The Use of Geo-Spatial Technology in Handheld Devices for Teaching Geography in a Formal School Context

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INTRODUCTION

Mobile learning (m-learning) is considered by some as a new reality while others trace it back to the 1980s and earlier when handheld devices such as calculators, electronic dictionaries and pocket wordprocessors were introduced into classrooms. At its most basic level, m-learning is described as the learning which occurs when the pupil is mobile or able to move freely without being confined to a physical location such as a library, classroom or computer suite (Kukulska-Hulme & Traxler, 2005; O'Malley et al., 2005; Sharples, Milrad, Arnedillo Sanchez, & Vavoula, 2009) thus including all learning which may result from connections with books, people, places or technology. However the more widely understood meaning of m-learning which reflects present society is "*the use of mobile or handheld IT devices, such as PDAs, mobile phones, laptops and tablet PCs in teaching and learning*" (Wood, 2003, p. 65) indeed Quinn (2011) includes an increased level of productivity when both using and creating information through pocket-sized digital devices in recognition of the dual role of mobile technology in today's society. It is the portability and pervasive nature of the device which often distinguishes m-learning from e-learning as m-learning is considered to be "*spontaneous, personal, informal, contextual, ubiquitous (available everywhere) and pervasive (so integrated with daily activities that it is hardly noticed)"* (Kukulska-Hulme & Traxler, 2005, p. 2). It is these latter definitions of modern technologies and their m-learning potential which will be the focus of this article.

Over the past ten years mobile learning (m-learning) has grown in use in schools around the world (Sharples, 2007; Sharples & Roschelle, 2010) with learning occurring both formally inside the school, as well as informally outside school. The widespread availability of mobile technologies such as mobile phones, personal response systems, personal digital assistants (PDAs) with GPS, mp3 players and touch screen tablets, offers opportunities for all teachers to reconsider how they teach when the traditional constraints of the physical classroom can be replaced with the virtual world of personalized and up-to-date learning on demand.

The use of m-learning tools however does not automatically guarantee learning: teachers need the skills and expertise to design and develop pedagogically sound opportunities for mobile learning in environments conducive to a blend of both formal and informal m-learning experiences (Duncan-Howell & Lee, 2007). To date, much of the research into the use of geo-spatial technology has addressed contexts outside the standard school curriculum such as adults geo-caching (Hall & Bush, 2013) or teacher educators' use of Geographical Information Systems (GIS) (Baker, Palmer, & Kerski, 2009). As handheld devices with built-in global positioning systems (GPS) become more widely accessible to increasingly younger users, calls are being made to teachers to utilize these novel geo-spatial technologies to engage pupils and enhance the teaching and learning process (Brooks, 2012; Baldwin, 2012; Kinniburgh, 2010; Jackson, 2006; Buckanek, 2011). At present there is little research focusing on pupil attainment in geography as a result of using personal digital assistants (PDAs) with GPS (McLean,

DOI: 10.4018/978-1-4666-5888-2.ch257

2003; Beetham & Sharpe, 2007) and in particular, little is known about the impact of GPS-enabled PDAs when teaching secondary/high school pupils for national examinations. The majority of m-learning studies have been small scale pilots with non-examination classes focusing on the affective measures of pupils' enjoyment and engagement in the process of learning (Facer, Joiner, Stanton, Reid, Hull, & Kirk, 2004; Wood et al., 2004; Davey, 2007; Battista, 2008) or research with adults in language learning (Liu & Tsai, 2013), history (Chen & Choi, 2010) or in museums (Fevgas, Tsompanopoulou, & Bozanis, 2011). Most large scale studies of teenagers' use of PDAs have been in games-based, informal settings where the technical functionality of the devices was the focus of attention rather than the academic learning outcomes from these mobile experiences (Ericsson, 2002; Mobilearn, 2005; Huizenga et al., 2009). By focusing on the use of GPS-enhanced PDAs within a formal school setting with pupils enrolled on a two-year program preparing them for compulsory national examinations in Geography, this article extends the existing research into the use of geo-spatial technologies to include content delivery to secondary/high school pupils in a subject-specific formal school context.

BACKGROUND

What is a Geo-Spatial Task?

By integrating GPS with the use of a Personal Digital Assistant (PDA), a multimedia learning object can be triggered to begin automatically when a person enters a pre-defined space. This media is then presented on the screen of the PDA and/or via headphones as the learner moves through the digital space or digital landscape. These geo-tagged spaces or 'media landscapes' may also be referred to as mediascapes (or mscapes). A geo-spatial task is hosted in one of these mediascapes and is therefore responsive to the learner's geographical position within the geo-tagged space (as determined by the GPS). The multimedia objects change depending on the position of the learner as he/she moves in the mediascape thus enabling users to engage in a location-based experience for fun and/or educational purposes and even to experience the passage of time if re-living a battle or war at the location by revisiting a location multiple times. As Hewlett-Packard (2008) explain

A place is a place. A mediascape is an experience… Mediascapes are rich in interactivity – full of sound and music, images and text, videos and animation, narrative and dialog, all embedded in the space in which you are standing.

The uniqueness of the mscape experience compared to other media-rich experiences delivered via a mobile device is the "*logic that specifies the relevance it* [the multimedia] *has to the physical situation*" (Stenton, Hull, Goddi, Reid, Clayton, Melamed, & Wee, 2007). Loveless, Denning, Fisher & Higgins (2008) believe mscapes enable the creation of m-learning activities which afford "*rich learning experiences*" (p. 354) a view supported by Naismith, Lonsdale, Vavoula, and Sharples (2004) and Battista (2008) who posit, the process of creating the m-learning experience from conception through to completion enables pupils to construct deeper connections and meaning to the content. This suggestion is especially pertinent to geography where calls are being made to modernize the pedagogical approaches used in teaching to take account of the affordances being offered by new technologies (Baldwin, 2012; Kinniburgh, 2010). In addition, teachers have a social responsibility to prepare young people for the world of work where many of the traditional skills are being automated through the use of computers. Information and communications technology has already been shown to motivate and engage pupils (Balanska, Blamir, & Kefala., 2006), to enhance their learning experiences (Cox *et al*., 2003) and to include transferable skills which will prepare them for third level education and/or increase their employability (Becta, 2004; Buckanek, 2011). Although examination bodies are not stipulating the use of technology in the content of their curriculum specification there is a token gesture to its beneficial role for pupils in statements such as "*pupils should have opportunities to apply and develop their ICT capacity through the use of ICT tools to support their learning*" (AQA, 2008, p.7). However exemplification of potential sources of ICT considered suitable for teaching include digital photographs; spreadsheets or databases to capture, collate or search data; and the use of Internet websites, TV programmes or videos to extract information on recent world events. Unlike Science teaching where pupils experience laboratory work (such as mixing chemicals), using microscopes or sensors, analyzing dissections or setting up circuit