

4. Research Methodology and Process

A three-pronged evaluation process was employed, undertaken by external researchers. Quantitative data were captured through an end-of-semester questionnaire (n=96), and WebCT logs of individual student activities and marks.

Qualitative data were captured through four focus groups and nine personal interviews with students and analyzed using a grounded theory approach.

5. Results

5.1. Qualitative results

Analysis of the transcripts identified four main categories for which the use of podcasts was identified as beneficial by the groups:

1. Material flexibility and reuse
2. Promotion of independent learning
3. Cognitive benefits of rich media
4. Student engagement and motivation

The indication of significant material reuse provided by the questionnaire was confirmed in the focus groups and interviews with students commenting on their repeated use of podcasts to support coursework and allow flexible learning by undertaking practical exercises outside of the designated practical periods. Students noted the value of being able to fast forward, rewind and recap and indicated that the video podcasts, giving students control over their learning, enabling them to work independently and providing improved confidence. Several students directly highlighted the cognitive benefits of integrated rich media, over text-based instructions and recognised the benefits of dynamic materials in which a representation of *where* to go, as well as *what* to do was provided. The video podcast approach provided students with improved clarity in the instructions given and this helped to improve motivation through enhanced confidence. Students also commented on the freshness of the podcasting approach being engaging: in particular, the contrast with text-based materials requiring substantial reading was made.

5.2. Quantitative results

End-of-module questionnaires assessed the ability of students to access the podcast technology and student engagement with the podcasts. 100% of students had access to personal computing facilities over and above those provided by the university, with a high proportion of MP4 players available on personal devices including mobile telephones (21%) and video iPods (77%). The high proportion of students in university accommodation meant that 89% had broadband access for enabling podcast download. Students employed a flexible approach to using the podcasts with material reuse: 34% indicated that their use was split equally on and off campus. However, only 10% downloaded the podcasts to laptop or MP4 players. Given the high proportion of students reporting ownership of MP4 players (77%), this may indicate an unwillingness for students to place ‘work’ material onto devices they consider as ‘entertainment’.

5.3. User statistics

Individual student user statistics (n=179) were collected for total number of podcast downloads, marks for the practical assessment item and the overall mark for the module, with incomplete records removed. Podcast download numbers were

regressed against practical assessment marks and overall module marks as a measure of the direction and strength of the relationships between them. Unsurprisingly, both relationships are also statistically weak with the correlation coefficients indicating that improving marks can not be explained solely on the basis of podcast downloads in either case (no coefficient was > 0.02).

7. Summary

The evaluation highlights the motivational benefits of video podcasting. Certainly, the doubling of the uptake of level 2 GIS modules following the introduction of video podcasting (an average of 17% between 2002 and 2005, and 46% in 2006) would strongly suggest improved student motivation. Video podcasting improves learner cognition through better integration of the visual and textual materials found in text-based manuals and improves learner efficiency through reduced information redundancy and a less abstract representation of the steps needed for effective software operation. It encourages a more flexible approach to learning, offers a new element of learner independence and control and improves student motivation by directly engaging with contemporary student's expectations about the benefits of mobile technologies for their learning.

Media-rich materials should be considered a realistic and achievable alternative to text-based manuals for those involved in the teaching of GISc, but only where clear evidence exists that students are equipped with the necessary technology and hardware to benefit from them. Like any other enriched media, video podcasting is not a 'quick fix' for improving student achievement within a module. Indeed, simply replacing text-based manuals with podcasts is unlikely to have any significant learner benefits unless it is accompanied by a clear teaching strategy which considers the limitations of existing media approaches, the nature of the benefits (both direct and indirect) offered by podcasting and the underlying instructional method upon which the media will be developed.

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Biographies

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