International Virtual Field Trips: a new direction?

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ABSTRACT Virtual Field Trips (VFTs) have a valuable role in supporting and enhancing real fieldwork and empowering students who are disadvantaged financially or physically. The development of good VFT and VFT tools is still in its infancy and full ‘virtuality’ is still many years away. This article traces the evolution of virtual field trips, outlining their advantages and disadvantages and provides a brief overview of the materials and approaches currently becoming available.

KEYWORDS Virtual Field Trips, Virtual Field Course, ICT, international.

Introduction

The field course has long been an integral part of geography degrees in universities in many parts of the world and there is little doubt that this form of teaching and learning is popular with both students and staff. It is seen as providing different insights and learning experiences from those provided by a lecture or practical, as well as being a unique social experience, including the building of group identity, team spirit and good staff–student relationships (Clark, 1996). All of this is reflected in the following
feedback from students on the University of Plymouth’s Environmental Science Field Trip to Malta over Easter 1999.

I learned more in one week than months of literature study.

It is an experience I will always remember and I feel quite confident that I could give an interesting tour of Malta myself.

This trip gave me a chance to get to know people on the course I had previously never met and to get to know people I already knew even better.

Over time the approach to learning and teaching in the field has undergone many changes. Kent et al. (1997) have drawn up a schematic model of changing approaches to fieldwork in geography.

- In the 1950s and 1960s fieldwork was largely of the traditional ‘look see’ or ‘Cook’s Tour’ variety. The approach was based on observation and description, was very dependent on academics lecturing in the field, and required minimal student participation. Indeed students were often regarded as passive receptors of information.
- The 1970s and 1980s saw increasing development of problem-orientated, project-based fieldwork.
- By the late 1980s problem-orientated fieldwork was still dominant but with an increasing emphasis on transferable skills as well as disciplinary skills.
- The 1990s saw the consolidation of these approaches and in the UK a large increase in student numbers gave rise to problems of administration, accommodation and an increasing impact on the environments of the fieldwork locations.
- The 1980s and 1990s saw in many UK geography departments the development of foreign or international field trips often based on the availability of cheap packages.

New Directions

Although international field trips are certainly popular, they do have a number of disadvantages, including relatively high costs, issues of student equity (in that not everyone can afford to go), difficulties faced by disabled students, gender issues (female students may be less inclined to visit locations perceived as dangerous), language barriers, logistical and preparation problems, culture shock and the difficulty of making accurate risk assessments in advance (Ternan et al., 1999). To these (Nairn, 1998) and (Robinson, 1998) have added the potential problems of elitism and paternalistic sympathy with ‘privileged’ university students going to view ‘underprivileged’ groups in poorer societies. These difficulties and others, such as the pressure on much visited sites, have led a growing number of geographers and geologists to change direction once again by using Information and Communication Technology (ICT) to support fieldwork (Ford, 1998; Gratton, 1997; Hurst, 1998; Phipps & Stainfield, 1998, 1999; Warburton & Higgitt, 1997). This approach has given rise to the concept of the virtual field trip (VFT). It is important to emphasise that by virtual here it is meant ‘digital alternative representations of reality’. VFT is not at present an attempt to create a virtual reality, where the intention is to immerse the user fully in an interactive computer-generated environment using sensors and input devices such as data gloves and body suits and output devices such as head mounted displays and surround-sound audio systems. Instead a VFT is simply an attempt to place further autonomy in the user’s hands, by
allowing observations to be made without being on the actual site or having a lecturer at hand to explain. At its best, it should also allow interaction with the virtual environment through participation, exploration, analysis and the learning and the testing of skills both old and new. This approach has been given an international dimension by the use of the Internet to provide background information, photographs, virtual tours, clickable maps, exercises and tests about far-away places.

The aim of VFT has not been to replace field trips but rather “to introduce students to various aspects and develop some of the basic skills needed and to prepare students for going into the field or as follow up exercises after a real field trip” (Gilmour, 1997, http://earth2.open.ac.uk/Skiddaw/Text/Skiddaw.html). A second major aim has been to improve the efficiency of time spent in the field. VFTs can replace or enhance background lecturing/information transmission and so increase the time spent by students exploring specific issues in a more ‘inquiry-based’ manner both in the field and on campus. By providing more of the lecture/background material on-line, students can study it before they come to class or depart on a field trip. They can also review it after the trip. An ‘integration’ of skills, knowledge and application, as well as human-value/ethical issues, is looked for.

Such material can, of course, be delivered conventionally via a handbook. In comparison VFTs:

- give greater flexibility as they are easier to update, allowing the addition of last-minute instructions and information;
- can contain links to other sources of information databases;
- have no size limit;
- have a lower cost of production;
- cannot be lost;
- are accessible internationally;
- allow students to present their work for other students (world-wide) to see (Gratton, 1999a, http://www.aber.ac.uk/~ieswww/cti-g/students99.html); and
- allow the interactive testing of knowledge and skills.

The only advantage the conventional handbook would appear to have is its portability and even this advantage is increasingly eroded by the ability to place the material on a CD and the spread of lightweight portable computers.

Existing VFT Materials

At present there exists a variety of VFT materials that are accessible via the Internet (Table I). The largest collection at one site can be found at the Virtual Geography Department project at the University of Texas (http://www.utexas.edu/depts/rgg/virtdept/contents.html). This site contains on-line virtual fieldtrips, guidelines for virtual fieldtrips, virtual fieldtrips under construction, a virtual fieldtrips Web forum and information about a virtual fieldtrip working group. Subject listings include biogeography and ecology, climatology, geomorphology, hazards and political geography. Regional listings include Israel, Antarctica, the Aral Sea, Bosnia, Malta, Alaska, Arizona, California, Colorado, Hawaii, Kentucky, Maine, Michigan, New York, Ohio, Tennessee, Texas, Utah, Wisconsin and Wyoming.
Another collection can be found at the CTI site on Virtual Fieldtrips and Tours (based at Leicester University in the UK) (http://www.geog.le.ac.uk/cti/virt.html) which has examples from the UK, Europe, Asia and America with links to virtual libraries, natural history museums and environmental sites. Some of these are the same as those to be found on the University of Texas site.

An interesting collection of case studies can be found under *Geosystems: An Interactive Casebook* edited by Ford and Hipple (1998, http://www.wiley.com/college/geocases). This material was designed as a supplement to a set of geoscience, earth systems science, geology, geography and environmental science textbooks published by John Wiley and Sons. In contrast to many other sites which sometimes appear

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<th>Table I. Examples of virtual field trip materials</th>
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<td>Malta '97 Project Web Pages</td>
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<td>Aberystwyth Virtual Malta</td>
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<td>Earthquake Hazards</td>
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<td>Earth System Science Education</td>
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<td>Flood Hazards of Manitou Springs Colorado</td>
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<td>Point Reyes Peninsula and Vicinity Ecosystem Field Trip California</td>
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<td>The Virtual Library of Ecology and Biodiversity</td>
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to be an unstructured collection of photos, maps, and text, these case studies have a common format. Each study is divided into three sections. The first is entitled ‘About the Case Study’. This contains instructions on how to use the materials and discusses a number of key geoscience and earth systems concepts. The second section contains virtual tours and exercises. The third section is entitled ‘Learning Resources’ and contains information on how to contact experts in that area, on the places where expert information and facts can be obtained, on further learning activities and on guidelines for the instructor, as well as Worldwide Web links to related sites. In some of the case studies, there are interactive elements. For example, in ‘Earthquake Hazards along the Wasatch Fault’, (http://www.wiley.com/college/geocases/cases/case1/index.html) by Michael Hernandez there is a link to Virtual Earthquake, which is a site created by the Electronic Desktop Project at California State University. This is an interactive computer program designed to introduce the student to the concepts of how an earthquake epicentre is located and how the Richter magnitude of an earthquake is determined.

International Collaboration

From reviewing the materials and sites referred to above, it is clear that examples of international collaboration in the creation of individual VFTs are rare. One exception is ‘Environmental problems in the Mediterranean’, a case study of Malta (Phipps & Stainfield, 1996, http://www.science.plymouth.ac.uk/departments/learn/malta/).

This site is a refereed resource base with links to other sites such as the Maltese National Database of Biodiversity (http://www.mcsf.org.mt/msant/chapter01.htm). In addition to maps and photographs, the site contains specially commissioned articles by Maltese and English academics, as well as abstracts from articles where copyright permission has been granted. The approach adopted is not to replace fieldwork with a virtual substitute but rather to enhance the fieldwork through providing a resource base for a wide range of students from a variety of disciplines.

Interactivity

Few sites offer more than a rudimentary interactive element, the notable exception being Ford and Hipple (1998, http://www.wiley.com/college/ford_test/index.html). At present there seem to be three approaches to improving interactivity. Firstly, the development of interactive field exercises which simulate work to be undertaken in the field. Secondly, the development of generic software for building and running VFTs. And thirdly, student involvement in the production of Web-based materials.

Interactive Field Exercises

For example, quadrat analysis is a commonly used technique by biologists, biogeographers and environmental scientists. A computer application is under development at the University of Plymouth to simulate the random distribution of quadrats, followed by the identification of the plants included in the quadrat via reference to a stored flora database. Students are able to note their findings and then calculate the appropriate indices. Although this development is presently based on a specific site, there is no reason why such a simulation cannot have a generic application simply by adding different flora databases and maps. Similar potentially generic simulations are under development in water quality analysis and waste disposal.
**Generic Software**

The second approach is that of the Virtual Field Course (VFC) project which is a joint venture between Birkbeck College (University of London), Leicester University and Oxford Brookes University. The aim has been to develop generic software for building and running VFCs.

The VFC Project has developed a software toolkit to enhance and extend traditional fieldwork courses. It includes the following tools:

1. traVelleR: a Java/VRML multidimensional (2D/3D) interface to spatial multimedia;
2. PanoraMap: this allows the exploration of field locations through panoramic imagery linked to multiple base maps and data;
3. Urban Modeller: a tool for true three-dimensional mapping and exploration;
4. VRGIS: a stand-alone 2D/3D explorer with basic GIS functionality;
5. LandSerf: Java/Open GL-based terrain analysis and exploration (http://www.geog.le.ac.uk/jwo/research/LandSerf/landserf16/doc/index.html); and

The emphasis here is on student visualisation, involvement and presentation. Students learn by the use of visual tools that enable comparison and interrogation of spatial data in the form of maps, images, virtual-reality environments and other media. Panoromap uses maps and panoramic imagery to allow students to explore fieldwork regions and add their own data to the VFC database. For more details see (http://www.geog.le.ac.uk/vfc/index.html) and also Moore (1999).

**Student-centred Web Sites**

The third approach to increased student interaction is that of encouraging students to display their work as a Web page (http://www.aber.ac.uk/~ieswww/cti-g/students99.html). Not only does this motivate and enthuse students but it also encourages the development of valuable C&IT skills (Gratton, 1999b).

**Constraints and Opportunities**

Most VFT resources cannot be constructed cheaply and to achieve Unwin’s criteria of “the re-creation and support in a virtual environment of the pedagogic activities traditionally executed in the field” (Unwin, 1996) is likely to be very expensive. Even if considerable effort and investment is made in creating VFTs, they are likely to fall short of the real fieldtrip experience of learning in the field:

… a virtual field trip cannot communicate the awe of a spectacular landscape; the sights, sounds, and smells of the city; or the shared experience of a trip to the copper mines. While some of our subject matter can be conveyed successfully electronically, the essence of what it means to be a geographer cannot. (Gober, 1998, pp. 1–2)

What a VFT can offer is a different form of interaction. In the field, interaction is with people and places: in a VFT, interaction is with time and space:

One of the most exciting potentials of virtual reality in education is the ability it has to allow for high levels of interaction on a multitude of levels. VR has
the ability to model time, process, space and morphology and… allow the user … (to) alter these components. (Jenkins & Williams, 1997).

Conclusions

Given that we are many years away from creating a VFT that could be properly called virtual reality where the user is fully immersed in an interactive computer-generated environment, Jenkins & Williams (1997) pose the question: “What should a VFT do to extract the maximum educational value from existing field excursions?” The following would seem to be achievable in the short term:

- preparation of students for a conventional field course;
- development of fieldwork skills;
- give a ‘virtual’ experience of field course projects which are student-centred;
- provide a searchable knowledge base on topics such as the local geology, flora and fauna, settlement patterns, and so on;
- allow a range of ‘virtual visits’ and hence comparisons at almost zero cost;
- permit assessment and feedback;
- encourage collaboration amongst students;
- offer interactive experiences;
- create simulated environments; and
- empower those who by reason of financial constraints or physical disability are at present prevented from the field trip experience.

And, of course, to be truly international all virtual field trips should be available in several languages!

Finally, VFTs placed on the Internet meet the objectives of the International Network for Learning and Teaching of Geography in Higher Education (INLT) by providing a focus for the international exchange of materials, ideas and experiences, whilst encouraging the development of innovative and stimulating Web sites which are available to all.

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WEB SITES

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The Virtual Geography Department Project at the University of Texas (http://www.utexas.edu/depts/grg/virtdept/contents.html).

CTI Centre for Geography, Geology and Meteorology: Virtual Fieldtrips (http://www.geog.le.ac.uk/cti/virt.html).
