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Learning across contexts – mobile for fieldwork in Environmental Sciences

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Context

The culture, practice and pedagogy of academic disciplines such as geography and environmental sciences are based around *in the field* activities as well as traditional learning in face to face, online and laboratory scenarios. Downward et al (2008) have argued that environmental scientists are uniquely positioned to pilot mobile technologies, because they work across so many different contexts.

Figure 1 depicts the varied contexts in which environmental students are now expected to work. Within each of these disciplinary contexts learners should have access to all the resources they need, as well as the ability to capture, reflect on, develop and extend their ideas into other contexts.

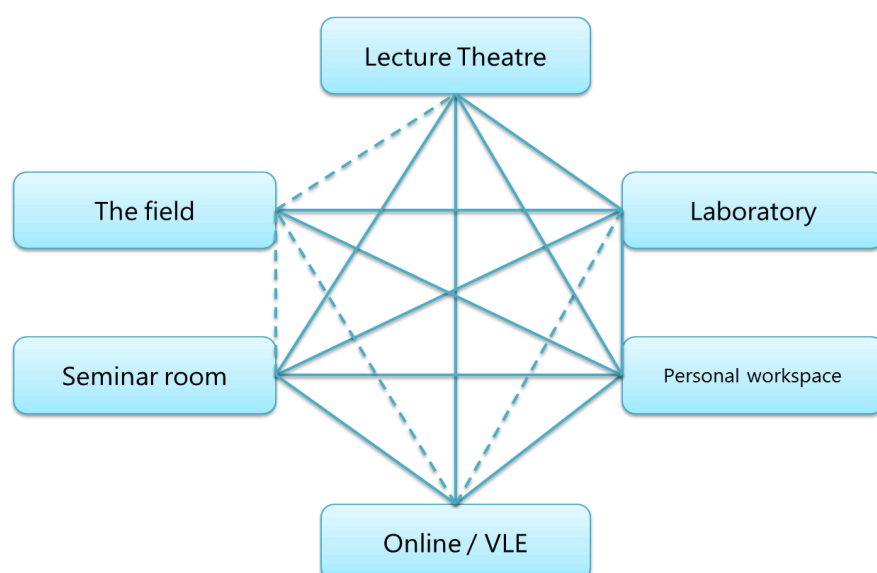


Figure 1

As Kukulska-Hulme et al (2007) note, mobile learning may offer a solution to this problem, by encouraging students to use “portable tools that support observations, interactions, conversations and reflections, within and across various contexts of use...” (p.53).

With this in mind we wanted to find a solution that could facilitate students’ learning both *within* and *across* these contexts.

Why mobile?

Work carried out in the field has previously involved use of paper notebooks. This can be time intensive, weather dependent and limiting in terms of having previous data or other resources (e.g. handouts, maps) to hand. There is much potential for both staff and students to use mobile devices to enhance fieldwork learning, both in gathering and recording data. Mobile devices are multifunctional tools. They combine the roles of what previously required several separate devices, each performing a specific role including the use of digital cameras for capturing visual media, audio recorders and players, laptops or PDAs for processing data and reading emails etc.

We trialled the technology on two field trips. Wicken Fen National Nature Reserve in December 2011 and Stonehenge in February 2012. For both trips the tutor set up a shared blog space in the Virtual Learning Environment (VLE), Blackboard, and asked the students to record their findings on site using their mobile devices, posting directly to the blog to foster discussion on the results.

The intended result of this activity was to encourage and enable students to quickly and easily document discoveries and ideas in the field, to access resources electronically and reuse data in other learning contexts, and to encourage students to develop a collaborative approach to data sharing and discourse. Overall, the aim was to encourage students to create as well as consume data.

The process

The Wicken Fen field trip formed part of a second year module on Habitat Ecology and Management. Students were asked to observe and record details of the wetland habitat, which is one of the most important in Europe, and share their observations with the group. They also planned to use GPS to tag the exact locations of their images and notes, to share with the wider community via Flickr.

The Stonehenge field trip formed part of a Sustainable Development module, focusing on land use, visitor experiences and planning. Students were asked to consider the proposed changes to the landscape, plans for the new visitor centre and to form a case from the perspective of one of a range of stakeholders with interests in how the site is used.

For both trips, students were asked to capture images, audio and video narratives using their own mobile devices where they had them, or by borrowing an iPod Touch from the Learning Technology team if they did not. Students were also given limited access to wifi using mobile wifi hotspot units borrowed from the Learning Technology team, which can connect up to five devices via a 3G signal to upload to their Blackboard blog via the Mobile Blackboard Learn (VLE) app. There was a cost involved for the hotspot units and the data contracts which, for the pilot, the Learning Technology Team covered. In a larger scale scenario the School/Faculty would need to fund the hotspot units.

Students were also given an information sheet with some ideas on how best to use the mobile device with recommendations on which tools to use for recording data. The information sheet addressed notes apps like the standard Notes app that comes with any iOS device, and the Pages app (which is on all the iPod Touches which are loaned out from Learning Technology). It also guided students on how to enter data into spreadsheets using the Numbers app (also on the loan equipment) alongside the Forms tool (Figure 2), and use an audio recorder app to record more detailed observations in the field.



	Percent expected	Percent observed	Quantity expected	Quantity observed
Blue	40	7	36	96
Green	20	63	1	9
Red	50	30	20	10
Orange	30	60	50	10

Figure 2

These information sheets were not given to the students until the day of the trips, simply because the advantages of circulating them beforehand were not foreseen. If a longer period of time had been allowed for students to access loan devices, or just the information before the trips, then there might have been better take up of the Forms tool. In addition, the tutor could create forms for the students to use to make sure the correct data is gathered.



Benefits and challenges

Feedback from the students, via paper based evaluation sheets circulated in class, revealed that students enjoyed using the devices, particularly for photography and video, which helped them to record a large amount of data very easily. 80% of the students said that uploading their data into the blog on the VLE through the app was *easy* or *very easy*. Students commented that they found it very useful to have the ability to take pictures, make notes and record audio all in one place. There was also very little writing up/editing notes once back from the field trip. Anecdotal feedback was gathered to measure the groups' thoughts about the general use of mobile in the field and measure the impact of the learning experience – much of which was positive.

One of the main challenges of these activities was connectivity. The Wicken Fen trip was particularly affected by the very limited mobile data signal. This was challenging partly because of students' expectations of the *connectedness* of the mobile devices they were using. When handed an internet enabled device, they expected to be able to connect to the internet and start accessing information immediately. The purpose of the trip, however, was for them to record their own data, and be creators and, to a limited extent, consumers of data so expectations needed to be clearly set. One of the points to remember for the next time this exercise takes place is to perhaps place the emphasis less on connectivity in the field, and more on the ability to record data electronically in the field. This places less pressure on the technology to perform tasks like checking the latest updates on Facebook and Twitter! Managing the expectations of students when in the field is important. If they are not aware that they will not be able to access information in a timely fashion, or at all, then the overall experience may be tainted.

Unfortunately, the connectivity issues affected recording information about data that was being gathered. GPS tagging of resources was an ideal feature to identify locations of images, but often proved too time consuming (whilst waiting for data to upload/download) to benefit the experience. Some students tried out the Dragon Dictation app, but this relied on a data connection and so did not work well with the slow or intermittent signal. The same can be said about apps which rely on stored information in the cloud (Google Docs, Dropbox etc) that have not been set up to use offline, pre-field trip.

Evaluation and impact

The relationship between situated and classroom learning is one which is important for environmental scientists. However, they generally take place as separate processes. For example, Laru et al (2012) have emphasised that observations and data collections should take place outside the classroom (on a field trip) with further analysis then carried out inside the classroom, often by using software only available on the computers on campus. Bridging the gap between these situations and the contexts described in Figure 1 can be facilitated by mobile technologies. Having access to resources whilst physically being in the field can help students to recognise the interdependence of theory and practice and, therefore, increase their understanding more spontaneously and in context.

Regrettably the connectivity issues meant that this was not proven in the field for our case examples. Nevertheless, there is still value in gathering data and recording it electronically in the field. What this means is that data can be analysed, discussed and shared (once connected to a data signal) in a more timely manner. Value can also be placed on simply having access to mobile recording equipment, without having to carry the larger bags and accessories that go along with traditional recording equipment.

Future developments

With the anticipated improvements in connectivity (i.e. 4G and more comprehensive coverage of areas in the UK) from service providers, issues caused by connectivity, or lack thereof, should phase out over the coming years. This will significantly improve access to resources at the time of need and in context. It will also enable students to apply that knowledge into other contexts because of the increased understanding of the original context in which it was gathered.

We plan to put more emphasis on pre-field trip work where data gathering will be more structured, but not restrictive. This will require data signals, at least in the preparation stages of the field trip, to access the forms feature (or a similar app/feature) to distribute templates to students for them to gather appropriate data, with suggestions on how they could expand their knowledge outside of the prescribed boundaries of the form or template.

Voice recording and dictation has already moved on from the capabilities when these field trips took place, and tools like Siri on iOS may offer a solution to the issues that students experienced here.

Transferability

The same principles of this study can be applied to most fieldwork activities. The better the connectivity within the fieldwork location the richer the experience, but recording and gathering data offline and synchronising once connected still makes for enhanced practice. There needs to be more emphasis on pre-field work in future activities both from a tutor's and student's perspective. More students are starting to buy into the Bring Your Own Device (BYOD) culture within their learning environments, so inclusivity will become less of an issue, but we must be careful to make sure that there are no instances of exclusion.

The information sheet that was shared with students can be found here: <http://bit.ly/uonenvsci-mobfw> and used under a **Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License**.

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