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Location-based mobile phone applications for increasing student engagement with field-based extracurricular activities

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Abstract

With pressures on university and student finance, and an ever growing number of internet-enabled portable devices, we investigate the ability for free, 'self-guided' field-trips – using GPS features present on most modern smartphones, combined with internet access to provide background information and receive responses from participants. We create a field-trip around Cheltenham, to examine rock types commonly used for buildings. Student motivation to complete the extra-curricular task was reasonable, with 50% of students participating. However, few thought their geological knowledge had improved. We suggest that as well as some minor technological issues, the potential use of mobile internet and apps for teaching in higher education may have been overestimated (especially since motivation will decrease with novelty of the use of the technology). This may be related to how people in general, and students in particular, use mobile technology: instant bite sized knowledge conflicting with the deep learning required for higher education.

Introduction

For subjects with a strong field-based component such as geography, geology, environmental sciences and ecology, the importance of field trips is well established (Smith, 2004; Dillon et al., 2006; Rahman and Spafford, 2009; Gamarra et al., 2010; Hart et al., 2011). However, time and budget constraints (of students and universities) are limiting the number of these activities which are taking place (Smith, 2004). One option is to prescribe extracurricular 'field-based' activities – especially to allow students to explore their local environment (e.g. Morris, 2004). As such, learning can take place outside of the lecture theatre, but budgets, staff time and other resources are not used by formally teaching these sessions, and the local nature of the excursion keeps student costs negligible. However, in reality, many higher education students do not engage with extracurricular activities, designed to enhance their learning of a subject, beyond what can be done in a formal lecture / practical class (Crosling et al., 2007).

With the rise of mobile technology, there have been increasing numbers of 'geo-location' games and activities (which utilise GPS or mobile signals to determine the user's location) (Benford et al., 2006; Marins et al., 2011). Many of these games have proved highly popular, and have resulted in large communities of participants. Such approaches could have great potential for self-guided fieldtrips, guiding students to specific locations and getting them to observe features of the area. For example, the mobile 'app' SCVNGR (pronounced 'scavenger'), is a take on traditional scavenger hunts, providing a list of locations and tasks to perform at each location (i.e. 'check in', answer questions or take photographs). Such an approach should be ideal for 'self-guided field-trips', however, in practice, there is a strict limit on words needed to describe each task, so providing information of academic importance (i.e. geological characteristics, rare species) becomes impossible within the framework of the application.

The development of HTML 5, however, provides many tools for the design of mobile webpages, which integrate features of most mobile phones with an internet connection (Firtman, 2011). This allows design of webpages that can easily find user location details, for example. As such, mobile friendly webpages can be developed for use on over 90% of the current UK mobile phone market (as opposed to 'apps' which are generally confined only to high-end smart phones such as those produced by Apple or using the Android operating system, which currently have a much smaller market penetration). Development of webpages also removes the constraints of existing geolocation apps, meaning that useful information about any location, and what is present there, can be given – facilitating learning while present in the field environment.

The aim of this study was to 1) develop a mobile web-site suitable for use as a self-guided field-trip. 2) assess the levels of use of the website, and hence the number of students engaged in extracurricular activity. 3) assess student responses to using mobile technology (i.e. was it easy to use, did it encourage participation and did it increase their knowledge of the topic).

Methods

The field-trip was designed to examine rock types, geological formations and weathering in a variety of location in Cheltenham, UK. The website was designed to mobile W3C standards, following the conventions in Firtman (2011). For each of the 10 locations used, a series of questions were asked about the rock types, which either involved typing one or two words of text, or clicking on radio buttons (for example, for 'yes' or 'no' answers). Submitted results were stored on a remote server, and included the answer(s), the time and date of the answer, the IP address (to help determine unique responses – see discussion for further details, and to compare with eventual submission of name or ID, so feedback on answers could be given) and the location (latitude and longitude) where the answer was submitted, was recorded. Geolocation features were implemented using the free to use 'geolocation-javascript' package (detailed in Firtman, 2011) and were used to indicate the distance to nearby locations from the current location, to send coordinates to Google maps to provide directions to each site, and were recorded at the time and place at which the question was answered (to determine if questions were answered in the field, or elsewhere).

The working website can be accessed at http://www.esafari.co.uk/rocks/ and will work from most mobile devices (although see results) as well as desktop computers (although it is not designed for use of desktop devices and hence has a very basic appearance). It should be noted that some university or other firewalls disable the or otherwise modify the geolocation service found through the internet connection.

The website address was given to first year (Level 4) geography students undertaking a module titled Earth Systems and Processes, at a medium sized university in the southwest of England, in November 2011. The module had 40 registered students. The students were given two weeks to undertake the project, and following this period, were asked to complete a short questionnaire answering the following questions, designed to assess the type of technology used, issues relating to the technology, motivation to do the work, and a self-assessment of learning from the process:

1. What type of mobile device did you use?
2. Was the technology easy to use? (1-10 scale)
3. Were there any issues using the technology, if so, what?
4. Would you like to see anything regarding the technology changed?
5. To what extent did the use of technology motivate you to do the work? (1-10 scale)
6. Would you still have done this work if you were given questions on a sheet of paper?
7. Would you take the opportunity to do more of these geo-locating trails if offered?
8. Has your knowledge of geology/weathering improved as a result of this trail? (1-10 scale)
9. Has your orientation of Cheltenham improved?

Results

Depending on the location, a minimum of 5 and maximum of 13 answers were recorded from the mobile website on the database. The 13 answers appeared to contain one answer resubmitted twice, since they were recorded in quick succession, from the same IP address, and contained identical answers – hence a maximum of 12 unique answers was recorded. If everyone had worked independently, this would give an uptake rate of 30%, however, a total of 20 paper questionnaires (or 50 % of the class) were also collected, indicating some people probably worked in groups.

The nearest and easiest to find locations gave the highest proportion of responses. For example, the highest number of responses was from a site on the University campus, where as the lowest number was for a churchyard slightly set back from the main shopping area of town. For easy to find locations, there were also a decreased proportion of sites with GPS coordinates, suggesting these may have been accessed by people without the use of the ‘link to Google maps’ feature – hence not needing to activate GPS on the mobile device. Where GPS information was included, it indicated the questions had been answered at the appropriate location.

Out of the 20 responses received, 13 students indicated they had used a generic internet enabled mobile phone (i.e. not one of the leading smartphones mentioned below). Only three students had used an Apple iPhone, one student had used and Android phone and two had used Blackberries and one had used a Nokia N8. The technology proved problematic to the participant using Nokia N8 phones, as it seem incompatible with the geo-locating Javascript. Blackberry users seem to struggle with pages loading, and occasionally pages were slow to load on some other phones. The single Android user struggled with directions on Google maps (although the site was developed and tested using an Android smartphone). A San Francisco phone was also incompatible with radio buttons. Although these problems were registered, participants responded to the ease of use evaluation question (Q2) positively, generating a mean score of 6.53 (Figure 1). No suggestions were made to improve the technology, however, indicating there were no obvious shortcomings in the design of the website, other than compatibility issues with various devices.

Overall students did not find the exercise particularly stimulating. Although a relatively high number (50 %) attempted the extracurricular activity, those that did, generated a mean score of 4.9 for a question on their motivation to complete the task (Figure 1). A large standard deviation suggests that a few students were motivated but perhaps the problems with the technology deflated the scores. Also of interest, in terms of motivation, were the times of submission of data – with only one record being submitted before 11.30 am, and the vast majority being submitted during the mid to late afternoon.

When asked whether the task improved their knowledge of the topic, answers ranged from 1 – 10, with a mean score of 5.0. However, many answers submitted were factually incorrect, and the feedback session on the task may have improved knowledge further. Most (65%) participants suggested that their orientation of the town centre had improved, suggesting that this could be a useful exercise to undertake during the first year induction period.

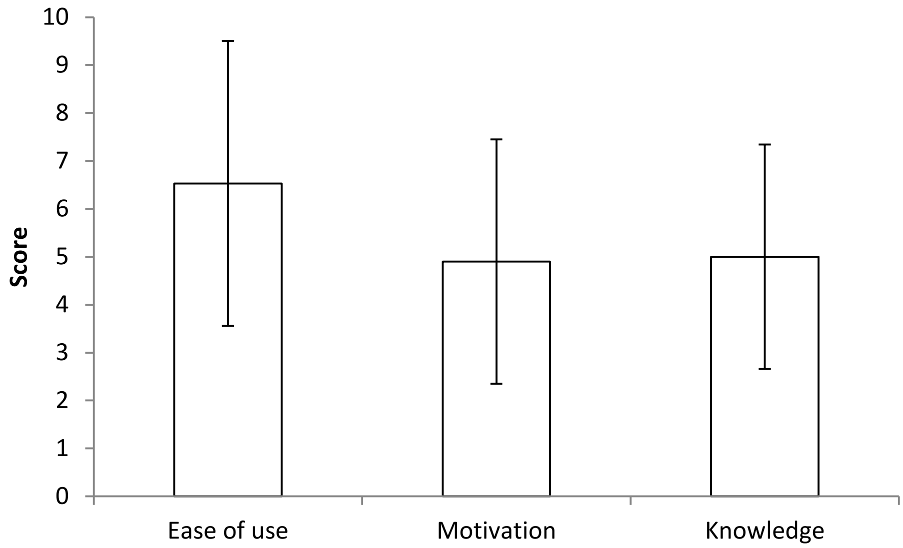

Figure 1: Mean (±S.D. n = 20) score for questions 2 (ease of use), 5 (motivation) and 6 (improvement of knowledge).

Discussion

The role of technology in higher education is an important topic, and there are many claims that it will revolutionise the provision of degrees in the future (Glenn, 2008). While perhaps the biggest changes have come from the use of the internet (for example, online journal articles, open access publishing and open educational resources), the advent of mobile internet creates many more potential opportunities (Alexander, 2004; Glenn, 2008).

This paper presents an up to date case study of such a provision. While some aspects (such as the ‘fieldtrip’) may be subject specific to disciplines such as earth and environmental sciences, other outcomes of the study are likely to be more generic.

At the present time, the results give a good snapshot of the incompatibilities of various smartphone technologies, despite being a generic website designed for maximum mobile phone compatibility. While no problems were recorded using Apple iPhones, the number of students using these phones was low (hence the development of a specific ‘app’ for iPhones, or for any other brand, would have significantly lowered participation). Problems were reported from many other brands of phone, including high end smartphones such as those from Blackberry and using the Android operating system. As with previous compatibility issues with technology, such problems are likely to become less important over time, but as a contemporary case study, it is clear that at the time of writing, mobile technology is not as advanced as would be hoped, and this needs to be considered in developing mobile-based teaching methods.

Although there are issues with technological compatibility, mobile-based teaching aids are in their infancy, and therefore the novelty factor should be high. However, motivation for the task was not especially high in the survey we conducted. This is likely to indicate two key issues. Firstly, that student motivation for extra-curricular activity is generally low (Crosling et al., 2007). Secondly, that if more mobile technology is used in higher education in the future, motivation for the task is likely to fall, as the novelty factor decreases.

Perhaps, key to understanding motivation issues, as well as the low perceived gain in knowledge from the current task, is an understanding of how mobile (and indeed, internet technology) is generally used. In general, mobile internet (and web-based apps in general) is used as a form of communication through social networks, text or email, or to upload and share photographs or videos; and to obtain instant information, i.e. locations of pubs or restaurants or train, bus or cinema times, (BuzzCity, 2008; Lenhart et al., 2010). Hence, its use in education should perhaps mimic this. Rather than asking questions which may require prior or subsequent research (such as the identification of rocks and geological formations), mobile technology should be used to provide site specific information, albeit in short, easy to understand form. Given higher education generally requires reading large amounts of complex literature, and formulation of deep understanding, the use of mobile technology may not play such a large role (outside of activities such as orientation or induction) as many might have hoped.

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