Editorial

Welcome to Planet 20—we have a wide variety of interesting and exciting papers in this latest general issue of Planet that we hope you will enjoy.

In this issue, we bid farewell, with great thanks, to Neil Thomas, GEES Subject Centre Earth Science Senior Advisor since our inception in 2000—we appreciate all his efforts over the last eight years! In the same breath, we also welcome Jim Andrews and Helen King, wearing 'new hats', as our joint Earth Science Senior Advisors. Neil has written an article looking at the direction of earth science in the GEES Subject Centre, with a few words from Jim and Helen about their plans until 2009 (p6).

Also looking at the recent history of, and future prospects for a GEES discipline, we have an interesting paper from our Environmental Science Senior Advisor, Jenny Blumhof summarising a report released this year from CHES (Committee Heads of Environmental Sciences), mapping the discipline in the UK (p2).

We are particularly pleased to publish a number of updates on small projects being funded by the GEES Subject Centre. These include papers on why students choose to do PhDs and their perceptions of their institutions' research support programmes (p10); an investigation into the impact of using problem-based field exercises in applied geosciences (p37); a pilot e-journal that is publishing undergraduate research in geography (p41); an evaluation of 'going digital' media in the field (p47); and podcasting in the GEES disciplines (p56).

In addition, we have a diverse range of papers from both new and regular Planet authors. These include papers about using systems thinking software to enhance student learning (p21); building 'preflight' assignments into courses to improve students' performances in practical assignments (p29); issues relating to teaching ethical issues in geography (p51); and an online resource to help undergraduates undertake research (p65).

We also have some intriguing information from authors about students' experiences of geography in the 1960s (p60); good practice in earth science at a school level (p62); and an international article on teaching sustainable development in the geography curriculum in Italian schools that may be of relevance to the UK(p26).

It is also our very great pleasure to reinstate the resource section which, in this issue, is about online resources focusing on numeracy (p66). As usual, we also have a diary of events and activities coming up throughout the rest of the year (p67).

This is a 'bumper' issue and we hope you enjoy the variety Planet 20 offers—there should be something for everyone. As per usual, we would like to encourage future contributions and look forward to hearing from you. Our next issue, Planet 21, has a copy deadline of 31 August, and will be a Special Issue themed on our 2008 conference: Employability, Employer Engagement and Enterprise in the GEES Disciplines. We will be including papers from our conference presenters, but we would also welcome papers from others who have interesting ideas to contribute on this topic.

Elaine Tilson
Editor

Mapping the environmental landscape: an investigation into the state of Environmental Science in higher education.

Jennifer Blumhof[1] and Phil Holmes[2]

[1] Senior Advisor, Environmental Science (ES), GEES Subject Centre
[2] ES Project Assistant

Abstract

Part of Phase 1 of a project to map the landscape of Higher education (HE) for environmental science over time has been completed and the report *Mapping the Environmental Landscape: An investigation into the state of the environmental science subject in higher education* was released in March 2008. This paper summarizes the information it provided.

Introducing the landscape

Formal environmental science (ES) education in higher education institutions (HEIs) in the UK has been developing over forty years. The pervasive and unique role environmental science (ES) plays in higher education has evolved from a relatively modern movement, questioning, analysing and evaluating our influence on, and relation with, the environment.

A number of universities and former polytechnics lay claim to establishing some of the earliest environmental programmes. These include East Anglia, Hertfordshire, Lancaster, Plymouth, Southampton, Stirling and Sunderland. Governmental and public concern for the environment determined the popularity of these programmes with the number of students enrolling in environmental sciences reaching a peak in the late eighties and early nineties, following a plethora of summits and conferences advocating environmental education and responding to disasters such as Chernobyl.

It is now apparent that across government, industry, the media, and society as a whole concern for the environment is once again moving up the policy agenda. Research carried out by a generation of diverse professionals, which include environmental scientists, is revealing the multiplicity of impacts of human activity on resources and natural systems. These professions depend upon higher education institutions to provide high quality graduates who are able to link many aspects of science and society together in order to tackle environmental issues. Over 40 years of formal education the discipline has evolved and environmental perspectives have permeated many aspects of higher education both curricula and estates. Numbers of students entering the discipline have fluctuated, programmes have been shaped and re-shaped, curricula have responded to global and local agendas, departments have come and gone, and programmes have moved to different homes in different organisational structures.

The aim of this two-phased project is, in Phase 1, to try and map the complex landscape of formal ES provision in UK HE over time, by investigating recent provision from a number of perspectives. Phase 2 will involve a panel of ES higher education providers interrogating the findings in order to examine trends and issues, make recommendations for the direction of the discipline and further study. This work is being led by the Committee for the Heads of Environmental Sciences (CHES) and supported by the Higher Education Academy Subject Centre for Geography, Earth and Environmental Sciences (GEES) and the Institution of Environmental Sciences (IES).

In part, the complex landscape was illustrated in the Venn diagram in the recently revised Subject Benchmark Statement for Earth Sciences, Environmental Sciences and Environmental Studies (ES3) (www.qaa.ac.uk).

The challenge of the data

Phase 1 of the report identified issues with using JACS (Joint Academic Coding System) which, due to multiple changes in the way ES has been coded, makes detailed longitudinal studies of student numbers very problematic. To try and address this problem, undergraduate single honours programmes calling themselves Environmental Science were drawn from the plethora of JACS groups and used as an indicator to reveal five-year trends. Additionally, subject groups were joined together as the 'ES contingent' (JACS F850/851/890/900/990). It is worth noting that another change has been implemented. As from 2007/2008, the subject code for environmental science has changed to F7. The reason for this move can be found at the following UCAS website. http://www.ucas.com/he_staff/datamanagement/jacs/jacs20

Not only was the problematic statistical data interrogated, but surveys were also undertaken. An electronic questionnaire was sent to a list of environmental science providers maintained by the Committee of Heads of Environmental Science (CHES). This was sent to 50 programme leaders, heads of departments and lecturers. There were 20 respondents from both large and small HEIs. The key questions asked were about :

- programme restructure
- pressures on provision
- future ES provision at local and national level
- key issues over the next five years
- the future shape of the discipline.

An electronic questionnaire was also sent to 80 ES professionals from the consultation network of the Institution of Environmental Sciences. 12 responded and they included consultants, principal scientists, managers and directors.

The key questions/issues asked were about:

- quality and number of graduate supply
- factors influencing applications to ES programmes
- future shape of employment
- recommendations to the HE sector.

Use was also made of a recent report on the current agenda of sustainability in the higher education curriculum. The introduction of sustainability into the curriculum and general activity of university life has created an important and recognised agenda. As a relatively new facet of environmental science, its effects on employability and curriculum content are still being debated. Work carried out by John Baines OBE for the GEES Subject Centre and for Professional Partnerships for Sustainable Development (PP4SD) looks at the current level of sustainability skills taught by universities and their application to professional life. This report is available at http://www.gees.ac.uk/projtheme/esd/esdinprofprac.doc.

Findings: The Environmental Science Landscape

Findings from the investigation were grouped under the following aspects:

- recruitment
- changing structures
- skills and employment
- future provision
- education for sustainability

The main findings on student numbers and recruitment include:

- ES applications and enrolments have seen a very minor decrease, against an overall increase in recruitment to HE as a whole
- at present, there are approximately 18,000 students studying ES and closely aligned subjects, which includes approximately 2,200 students studying ES as a named single honours programme
- postgraduate provision has increased, with approximately 4,800 students studying in ES and aligned subjects in 2005
- many ES providers saw the popularity of environmental issues in the media as a method of increasing recruitment

Providers were asked to give recommendations to enhance recruitment to ES degrees nationally. Responses circle around ideas of raising awareness of the subject, especially in secondary schools. There was also consensus that the potential career path of graduates was not highlighted enough. Interestingly, the reaffirmation of the science at the core of the discipline was seen as a way to promote the subject's academic robustness. It was hoped that the current media coverage of environmental issues would spur a new generation of applicants. Respondents stated a need for a "*Stronger emphasis on employability*" and ... "*to continue to stress value and quality..Students have no idea of potential career pathways*".

The question of enhancing recruitment was also put to environmental professionals. The ES professionals had concerns about a shortage of graduates and the need to increase linkages between courses and employers. On the question of student motivations to apply to ES programmes, responses ranged from idealistic reasons,"*The chance to make a real difference*", to more pragmatic reasons of programme location or A-level points.

The main findings on changing structures and future provision include:

- academic structures have been undergoing change to cope with pressures such as student numbers, staff resources and new agendas (86% of respondents had experienced restructuring over the past five years, with nearly half experiencing withdrawal of some provision and 80% some additional provision). The main prompt for change was said to be staffing resources closely followed by decreasing

student numbers, new agendas and negative organisational pressures.)
- there has been a reduction in the number of institutions offering ES (currently 45) overall: there has been a growing 'core' and shrinking 'periphery'
- postgraduate provision was increasing and seen by some institutions as a priority with a "*demand from the students themselves*"
- there is not a surplus of graduates and employers are still recruiting

Responses to the impacts of changing locations were polarised. Many noted the loss of power and prominence in the suite of programmes offered by their institution as programmes are moved under the management of those with little ES (or science) knowledge. Others noted the creation of opportunities for closer links with other cognate courses or improved facilities.

The main findings on skills and employment include:

- many employers felt that whilst students had a broad knowledge, they were lacking in specialised skills relevant to the work place
- employers would like more input into the higher education curriculum.

The employment of ES graduates is traditionally difficult to track, as many spend time immediately after graduating either volunteering or travelling. Three years of data supplied by HESA shows that the first destination of 50% of ES graduates fall into five areas. These include science and technology professionals and associate professionals, teaching and research professionals, business and public service associate professionals and administrative occupations. The remaining 50% of graduates enter over 24 more esoteric and often unrelated employment categories. Figure 1 highlights the average first destination for the JACS group F850, that was identified as containing most titles allied to ES.

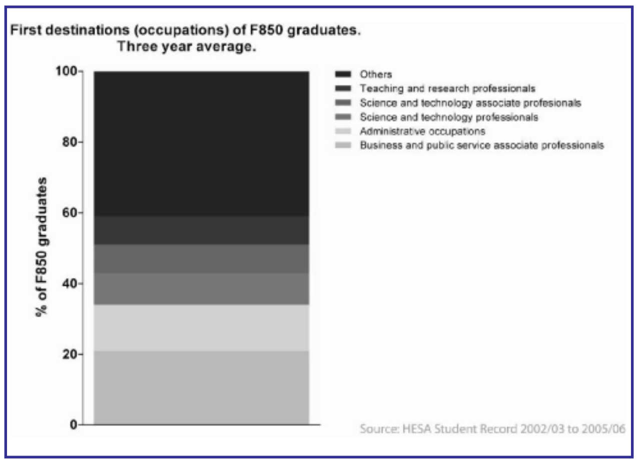

Figure 1: First destination of environmental science graduates. 50% of students are likely to be employed in sectors relevant to their degree.

Questions about the supply of graduates and associated skills were put to the ES professionals. When asked how they would describe the current supply of graduates (from undergraduate level), the majority of responses voiced that there was a shortage (Figure 2). This was also the case with postgraduates entering the job market, although the percentage responding that there was an adequate supply of postgraduates was higher than for undergraduates.

The professionals were asked to assess the skills of graduates and whether they were adequately prepared to enter the ES sector. The majority of the responses indicated that currently students were not adequately prepared, but noted that graduates from vocational programmes fared better. There was also a call for more focus on industrial or professional skills and "training in how to be a good consultant".

The main findings on future provision include:

- providers felt concerned or uncertain about future provision though no dramatic change was thought to be on the horizon
- key issues were identified as maintaining student numbers; responding to new agendas, such as sustainability and employability; ensuring science in the discipline; and maintaining resources, such as laboratory and fieldwork.

Some respondents were optimistic. For example:

> *"Arguably, environmental issues have never been given such prominence or priority at a*

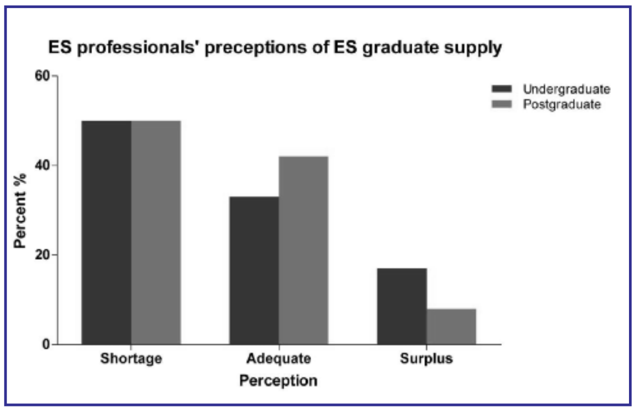

Figure 2: Perception of environmental science graduate supply.

government level – there is likely to be strong demand for well trained environmental science graduates."

In terms of national provision, more noted again that the current media coverage and government priority will secure the demand and supply of students in ES programmes for the foreseeable future.

Some noted, however, that the link has not yet come to fruition. Additionally, some noted that there is a worrying decline in students studying the scientific aspects of the discipline.
ES providers were asked to identify the key issues for ES in higher education over the next five years. Suggestions ranged from maintaining student numbers to new agendas, such as employability and sustainability. Special reference was made to the need to ensure the credibility of science in the discipline; ensuring students are engaged with the academia of ES as well as its practical elements. Additionally, comments were made in respect of resources such as fieldwork and laboratory time, echoing concern that these vital elements of the discipline are under continued threat. The ES professionals reinforced the idea of links with industry in the future as a way to ensure highly skilled, work place ready graduates.

The main findings on sustainability include:

- environmental professionals increasingly need to be knowledgeable about and competent in sustainable development
- there is strong support for the inclusion of sustainable development in ES programmes
- ES programmes provide an adequate base on which to build
- graduates need to take further education and training to be better qualified to integrate sustainable development principles into their chosen environmental profession
- These are based on John Baine's survey of 350 members of the IES with 44 responses. This work contributes towards the discussion on curriculum content and design and could help shape future provision.

Phase 2

The findings of Phase 1 of the Mapping the ES Landscape report will be discussed at the CHES AGM in London, June 23rd 2008. This group will examine the trends and issues outlined in Phase 1, and begin the process of identifying the key challenges facing the ES higher education community, anticipating the future shape and structure of the ES landscape and formulating recommendations for future provision.

This paper is an abbreviated version of the full report that can be found at http://www.ches.org.uk/publications.html

CHES – The Committee of Heads of Environmental Science is an organisation that includes senior environmental scientists from both colleges and universities. CHES aims to promote and facilitate environmental education within higher education and has been active in RAE and benchmarking consultations, as well as joint programme accreditation with the Institution of Environmental Sciences.

IES – The Institution of Environmental Sciences is a professional body, created at the same time as the first environmental science courses in higher education. It has very strong links with the university and further education sector. Believing that science and professionalism should underpin our understanding and interaction with the environment, the Institution accredits programmes in universities which are of high merit. Its members are very high quality scientists working in every aspect of the environmental field, from air quality to nuclear power.

Mapping the Earth Sciences Learning and Teaching agenda for 2007-2011

Dr Neil Thomas.

From the GEES SC Team

Our great thanks go to Neil as we bid farewell to him as the GEES Subject Centre's first Earth Science Senior Advisor (2000-2007). We would also like to welcome our new Earth Science Senior Advisory Team, Helen King and Jim Andrews. This paper gives a brief overview of the work Neil has been doing for the GEES Subject Centre, and where Helen and Jim are taking it from here. We wish Neil all the best in his other endeavours and look forward to working with Helen and Jim.

Introduction and Background

Since the inception of the Subject Centre for Geography, Earth and Environmental Sciences (GEES) in 2000, the Earth Sciences landscape in the UK has changed dramatically, with several former Geology departments being amalgamated with other discipline areas, chiefly Geography and Environmental Sciences, and others closing completely. Even in departments where little structural change has occurred, there has been an evolution of learning cultures, priorities and bureaucracy and, in some people's views, this has been a necessary and thoroughly appropriate change. This has inevitably meant that the student learning experience has changed substantially during the past few years and is likely to continue changing for the next five and beyond.

For this reason the Subject Centre decided to convene a residential planning event, bringing together a critical mass of Heads of Learning and Teaching (L&T) (or delegated key staff), from Earth Science departments across the UK HE sector, to discuss current issues affecting the discipline, and its future. The aim was to map out an action plan for Subject Centre support of Earth Sciences during the 2007-2011 period. This event (commonly known as the Arden meeting) took place from 12-13 September 2006 at the Forest of Aden Golf and Country Club in Warwickshire, and brought together twenty six representatives from sixteen University departments, the Geological Society (GS), the Committee of Heads of Geoscience Departments (CHUGD), the British Geophysical Association (BGA), the Earth Science Teachers Association (ESTA), the Earth Science Education Unit (ESEU), the Earth Science Education Forum (ESEF) and the GEES Subject Centre (SC).

This article, written 18 months or so after Arden, summarises the issues, discussions and outcomes of the meeting, and the progress made since.

Aims of the Arden meeting

Delegates split into working groups, with the aim of answering the following questions:

1. What is the future of Earth Sciences, and what will the discipline territory be like in 2011?
2. What will be the key issues to affect and shape the discipline in the period 2007-2011? What are the priority issues for the UK discipline community?
3. What activities (long & short term) can be undertaken to support the profile of the discipline and L&T issues within these priority areas? How can the Subject Centre help?

Summary of the meeting discussions

The future of the discipline

Delegates discussed this in groups and open plenary, aided by presentations from Subject Centre staff (Dr Helen King & Dr Neil Thomas) and the Geological Society (Prof. Dave Sanderson, Chair Education Sub-Committee), and contributions from the Committee of Heads of University Geoscience Departments (CHUGD) (Prof Andy Rankin, Chair CHUGD), the British Geophysical Association (Dr Tine Thomas) and The Earth Science Education Unit (Prof Chris King). The main points to arise from these discussions were that, by 2011:

- There will probably be no University departments with the name 'Geology' or 'Geological Sciences', reflecting the shift in emphasis to multi- and inter-disciplinary 'mega-departments' in the broad areas covered by the Subject Centre disciplines.
- There will be an increase in the number of interdisciplinary academic staff, at the expense of single-subject staff (i.e. specialist to generalist) and a resulting change in the emphasis of degree programmes and of research.

Left to right: Jim Andrews, Neil Thomas and Helen King

- There will be an increased emphasis on the applications of Earth Sciences to the 'real world'. Degree programme names and structures are more likely to reflect this. There was a feeling that the discipline currently clings on to the "traditional view" of Geology, although this approach is changing as a result of the gradual retirement of the existing staff generation. However, all delegates recognised the need to retain core skills and elements of the "traditional" subject, even in an evolving discipline.
- There will be a move towards engaging with, and analysing, global datasets as a standard and, associated with this, will be the need for realignment of staff skills.
- Earth Sciences will be heavily concerned with the concept of "perturbed systems" and the anticipation and modelling of future events.
- The UN-designated Year of Planet Earth in 2008 has a significant part to play in shaping the discipline and the public perception of Earth Sciences.

These observations and predictions will have a significant impact on the style and nature of education and training that discipline practitioners are able to provide for the next generation of undergraduates. There will also be significant staff development needs.

Key issues to affect teaching & learning in the discipline between 2007 and 2011

A range of issues was identified by the four delegate groups, with a significant amount of overlap but also different emphases. The five priority issues, identified by cross-discussions between the groups were:

- Fieldwork teaching & learning
- Basic skills in Earth Science

Institution	Programme(s) used	Innovation(s) summary	Comments
University of Glasgow	Earth Science	GESInfo web site for prospective students (with Blogs, student essays, student testimonials, resources for teachers and students, Synoptic verbal field reports)	Innovative marketing and generates motivation; develops independent learning and employability skills
Keele University	Geology, Earth System Science	Web-based support for honours year projects and field mapping	Paces student project work.
Kingston University, London	Geology, Applied & Environmental Geology; Environmental Hazards & Disaster Management	Scenario-based exercises (problem-based learning); widespread use of interpretive exam questions	Develops critical thinking and problem solving skills; career development and promotes self-directed, reflective learning.
University of Manchester	Geology; Environmental & Resource Geology; Earth Sciences	Level 1 skills module (personal journey approach); baseline skills analysis	Enhances student motivation and reflective learning.
University of Portsmouth	Geology; Earth Sciences; Geological Hazards	Geological toolkit unit; Student Ambassadors Scheme; Terrasaur outreach work	Emphasis on marketing and recruitment changed recently; innovative approach to basic skills teaching.
University of Southampton	Geology; Geophysical Sciences	Undergraduate Mentor Scheme; Academic Integrity programme; Student Ambassador Scheme	Using students to support student learning; innovative approach to basic skills teaching.

Table 1: Summary of results for particularly innovative practice.

- Curriculum issues (inc. employability)
- Recruitment & marketing the discipline
- Motivation & scholarship of students

Examples of existing good practice

There are many innovative learning and teaching developments taking place in Earth Science departments around the country. Part of the Subject Centre's work is to conduct research in departments to highlight good practice and disseminate it via its database, website or Planet articles. A snapshot analysis of ten Earth Science departments was undertaken during 2007, using a variety of mechanisms including telephone conversations, requests for update information, website analysis and, in some cases, departmental visits. The latter, unsurprisingly, proved to be the most productive in identifying examples of good practice. As a result, a range of innovative and highly effective approaches have been identified (See Table 1).

Some notable innovations encountered were those which provided students with the opportunity to explore and reflect on their own learning. These initiatives take time to bed down in most student communities but can be greatly helped by careful planning and support on behalf of the staff team. Examples include the 'personal journey' approach to development of basic mathematical and science skills in the First Year (Level 4) programme at Manchester which has resulted in excellent student feedback and enhanced results in a previously poor-performance module. The Undergraduate Mentor Scheme at the University of Southampton is in its infancy but offers an exciting model where 3rd and 4th year undergraduates apply, with justification, to become mentors to Level 1 and 2 students. The mentors are trained by postgraduate students which makes the chain even more innovative.

At Keele, students in their honours year are supported through their project work by a week-by-week guide as to 'where they should be' in terms of their planning, progress and targets. This support is provided by a detailed and dedicated VLE and reflects what many departments do on a much more time-consuming basis. A similar resource is provided to help first years through their mapping skills module.

Discussion

Several mechanisms could be employed to satisfy action points, including open bidding for projects in the defined key themes; identifying key practitioners with experience in key theme areas and providing a bursary for them to complete key work towards achieving a target, or organising consortia from the interested parties to undertake the work against an agreed budget. In reality, some combinations involving all of these mechanisms may prove to be the best approach. Certainly, the activities should be undertaken in collaboration with relavant organisations including the Geological Society, Earth Science Teachers' Association (ESTA) and the Earth Science Education Unit (ESEU).

Reference

Boyle, A.P., Maguire, S., Martin, A., Milsom, C., Nash, R., Rowlinson, S., Turner, A., Wurthmann, S. and Conchie, S., *2007. Fieldwork is good: the student perception and the affective domain. Journal of Geography in Higher Education, 31, 2990317.*

Earth Science Senior Advisor Team Activities May 2008 – July 2009

Dr Jim Andrews (School of Ocean and Earth Sciences, University of Southampton) and Dr Helen King (higher education consultant, previously GEES Subject Centre Assistant Director) have been appointed as the Earth Science Senior Advisor Team from 1st May 2008 to 31st July 2009. They have developed an operational plan for this period based on the original and comprehensive Earth Science Action Plan devised by Neil Thomas in September 2006. This plan also takes account of themes raised by the Geological Society Education Committee and the Committee of Heads of University Geoscience Departments (CHUGD), and identifies areas of work that have already been undertaken elsewhere. A number of key activities have been prioritised for action over the next 15 months as listed below (see the Earth Science pages on the GEES Subject Centre website for more detailed information – http://www.gees.ac.uk/home/disciplines.htm):

Fieldwork organisation, teaching and learning

- Run (in collaboration with the British Geological Survey) a residential field skills course aimed at academic staff with little previous experience of geological fieldwork to enable them to support basic field teaching, including geological mapping (23rd – 27th March 2009).
- Publish, on the GEES wiki, information on field course locations and their uses (http://gees.pbwiki.com/).

Basic skills in Earth sciences

- Collect information on current resources and make this available on GEES and Geological Society websites.

Curriculum issues

- Conduct a state of play/baseline audit into the role of employer engagement within the Earth sciences in the UK HE.

Recruitment and marketing of Earth Sciences

- Conduct a review of outreach/recruitment activities to identify and promote effective models (in conjunction with the audit of employer engagement activities above);
- Evaluate the impact of university 'ambassador' schemes;
- Attend the Earth Science Teachers' Association (ESTA) conference in September 08 which includes an HE day on liaison with schools (http://www.esta-uk.org/liverpool.html).

Other activity

- Identification of department contacts and learning & teaching champions;
- Development of up-to-date content for the GEES Subject Centre and Geological Society websites;
- Dissemination of a regular newsletter to contacts, champions and heads of department (to include information on specific Earth Science and relevant GEES and broader HE issues, resources and activities).

Looking for some learning and teaching support?

The GEES Subject Centre continues to publish resources FREE, for educational purposes, and are available for download or in hard copy. The following are just a few of these:

- **GEES Learning and Teaching Guides:**
  - Teaching Geoscience through Fieldwork
    http://www.gees.ac.uk/pubs/guides/eesguides.htm
  - Practical Laboratory Work in Earth and Environmental Sciences: guide to good practice and helpful resources
    http://www.gees.ac.uk/pubs/guides/labspracs/geeslabsnpracs.pdf
  - Employability within Geography, Earth and Environmental Science
    http://www.gees.ac.uk/projtheme/emp/empguide.htm
  - Assessment in the Earth Sciences, Environmental Sciences and Environmental Studies
    http://www.gees.ac.uk/pubs/guides/assess/gees%20assesment.pdf
  - Enterprise, Skills and Entrepreneurship Resource Pack
    http://www.gees.ac.uk/projtheme/entrep/entrepres.htm
  - GEES Employability Profiles Resource Pack
    http://www.gees.ac.uk/projtheme/emp/empprofs.htm
- **Them & Us - A publication for Geography, Earth and Environmental Science Staff and Students**
  http://www.gees.ac.uk/pubs/student/contents.htm
- **Archive of all previous issues of Planet**
  http://www.gees.ac.uk/pubs/planet/index.htm

To see the full list of publications available, please see our website: www.gees.ac.uk. To obtain hard copies of publications, or to access any of our GEES Subject Centre support tools, please email info@gees.ac.uk or for electronic copies please see the above links.

Product or Process? A pilot study into the perceptions of research training by PhD students in GEES subjects at three universities

Steve Gaskin

Head of Skills, Education Enhancement, University of Exeter

Abstract

This paper presents the results of a small pedagogic research project funded by the GEES Subject Centre Small-Scale Projects, conducted with GEES PhD students across 3 HEIs. The research investigated student rationales for undertaking their research degrees, and their associated perceptions of the value of their institution's research training programmes. Results are presented from students in response to three key questions asked on these themes during Nominal Group Technique (NGT) focus groups. The paper provides background information on current debates with respect to the UK doctorate and researcher development more generally. It concludes with some recommendations for university doctoral training providers and finally presents some much larger questions which could spark a national and interesting debate about whether a doctorate in the GEES disciplines is in fact fit-for-purpose.

Introduction

"PhD students want to, and must, be recognised as a specific, different type of student, who is a professional being trained. The core component of doctoral training is the advancement of knowledge through original research… but we urge universities to ensure that their doctoral programmes promote interdisciplinary skills training and development." (UKGRAD, 2006).

"In tomorrow's global economy, business investment and job opportunities will be driven by costs and talent. We must raise our game with skills and training." (Richard Lambert, CBI Director-General, 2008)

"A generation ago, a British Prime Minister had to worry about the global arms race. Today a British Prime Minister has to worry about the global skills race..." (Gordon Brown PM, 2008)

These three quotes above reveal a government and business agenda articulating a skills revolution which is increasingly dominating many political debates and associated policies and funding models. According to those at the helm, the UK has a major skills shortage in many employment sectors. For example, a recent report by The Royal Society (Jan, 2008) concludes that the UK's position as a leader in higher education could be jeopardised by a failure to meet the needs of both the local and the global economy, where skills and innovation are increasingly essential to remain competitive.

The skills debate is nowhere more pertinent than in the current doctoral training process in the UK where a major transition is underway in the development of 'generic' skills amongst postgraduate research students (PGRs) and early-career researchers (often referred to as post-docs and/or contract research staff – CRS). Section 1 of the revised (2007) QAA Code of Practice, the Joint Skills Statement articulated by Research Councils UK (RCUK) and the recommendations arising from the 'Roberts Review (2002) SET for Success' report have embedded an already growing emphasis on skills and training, submission and qualification rates, quality of supervision and possible changes in the examination of doctoral research.

The Research Councils (RCUK) are committed to enhancing the quality and output of the UK research base through training the next generation of world-class researchers. They are the largest funder of research training, supporting over 30,000 researchers at any one time (including 15,500 doctoral students, 10,000 research staff in universities, 4,000 research staff in research institutes and 2,000 research fellows) (RCUK, 2008). The importance of research training, as much as the high demands for world-class research outputs, is now seen as an integral part of all (high-profile governmental) RCUK research grants, contracts and studentship / staff awards and associated policies. As Park (2007, p.8) notes "for the nation, the obvious benefits of an active community of scholars engaged in doctoral level research include enhanced creativity and innovation, and the development of a skilled workforce and of intellectual capital and knowledge transfer, which drive the knowledge economy and are engines of the growth of cultural capital."

The research councils and other major funders of research in the UK are now just as much interested in the "process" of doing research (i.e. the professional and transferable skills acquired and required to become a future independent successful researcher), as they are in the "products" of the research process (the thesis, the papers and associated knowledge transfer and application).

In recognition of the need to provide leadership and management of this ambitious and internationally-leading researcher development agenda, RCUK's first Research Careers and Diversity Strategy was launched in January 2007, and currently has 3 key aims: (1) to ensure that the best potential researchers are attracted into research careers in universities and research institutes, (2) to help universities to improve the quality of their research training and improve the employability of early stage researchers, both Post Graduate Research (PGRs) and research staff, and (3) to improve retention of the best researchers by promoting better professional development and management of early-career research staff in all research organisations (RCUK, 2008).

CRAC, the UK Career Development Organisation, in partnership with UKGRAD and UKHERD (the Higher Education Researcher Development group) are the overarching national bodies (funded by RCUK) for PGR and contract research staff (CRS) training respectively. A new programme – launched in January 2008 and yet to be named – will continue to build on the momentum gained during the highly successful UKGRAD contract in supporting postgraduate researchers, while widening the scope of their remit to include research staff. In other words, the UK, through RCUK, is seeing an unprecedented investment in the future of our researchers, both of our research students and research staff.

In short, January 2008 marked a major turning point in researcher development and associated skills training in the UK, with the research councils widening their researcher development brief, as detailed above, but also committing to maintain their funding for skills training throughout the Government's Comprehensive Spending Review (2007) for the period 2008/9 to 2010/11 at a rate of £20 million per annum. Enhancing the national, regional and local research infrastructure through investing in researcher development is clearly of national and international significance, and wider economic benefit.

In response to this agenda, most if not all HEIs (and certainly those involved in the current study) now have more or less formal research training programmes (RTPs) for their PGR students and, to a lesser extent, contract-research staff. These training programmes are often mapped around core development themes articulated in a 'Joint Skills Statement' (QAA, 2007, Appendix 4) (and provided in full in Appendix 1 in this paper for information). This statement gives a common view of the skills and experience of a typical research student, thereby providing universities with a clear and consistent message aimed at helping them to ensure that all research training is of the highest standard, across all disciplines. It has been invaluable in putting together research training programmes. The statement is categorised into several key skill areas, all expected of a competent researcher, namely: research skills and techniques, research management, communication, networking, team working and career management.

Measuring the Effectiveness of Researcher Development Investment Nationally

With the funding of the 'Roberts' agenda, and associated RCUK policy developments has come an increasing need to be able to evaluate and demonstrate the impact of this increased emphasis and new funding stream on PhD students' skills and careers, and on research outputs and the UK knowledge base more widely. The importance of evaluating researcher skills is being undertaken at a national level through 'The Rugby Team', a sector-led working group who aim to "propose a meaningful and workable way of evaluating the effectiveness of skills development in early career researchers" (UKGRAD, 2008). Amongst other things, the Rugby Team are charged with identifying a set of short term Key Performance Indicators to measure the effectiveness of the Roberts recommendations, and to benchmark current practice with which to measure progress against. Such measures are still in their infancy, as longer-term measures naturally require longer time-periods. Further information on this can be found at: www.grad.ac.uk/rugbyteam.

While it is common practice to have immediate post-course evaluations after each institution researcher development course, few HEIs currently evaluate the effectiveness of their training opportunities in a systematic and student-focused way using established pedagogic research methods. In recognition of this, increasingly, HEIs are looking at ways to gather PGR feedback that is representative, timely and which can inform future strategy and policy of institutional generic skills programmes.

Rationale for this GEES study

Given that most institutional programmes have now witnessed four years of 'Roberts' funding, this small-scale pilot study attempted to evaluate GEES student perceptions of their research degrees and associated training. GEES research staff were not the focus of this study.

The 3 research questions asked were:

> *Question 1:* What do you consider to be the main reasons for embarking on your research degree?
>
> *Question 2:* In what ways, if any, has your research degree experience been helped by personal and professional development opportunities provided by your university?
>
> *Question 3:* How might future personal and professional development opportunities at your university assist you in completing your research degree and in preparing you for the world of work?

Question 1 was felt important to ask, in order to ascertain how students considered their research degrees with respect to, for example, pure knowledge creation and/or future employability. For example, is skill acquisition as important to our research students, as it is to those who are often funding their research?

Question 2 was concerned with ascertaining how any institutional development programmes had enhanced their research degree experience. For example, are our programmes and development opportunities fit-for-purpose and do they add value to the student research experience as we intend?

Question 3 was added as an aspirational and practical question, in order to help inform future training provision in HEIs. For example, what might we do differently, and how?

The Student Sample

In this study, Nominal Group Technique was applied to PhD students, from 3 separate UK university groups (Table 1).

Each HEI within this study has established training programmes for PhD students which are mapped on the RCUK Joint Skills Statement and all 24 students who participated in this study, had engaged in these respective programmes in one way or another. All students were registered for a full-time PhD and at least 6 months into their programmes. Given the relatively small number of participants, no individual institutional analysis was conducted due to issues around representativeness and exposing those institutions who participated. An agreement about personal and institutional anonymity was established at the outset of the project.

University	Group Size	No. of responses generated to…		
		Q1	Q2	Q3
1	12	19	13	7
2	4	14	8	21
3	8	17	13	11
Totals	**24**	**50**	**34**	**39**

Table 1: Summary Group Data

Pedagogic Research Method

An established social sciences research method was employed in the current study known as Nominal Group Technique (NGT). NGT is a focus group research method which can be used in educational environments to obtain information from a group on a specific topic, or set of questions. Focus groups are useful as they allow information to be yielded from a group within a non-threatening environment and NGT's main advantage is that it focuses on participant (e.g. student) rather than evaluator (e.g. staff) interests. It is also advantageous in that it captures all participant views, not just those who are the most forthcoming or vociferous. In that respect, NGT is considered to elicit a more representative set of responses to a series of questions posed by the facilitator and it encourages a more abundant yield of themes than could otherwise be achieved using the more usual and open discussions in which tangential debates too often occur. A useful introductory guide to NGT can be found in Gaskin (2003) who includes a short GEES case study. A fuller practical guide can be found in Breen (2006). More detailed uses of NGT in GEES subject-based pedagogic research, with specific reference to fieldwork, can also be found in Gaskin and Hall (2002), Fuller et al. (2003) and Scott et al. (2006).

Rationalisation of student responses to each question took place with each and every response being assigned to specific 'data-derived' categories for each question posed, as can be seen in Tables 2 to 4 below.

Data–Derived Category	Example student response assigned to this category
1. Professional and Personal (skills focussed)	"to develop specialist skills in research methods"
2. Personal and Professional (knowledge-focussed)	"expand knowledge base in general"
3. Personal (e.g. satisfaction, motivation)	"self-affirmation"
4. Employability (e.g. career / earning potential)	"forwarding your career"
5. Other (e.g. lifestyle, philanthropy, social)	"continuing student lifestyle and making friends"

Table 2: Categories assigned for Question 1 *(What do you consider to be the main reasons for embarking on your research degree?) with examples of student responses assigned to those categories*

Data–Derived Category	Example student response assigned to this category
Confidence / Motivation	"more confidence"
Networking / Peer support & learning	"comradeship"
Other specific skills	"better presentation skills"

Table 3: Categories assigned for Question 2, *(In what ways, if any, has your research degree experience been helped by personal and professional development opportunities by your university?) with examples of student responses assigned to those categories*

Data–Derived Category	Example student response assigned to this category
General career management	"more general career development opportunities"
Specific career management	"more info on what specific options are available to PhDs"
Other specific skills	"ability to self-evaluate skills more effectively"

Table 4: Categories assigned for Question 3, *(How might future personal and professional development opportunities at your university assist you in completing your research degree and prepare for the world of work?) with examples of student responses assigned to those categories*

Once all student responses had been elicited to a given question (each student was able to contribute as many times as they like and were encouraged to "piggy-back" on the ideas of others), and after congruent items had been deleted after group agreement (i.e. very similar, if not the same, responses to a given question), participants were then given the individual opportunity to vote on their top responses which they personally considered to be 'most important' for each question. To do this, each student was given 5 voting cards – a 1, a 2, a 3, a 4 and a 5. The students were allowed to use each voting card only once per question. As there were 3 questions, students therefore voted 3 times. Although students were not forced to vote – if they found only 3 of the responses most important for example – in the event, everyone used all of their voting cards. This voting process enables ranking to take place and the identification of general trends in the results.

Data Standardisation

To adjust the raw data in order to reflect the fact that there was some variation in the group sizes between the 3 universities (ranging from between 4 people and 12 people), the votes for each NGT response were converted to percentages to standardise the results. The number of votes that a response received expressed as a proportion of the total vote available in answer to a question is expressed as the % total available vote (TAV). The TAV is obtained by adding all votes per student (5, 4, 3, 2, 1) in the group together. For example, where the number of students in a group was 12, the TAV is 180 (12 students, 15 votes per student). The %TAV is thus the vote that a response achieved expressed as the total available to that response and, because each student was only permitted to use one voting card against a specific response (5 or 4 or 3 or 2 or 1), the maximum possible %TAV for a single item is 33% (5/15). In summating the results into categories and across universities, to weight against the disproportionate impact that the smaller groups would have using this method alone, the %TAV of each response was multiplied by the proportion of the total number of participants between the 3 universities it represents. For example, where the group size was 4, as a proportion of 24 (the total number of students in the study) the TAV percentages are weighted by 0.125. Thus, each group has equal weighting in the summated results. The weighted percentage TAVs (%WTAV) are summarised in Figure 1.

In short, the higher the %WTAV (see Figures 1 to 3 below), the stronger the overall group's commitment (across all 3 universities) to that (category of) response. This method enables the extraction of an overall picture in respect of student responses to each of the three NGT questions posed. It therefore allows some general conclusions to be drawn, within natural limits given the scope of this study and the limited sample size.

Results and Discussion

In this section all verbatim student quotes are italicised.

Question 1

A graphical representation of the responses generated in response to Question 1 can be found in Figure 1 below.

With respect to Question 1, what is most striking is the importance of employability and careers (%WTAV=40) in students' thinking about the main purposes of a research degree. This is perhaps not surprising in that many PhD students currently pay considerable sums of money to undertake a PhD and invest years of their life (up to 7 years part-time). Therefore, one would expect that ensuring a good return on that investment was important to them in terms of future earning potential and career opportunities. Typical student responses to this question included "*better understanding academia*", "*future employment enhancement"* and "*access to higher salaries*". It would, of course, be interesting to dig deeper here and explore these issues further.

Perhaps our students in this study would be heartened by a recent research project (UKGRAD, 2004) which found that "PhD graduates are more geographically mobile, and more fully employed than less highly qualified graduates. Not only is their unemployment rate at just 3.2% less than half that of first degree graduates, but only 1% are in 'stop gap' jobs which bear no relation to the level of their qualifications". The study's data also challenges the view that a PhD leads only to a career in academia or research. In fact less than half of this cohort are employed in the education sector, fairly equally divided between teaching and postdoctoral research and significant numbers are found in all sectors of the economy. Despite this there still remains a paucity of data on whether PhDs command a significantly higher salary premium, and "*have access to higher salaries*" or "*speedier career progression*". Some employees in a study on employers' perceptions of recruiting research staff and students (EMPRESS, 2005) stated (perhaps understandably) a preference for competence rather than academic title. Further studies around the value-added of PhDs in terms of career options, recruitment practices, salary premiums and fast-track promotion would certainly

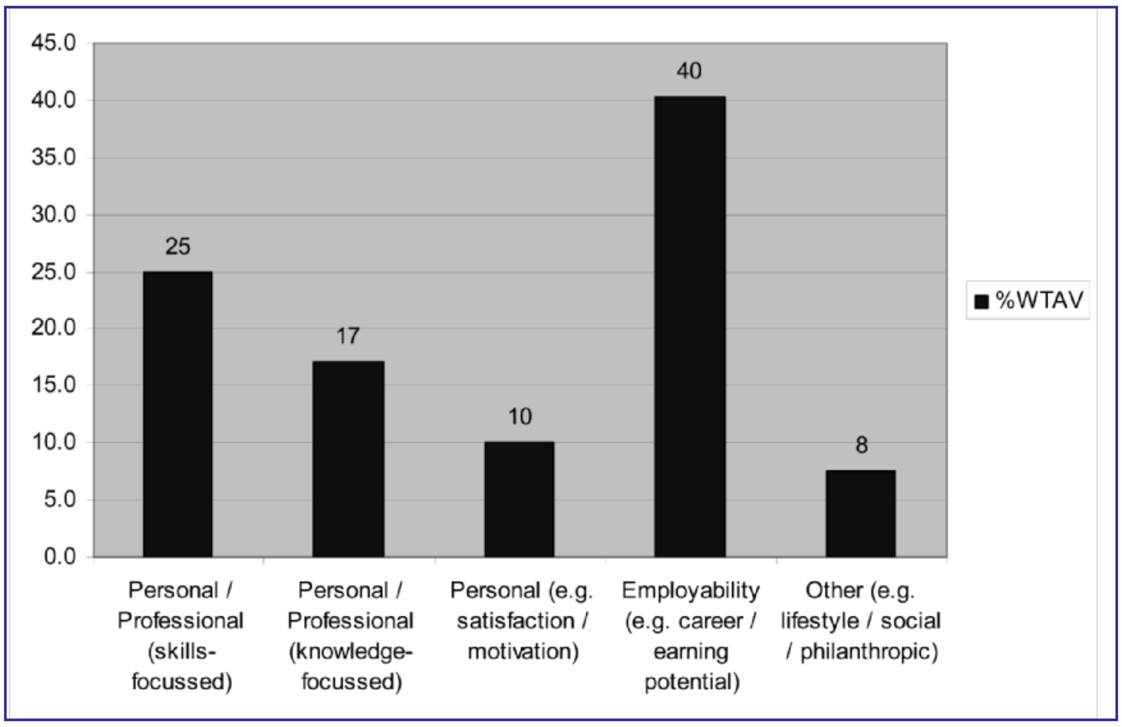

Figure 1: Votes for each category across all 3 universities expressed as a percentage of the weighted total available number of votes (%WTAV) for Question 1 (What do you consider to be the main reasons for embarking on your research degree?)

be welcomed at a national aggregate subject level, and also at a GEES level.

The second most important category in this study in terms of students' thinking about the purposes of a research degree is personal/professional (skills-focussed), which came above all of the other categories, including the personal/professional (knowledge-focussed) category. This could perhaps be because the institutions at which all these students are enrolled for their research degrees have well established training programmes and engagement by students in the training is overall very encouraging, although specific data on this cannot be published in this study.

Therefore, students may be more aware of the "*skills-agenda*" within their respective institutions and therefore talking about skills acquisition through the PhD (e.g. "*to enhance networking skills*" and "*to demonstrate core skills*") comes more naturally. It is fair to say that compared to just 4 years ago, there has been a step-change in skills provision at all of these HEIs, as a result of the RCUK training agenda, and therefore most, if not all, research students will be inducted into the generic training provision (in the form of workshops, seminars etc) which are offered by the institutions. It could, of course, be that the generic training agenda has had little influence and that students already understood and were able to articulate the skills-acquisition within a research degree. However, from experience in my own institution, the skills-agenda at research degree level has resulted in quite a cultural shift over the last 4 years and it is now seen as much more of an integral and legitimate part of research degree training.

Acquiring knowledge (e.g. "*contributing to a larger body of research*" and "*establishing a personal and strong knowledge foundation*") is of importance to some in a research degree in this study, but perhaps skills are seen as more important, as one recognises through the process of discovery and research how much knowledge is contested, debated and can quickly become out of date, especially within the confines of a PhD project.

Finally, it is interesting to note that "personal" and "other" reasons for doing a PhD, including "*self-discovery*", "*personal development*", "*personal satisfaction and fulfilment*", "*testing of own abilities*" together with philanthropic/social reasons such as "*making a difference in the world*" and "*making friends*" are important to some, but that these reasons alone are perhaps not enough in terms of justifying why one would embark on such an intensive postgraduate programme. This may, therefore, explain the relatively lower %WTAV scores for these categories.

Overall, from the students represented in this study, the idealist or even romantic view of the scholar in terms of pursuing research for the sake of discovery alone is perhaps much less important than the core (and even level-headed) business of skills acquisition and its link with future employability and career aspirations. Taken together, these 3 categories account for nearly two-thirds of the student vote with respect to this question about the reasons for pursuing a research degree (% WTAV totals = 65 in Figure 1).

Question 2

A graphical representation of the responses generated in response to Question 2 can be found in Figure 2 below.

Given that skills, employability / careers seems to collectively account for the majority of the rationale for the purposes of a research degree, it is interesting to then identify how any institutional programmes may have assisted in this process.

According to the students in this study, the greatest asset of these training programmes is in terms of confidence and motivation (%WTAV=53), (e.g. "*carrying on whatever happens*" and "*motivation and renewed enthusiasm*") followed by the networking opportunities (e.g. "*celebrating small victories with others*" and "*networking with those who have different or more experience than you*") such events and workshops present, and the peer support (e.g. "*comradeship*") that is associated with this.

Interestingly, however, the "other specific skills" category does not rank as highly (%WTAV=17%), suggesting that perhaps the social and professional networks are perceived to be more important than the actual skills acquired (which included responses such as "*better information retrieval skills*", "*improved interpersonal skills*" and "*better time management and project management*"). This is, in fact, not so surprising, and is supported by feedback from evaluation forms handed in at the end of workshops etc, which often state the main benefit of the session was "*meeting others*" and "*sharing ideas / concerns with people from beyond my subject area*". In other words, the "hidden" outcomes, as opposed to the "intended or learning outcomes" (which all universities in this study articulate prior to participants attending), are perhaps more powerful in terms of enhancing the learning experience, than the actual intended focus of the session on any particular skill type (e.g.

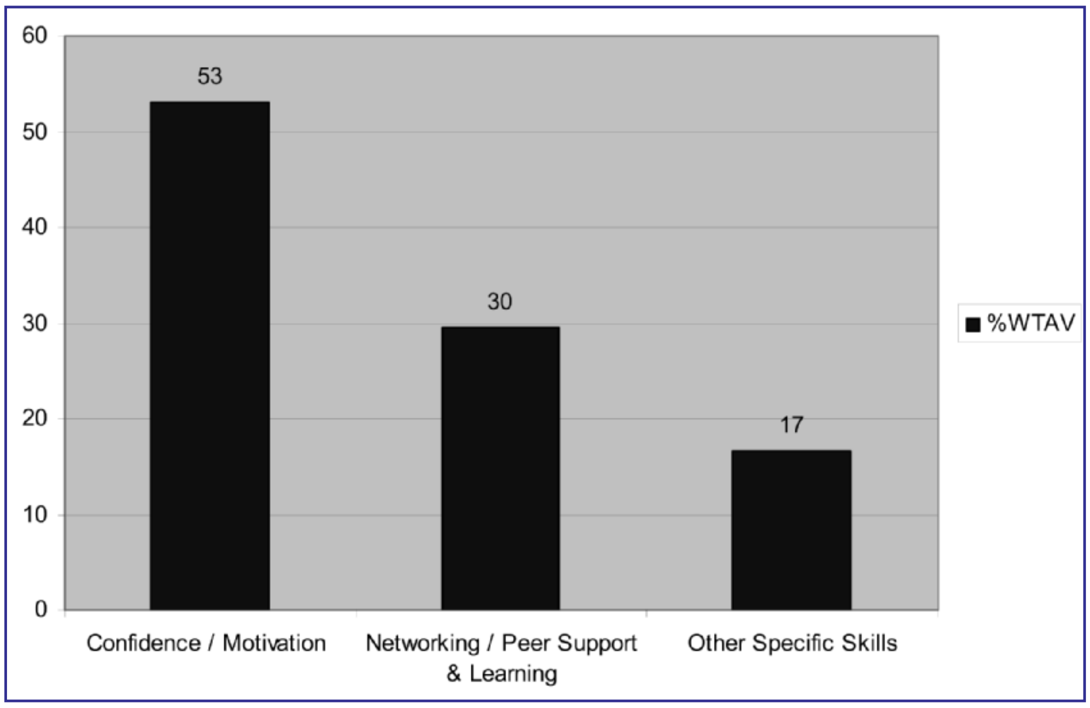

Figure 2: Votes for each category across all 3 universities expressed as a percentage of the weighted total available number of votes (%WTAV) for Question 2 (In what ways, if any, has your research degree experience been helped by personal and professional development opportunities provided by your university?)

project management, managing the supervisor, communicating a conference paper). However, this assertion would clearly need further testing; while every student who participated in this study had engaged in generic researcher training provided by their university, no data was collected on exactly which sessions had been attended.

Given that the training programmes in this study are intended to make our early career researchers more competent researchers for the future, perhaps the real benefit of these programmes is the networking and peer learning and support, a finding which may not be entirely palatable to those who fund such programmes.

Indeed, this assertion is supported by research evidence by Ahern and Manathunga (2005) who reported that reasons for non-completion in PhD programmes often included feelings of lack of academic and social integration into the department on the part of the student, leading to negative feelings and isolation finally leading to non-completion or delay. Given that "many research students go through periods where their research seems to stall, their motivation drops, and they seem unable to make any progress" (ibid, p. 237) and that blocks in research can occur in the cognitive (thinking) and affective (feeling/social) domains (and that these are often overlapping), the peer support and networking of bespoke PhD training programmes should perhaps be regarded as highly desirable hidden outcomes of these programmes in what can be regarded, at some points in the PhD journey, as quite an isolating Higher Education experience. Perhaps through discussion with others, demonstrating a clearer sense of a researcher community, utilising distinct postgraduate training space, a feeling of enthusiasm and comradeship are engendered.

Question 3

A graphical representation of the responses generated in response to Question 3 can be found in Figure 3 below.

In terms of student opinions on how their own universities might provide better / enhanced personal and professional development opportunities, career management in some form or another is significant (%WTAV=81). Moreover, the need for specific career management advice, training, support and guidance strikes a chord (%WTAV=57). Student responses here were typified by comments such as "*how to specifically contextualise my PhD for future employers*", "(more) f*ocussed career development on specific career sectors and for specific subjects*" and "*more relevant subject-focused training*". This is interesting because from Question 1, it is apparent from those interviewed in this study that research

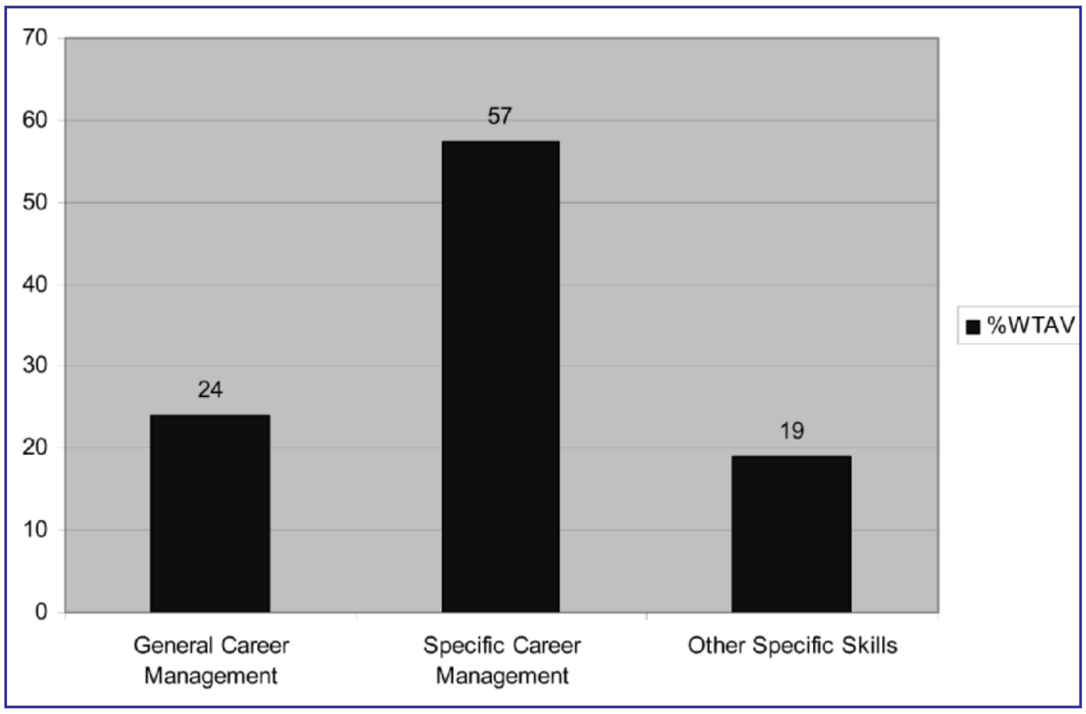

Figure 3: Votes for each category across all 3 universities expressed as a percentage of the weighted total available number of votes (%WTAV) for Question 3 (How might future personal and professional development opportunities at your university assist you in completing your research degree and in preparing you for the world of work?)

students are seeing the PhD as a means to an end; in other words as a period of training to become a professional researcher and to utilise these skills (to their advantage) in their future employment. Yet, students in this study have identified career management and guidance to be the most noticeable area for improvement.

This mis-match is perhaps not surprising, since students who embark on a PhD, are, by their very nature, becoming specialists in sharply focussed academic fields. Naturally, one would expect specialist careers advice to be a legitimate and predictable demand to meet at an institutional level during PhD programmes. One might ask, however, how a careers service would be able to respond to such specific subject-based requests? Many careers services are often geared towards undergraduate education and can be quite generic in depth and breadth. This is perhaps due to the sheer number of students with whom careers services are expected to engage and the small proportion of PhDs as a % of the overall student population in most universities.

The next most important category rated was about general careers advice, and responses such as "*more general career advice*" , "*general CV and interview advice*" and "*general advice on job markets*" were also common, suggesting that some students may just want some basic training before they start to make more specialist career decisions. Given that less than half of the national PhD cohort stays in the education sector, in HE or otherwise, and that they are fairly equally divided between teaching and postdoctoral research (and that there is no evidence to suggest that GEES students are different), significant numbers of PhDs are found in all sectors of the economy (UKGRAD, 2004). Thus, generic, more transferable advice is perhaps also important for the cohort researched in the current study, although anecdotes from the focus groups suggest that many of them intended to stay in research and HE, which perhaps explains why specific advice has more resonance for them.

In terms of other specific skills, there was some demand for "*more training on communication skills*" and "*more teamwork training*". Given that all of the GEES students in these studies were not part of large research groups and were largely working with one or perhaps two supervisors alone (even during fieldwork which is often associated with teamwork), teamwork and communication were perhaps recognised as areas for further work, despite all HEIs in this study offering opportunities to enhance these skills. By way of comparison, in the 'hard' science subjects (i.e. Physics, Chemistry, Biosciences and Engineering), teamwork and communication are perhaps more endemic due to the large research infrastructures that are naturally more associated with such subjects in the UK and internationally, where teamwork and communication are more endemic. An alternative explanation, of course, is that the students in this study were dissatisfied with the skills training around these areas within their respective universities.

Conclusions

From this small and limited pilot study, six general conclusions can be drawn with respect to students' perceptions of their research degrees and respective institutional research training programmes:

1. GEES students in this study see the PhD as a means to an end. In other words, the "process" (the period of training), is intended to assist in their future employability (one might argue the "product" or outcome of their investment).
2. The second most voted category in terms of rationale for undertaking a PhD was skills acquisition, which one might argue is inextricably linked to employability.
3. At a macro-scale, there is nothing to suggest in this study that research training is perceived as a negative external imposition which is 'bolted-on' and a distraction from the core business of doing research in one's discipline. The GEES students in this study were very forthcoming in their response to Question 2, and identified many ways in which research training was valuable and enhanced their learning experience – from academic reasons (e.g. skills acquisition) to non-academic reasons (e.g. enhanced motivation).
4. There would appear to be plenty of "hidden" outcomes of the training programmes in terms of enhancing confidence and motivation and bringing people together, sharing ideas and concerns and, engendering a peer-assisted community of practice. Such outcomes may be regarded as lacking academic focus and inherently difficult to measure by managers of programmes, but nevertheless the students clearly value these social opportunities.
5. These hidden outcomes, according to the students in this study, are more important than the actual skills and knowledge-focus of the sessions in which they have engaged. This is not saying that any skills acquired are unimportant, rather that fostering a network of like-minded scholars has real resonance for the participants. In the PhD research process, which one might argue can lead to feelings of isolation and over-independence, this is perhaps not surprising.
6. Despite skills acquisition and employability being the main reasons for embarking on a research degree, students feel that the career management training at the HEIs could be improved, in order to better prepare them for the world of work. This advice is needed mainly at a specialist level, but also at a generic level. There would appear to be a mis-match in terms of why students embark on a research degree and what HEIs involved in this study actually deliver in terms of supporting students' needs. In short, more work is needed in helping students fulfil the requirements of Section F of the Joint Skills Statement (see Appendix 1).

Constraints of this Study

This research is not without its limitations. Firstly, only 3 institutions are represented. Furthermore, the data are derived from a limited number of students within the departments represented. The representativeness of these results could, therefore, be open to question. Furthermore, the modest numbers of students who engaged in this research did not permit (for reasons of data integrity and validity) a more detailed interrogation of results, such as disaggregating between HEIs. In addition, a natural but minimal level of subjective judgment was required on the part of the facilitator in the category assignment process, but the vast majority of student responses were in fact clearly articulated, obvious in meaning and any ambiguity was resolved in the event by student verification on the spot. This assignment method to 'best-fit, data-derived' categories was used simply to impose order on what could otherwise be a chaotic data set to analyse. As detailed above, however, the student responses did in fact represent a high level of group consensus on the issues involved, across the 123 responses elicited. Given that the same facilitator ran all the focus groups, any inter-facilitator bias was also eliminated. In recognition of the above though, a larger study would prove most interesting, especially within the GEES disciplines.

Possible Recommendations

These data suggest that the affective and academic responses of students to 'generic/transferable' research degree training may have important implications for future programme design.
Firstly, perhaps more time and experiential learning activities could be built into training programmes to maximise peer support and learning, and the motivational benefits that this clearly brings. How one would market these "hidden outcomes" (which may sound rather nebulous to supervisors, and even students who have not engaged in generic training) may prove to be the challenge here.

Secondly, perhaps more institutional 'Roberts' funds can be invested into the career management areas of the Joint Skills Statement, to bridge the gap between the students' justification for doing a PhD (and their associated needs in terms of skills acquisition and employability), and what institutional training programmes actually deliver in terms of high quality specialist and generic career management provision, preparing our research students for academia or beyond. Clearly, there is work to be done in effecting better links between HEI research training programmes and the careers service in those universities involved in this study.

Thirdly, given that RCUK is funding the majority of research training programmes in the UK, it is important to note that the students in this study are very much "on cue" with the rationale for research degree programmes to offer transferable skills training. In short, the "process" of longer-term skills acquisition and employability (one might call continuing professional development) is clearly important to PhD students, as is the "product" of this process – a well developed set of transferable skills which a competent researcher should be able to put in to practise in a wide-variety of employment sectors. On this positive note, continued funding for effective researcher development would be welcomed.

Finally, the use of NGT provides an interesting and useful evaluation tool for HEIs considering undertaking more in-depth analyses of student feedback from training programmes. It is easy to use and the results can be much more representative than opinions/data obtained from more open discussions.

Interesting Future Questions

This paper has just dipped into a much wider agenda with respect to current national debates and drivers with respect to the UK doctorate. For a more comprehensive exposition of such issues, including international comparisons, the reader is referred to the excellent work of Park (2007) (a paper commissioned by the Higher Education Academy). Indeed, some of the astute and crucially important questions raised at the end of Park's discussion paper, written to help frame and inform a debate about the future of the UK doctorate, also seem appropriate to reproduce and amend for GEES disciplines. The questions hopefully provide some food for thought about doctorate programmes in general, and perhaps in GEES subjects. They are:

1. Is the doctorate really about the product (thesis) or the process (developing the researcher)? This has implications for how time is spent during the doctoral degree, and about how the degree is examined. In GEES subjects, for example, should the ability to conduct fieldwork or lab-work be assessed in the viva?
2. Is the UK doctorate about education or training, or both? How important are research training and the development of generic skills compared with actually doing the research and learning more about the subject? Should generic research training be compulsory or optional? If the skills articulated in the Joint Skills Statement of Appendix 1, cannot be articulated, should the student fail a PhD? This may sound an absurd proposition (although enforced by at least one, nameless, major research-intensive university in the UK), but otherwise how are any national 'skill requirements' really 'standards'? How might different GEES subjects vary in their opinions here? A national debate, perhaps co-ordinated by the GEES Subject Centre, would certainly be timely and interesting.
3. In what ways is the revised QAA Code of Practice (2007) improving the quality of the doctoral student experience? And, in what ways are part-time and distant students disadvantaged by current institutional training provisions and arrangements? In GEES, many of our students are based overseas for part of their PhD programmes. What are the implications here in terms of equity of training provision and parity of the research student experience?
4. How can the employability of doctoral students in GEES subjects be enhanced? How can they acquire the right mix of skills, competencies and experiences to make them more attractive to appropriate employers above and beyond a bachelors or masters award? This may seem obvious to those of us in HE, but to employers the differences may not be so apparent. What is the 'value-added' of a PhD and how might we articulate and market this to employers? And, how can we start to move away from an often traditional and somewhat outdated (and even myopic) view that a PhD is a period of training to become an 'academic only', rather than a period of training in the research process, for careers in a much wider range of fields (especially when 50% of PhDs nationally leave academia). How can the transition between being a doctoral student and adding real benefit to their employer be made shorter, easier and less stressful?

Comments / responses gratefully received by the author.

Appendices have been placed on the GEES SC web site at: www.gees.ac.uk/xxx

References

Ahern, K. and Manathunga, C. *(2004) Clutch-Starting Stalled Research Students. Innovative Higher Education, 28(4), pp. 237-54*
Breen, R. *(2006) Practical Guide to Focus-Group Research, Journal of Geography in Higher Education, 30(3), pp. 463-475.*
CBI *(2008) Richard Lambert, CBI Director General speech on CBI website: http://www.cbi.org.uk [Accessed 19 Feb 2008]*
Brown, G. *(2008) Prime minister's speech on BBC news at: http://news.bbc.co.uk/1/hi/education/7213127.stm [Accessed 19 Feb 2008]*
EMPRESS *(2005) Employers' perceptions of recruiting research staff and students, Leeds University Careers Centre (employer case study).*
Fuller, I., Gaskin, S. & Scott, I. *(2003) Student perceptions of geography and environmental sciences fieldwork in the light of restricted access to the field, caused by the foot and mouth disease in the UK in 2001, Journal of Geography in Higher Education, 27(1), pp. 79–102.*
Gaskin, S. *(2003) Pedagogic Research Methods in Geography Higher Education: A guide to nominal group technique, Journal of Geography in Higher Education, 27(3), pp. 341–347*
Gaskin, S. & Hall, R. *(2002) Exploring London: a novel induction exercise for the new undergraduate, Journal of Geography in Higher Education, 26(2), pp.197–208*
QAA *(2007) Code of practice for the assurance of academic quality and standards in higher education. Section 1: Postgraduate research programmes, QAA: Gloucester*
Park, C. *(2007) Redefining the Doctorate. York: The Higher Education Academy.*
RCUK *(2008) RCUK Research Careers and Diversity Strategy, RCUK: Swindon*
Roberts Review *(2002) Set for success: the supply of people with science, engineering and technology skills. London: UK Government Department of Trade and Industry and Department of Education and Skills.*
Scott, I., Fuller, I. & Gaskin, S. *(2006) Life without Fieldwork: Some Lecturers' Perceptions of Geography and Environmental Science Fieldwork, Journal of Geography in Higher Education, 30(1), pp. 161-171.*
UKGRAD *(2004) What do PhDs Do?, Shinton, UKGRAD Programme: Cambridge www.grad.ac.uk/wdpd [Accessed 19 Feb 2008]*
UKGRAD *(2007) Employers' views of researchers' skills development, UKGRAD: Cambridge (produced as part of a series of activities and publications by the Rugby Team: www.grad.ac.uk/rugbyteam [Accessed 19 Feb 2008]*

Acknowledgements

I would like to thank my colleagues in the 3 HEIs and the students who participated in this study, who were always high spirited and optimistic in their research endeavours and open-minded about future opportunities in a highly competitive job market. I would like to wish all the students the best of luck in their PhDs, and beyond. Finally, I would also like to thank the HEA Subject Centre for GEES for their small-scale project funding and support, understanding and patience in conducting this small study.

New and Aspiring Lecturers Workshop

12-13 May 2009 at the University of Birmingham Conference Park

This two-day residential workshop is designed for recently-appointed teaching staff and postgraduates/GTAs who are aspiring to be lecturers in Geography, Earth and Environmental Sciences (GEES).

The aim is to help participants learn about, evaluate and discuss a range of approaches, methods and resources for learning, teaching and assessment in these disciplines.

By being discipline-specific the event will complement any generic-based institutional courses that delegates are attending or have taken. It will also provide an informal opportunity for delegates to meet and share experiences with other new GEES staff from other institutions.

Registration will be opening in February 2009. For more information, please visit www.gees.ac.uk or contact elaine.tilson@plymouth.ac.uk.

The use of systems thinking software for research-led teaching of biogeochemical cycles: preliminary findings

Robert J.G. Mortimer and Michael D. Krom

School of Earth and Environment, University of Leeds.

Abstract

STELLA systems thinking software can be used to enhance learning in the GEES subject areas. This paper presents an example where STELLA has been used within final year undergraduate and Masters modules on biogeochemical cycles. Student feedback was generally very positive, and students found that the opportunity to build and test their own models enhanced their understanding of the Earth System. Some implementation issues occurred, which resulted in negative feedback, but these can be solved relatively easily. STELLA has potential to be used in a wide variety of learning and teaching across Geography, Earth and Environmental Sciences.

Introduction.

The STELLA computer programme (iSee Systems, Inc) has been used previously to enhance learning and teaching by modelling a wide variety of Earth systems and processes (e.g. Bice, 2001; Crawford-Brown and LaRocca 2006; Menking, 2006; Sheldon, 2006). It is a flexible, icon-based e-tool that allows students within the GEES subject areas to model relatively complex processes. It helps to bridge the gap between Geoscience research, which makes increasing use of modelling, and learning and teaching, which as a rule does not (Menking, 2006). It has been shown to help develop students' skills of: hypothesis formation and testing; integrative thinking; numeracy; and problem solving (Menking, 2006, Crawford-Brown and LaRocca 2006; Sheldon, 2006).

This paper describes how STELLA was used to enhance research-led teaching of biogeochemical cycles at undergraduate final year and Masters levels. One module was essentially a sub-component of the other, and hence they are discussed together. The aim of the course was to foster a modern Earth System Science approach in which the students were able to explore the integrated and holistic nature of biogeochemical cycles (Johnson, 2006). The basic rationale for incorporating STELLA was a simple one, namely that students benefit from active learning (Cox, 1994), and that creating, exploring, and testing their own models is better than listening to them being described in a lecture. Additional aims were to foster closer linkage between research and teaching, and to allow students to further develop skills of hypothesis formation and testing, integrative thinking, numeracy, and problem solving.

Method.

The STELLA software was embedded into the two new related modules, SOEE3110 Earth System Science: Biogeochemical Cycles and SOEE5232 Biogeochemical Cycles of the Earth System. The total class size was 65, and included students taking a variety of environmental and Earth-related degree programmes.

The software was introduced into the course in three ways. Students:

1. were given training in the use of the software to create simple models.
2. had familiarity with STELLA models reinforced, by using them as explanatory and illustrative tools during lectures.
3. were set two assessments using the software: the first was a three-stage model-building assessment; the second explored scenario testing and model limitations.

Prior to the STELLA training session, the course included two hours on box modelling to start students thinking about systems and how they might be described (Sibley et al., 2007). The STELLA training session itself lasted a further two hours, during which time students were introduced to the software and shown how to build basic models. During this session, the students constructed a model of the water cycle that was then used during lectures the following week.

The next section of the course covered the carbon cycle and, in parallel with lectures, students were set a three stage STELLA assessment to design a simplified model of the carbon cycle. The first stage of the model was relatively prescriptive, and was designed for students to practise and reinforce their modelling skills whilst starting to think about the carbon cycle. They were asked to follow quite detailed instructions in order to model expected and actual long term trends of atmospheric carbon dioxide. This was handed in for formative feedback and returned quickly so that students could progress to stage two of the model.

For stage two, students were given more general instructions, and were asked to add the impact of respiration and photosynthesis on carbon dioxide levels. The aim of this stage was threefold: to continue to develop students' modelling skills; to develop their numerical skills (mathematical functions required); and to encourage them to start thinking about the inter-relationships of processes within the carbon cycle. This was again handed in the form formative of feedback before students tackled the final stage of modelling, which was the summative assessment. For this final stage, students were asked to add the ocean carbon cycle to their model, based on their understanding of the processes covered in the lectures (Figure 1).

Later in the course, lectures on the phosphorous cycle introduced the concept of using STELLA for scenario testing (future and past; Figure 2). Students were then set their second assessment, where they had to use a model of the carbon cycle to test potential future scenarios. In addition, they were asked to explore the limitations of the model, something that Sheldon (2006) points out is a key part of developing student understanding of what models can be used for.

Feedback was gathered for the course as a whole using a standard proforma, but students were also asked to provide specific comments on the STELLA modelling component.

Results and Discussion.

The mean marks out of 5 given by the students for different aspects of the module are summarized in Table 1.

These results demonstrate that the module was a success, particularly given various teething problems that commonly occur for new modules. Specific feedback on the STELLA modelling component is presented in Table 2.

At first glance, it seems that views of the STELLA modelling were highly polarised. However, closer examination of the specific comments reveals a more positive picture. Students who praised the use of STELLA liked the opportunity to do modelling, and found it very useful. Typical comments were:

> *'STELLA modelling was very useful and interesting'*

> *'STELLA is a good learning tool and helped my understanding of biogeochemical cycles'*

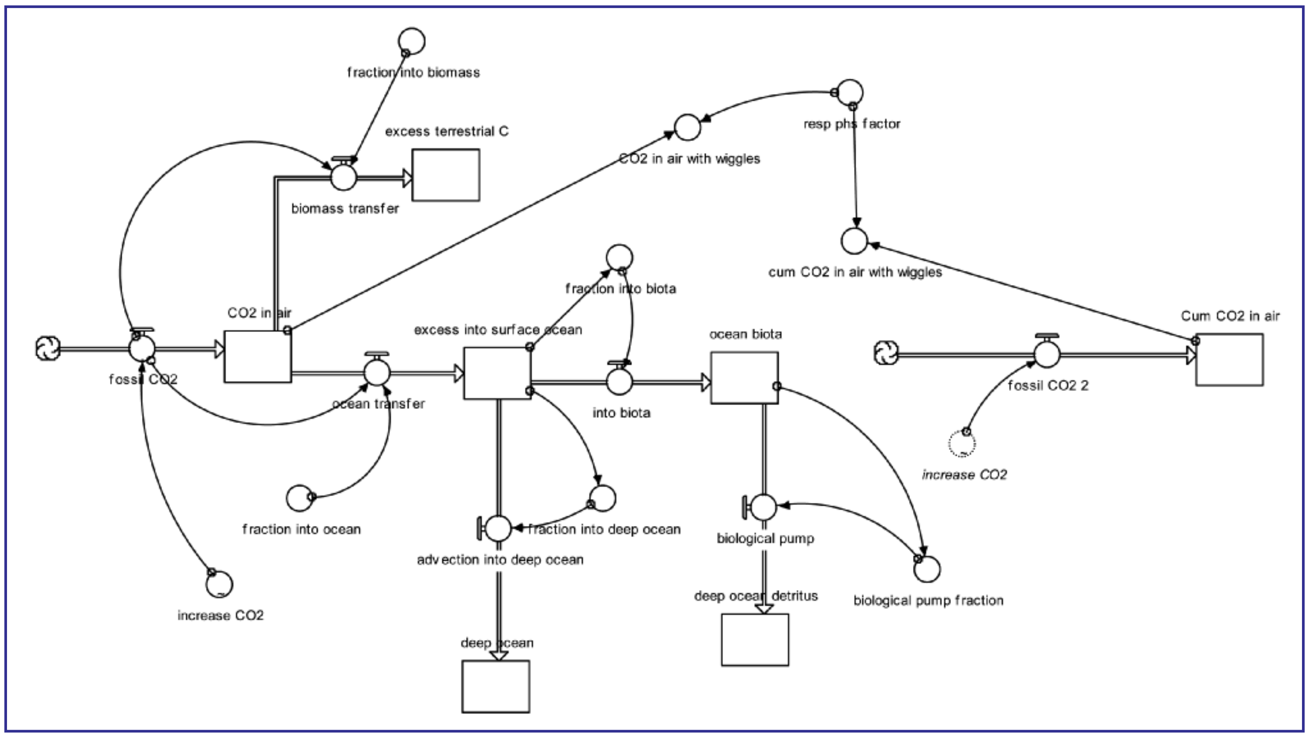

Figure 1: Basic STELLA model of the carbon cycle as constructed by students in three stages, together with example output.

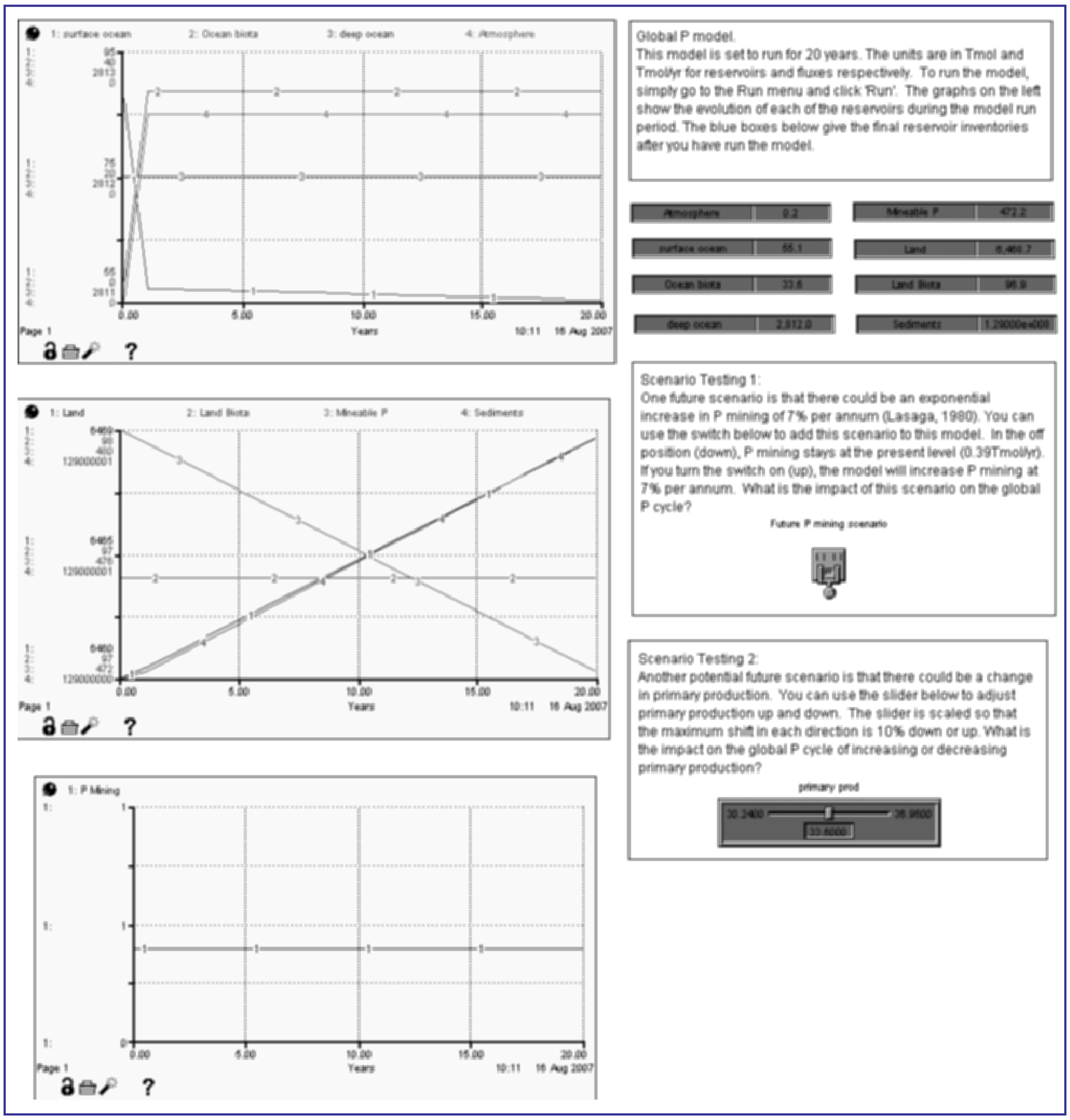

Figure 2: Interface from phosphorous model showing example of scenario testing possible with STELLA

'STELLA is good…we don't normally get the chance to use computer models. And actually be able to understand it!'

'STELLA modelling is interesting and helps you understand the links between the systems.'

'I believe the modelling is a good part of the course and must be kept'

'The work has been interesting and the modelling has been good. Using the modelling software and seeing the real implication of changes to the systems was really good.'

'I enjoyed the STELLA modelling- allowed us to look at different scenarios – helped with understanding.'

Comments were often framed with general comments about the global and holistic nature of the modules, and it is clear that the STELLA was beneficial in this respect. For example:

Was the material presented in the course interesting and relevant?	The assessment requirements are clear.	The amount of work is about right	Was the lecturing style lively and interesting?	There is adequate access to required learning resources.	Overall this is a good module.
4.2	3.7	4.1	3.8	3.5	4.1

Table 1: average evaluation of module by students (49 respondents out of a total of 65 students registered on modules (5 = strongly agree; 4 = agree; 3 = no opinion; 2 = disagree; 1 = strongly disagree)

Total number students providing feedback:	**49**
No. students who made specific positive comments about the STELLA modelling	31 (63%)
No. students who made specific negative comments about the STELLA modelling	25 (51%)

Table 2: numbers of students commenting on STELLA modelling component

> *'Broad nature of course forces you to think of the Earth system as a whole.'*
>
> *'Modelling work was excellent; helped understanding of course. Very good summary module for BSc Earth System Science.'*
>
> *'Covers wide range of topics, all linked and relevant to global system; it was good to have the opportunity to try modelling.'*
>
> *'Holistic view of Earth System* [was the best feature of this module]'

Several students praised the STELLA assessment, and particular the rapid feedback that was provided:

> *'Modelling was good: new and interesting. STELLA modelling assessment was clear and straight forward.'*
>
> *'Doing the modelling is a good idea as something to take pressure off exam.'*
>
> *'Feedback (given on STELLA models) gratefully received… gives useful feedback'*
>
> *'The feedback and modelling* [were the best feature of this module]*, as it forces understanding.'*
>
> *'Interesting module; really fast feedback on STELLA modelling assessment.'*
>
> [The best feature of this module was] *'the rapid and continuous feedback that the assessments provided'*

Number of students making negative comments about STELLA modelling:	**25**
Total number of negative comments:	29
Need STELLA on more PCs/restricted access to cluster	6 (21%)
Difficulties printing from STELLA	2 (7%)
More STELLA training wanted	5 (17%)
More clarity needed in STELLA assessment guidance notes	8 (28%)
More clarity needed in STELLA marking criteria	8 (28%)

Table 3: Summary of negative feedback on STELLA modelling

In contrast, the negative comments (See Table 3) were about three specific aspects of the STELLA modelling (hardware/software issues; training/clarity of instructions; level and marks allocation for first assessment). Several students who praised the modelling highlighted these aspects as things for improvement.

All of these criticisms have been taken on board for future years, but they are essentially implementation issues. Hardware and software issues (28% negative comments) are inevitable when introducing new electronic resources. Changes to the assessment guidelines will alleviate the printing problems next year. Access to PCs remains an issue and highlights the need for both sufficient hardware and enough STELLA licenses.

The issues of more STELLA training (17% of negative comments), and better clarity of guidance notes (28%) reflect differing levels of computing ability amongst the students. Some students found the modelling software very easy to use, while others didn't. Introduction of an additional voluntary training session is probably the best way to solve this problem in future years.

The final set of negative comments concerned the assessment criteria. After speaking to the students, it is clear that these comments came from students at the upper end of the ability spectrum who wanted more marks to be available for constructing more complex/accurate models, and who felt that too many marks were given for good presentation. These criticisms are valid, but reflect the fact that the level of the assessment was set with no prior knowledge of how the students might find systems thinking software and construction and testing of models. With the benefit of hindsight from this first year, the course and supporting materials will be modified for future years, to alleviate this problem.

Conclusions and recommendations.

Overall, the introduction of the STELLA software to teach biogeochemical cycles was very successful. Positive student feedback outweighed negative feedback, which was largely down to implementation problems (that were perhaps to be expected). Feedback in subsequent years will be compared with this first cohort to check that these problems have been resolved. The basic aim was realised, with student feedback showing very positive responses to active-learning. Students gained new modelling skills, but also enhanced existing skills of problem solving, integration and numeracy.

Most of the students were more computer-literature than expected (France and Fletcher, 2007), and many enjoyed the chance to do modelling. As with previous studies, the majority were enthusiastic and some really began to be creative and take ownership of the course (Menking, 2006). Similarly, the small number of students who were less enthusiastic tended to construct models with minor errors or timing issues that they were then unable to critically analyse and correct (Menking, 2006).

STELLA is a very flexible tool that can be used to model a wide variety of different systems in the GEES subject areas, both within the physical and social sciences. It also has the ability to allow students to explore links between physical and social processes (e.g. link between society, sustainability and the carbon cycle). As with any implementation of e-learning, some investment of time is needed by staff to learn how to use the software and to build models to support the learning and teaching (France and Fletcher, 2007). However, student learning can be enhanced significantly and STELLA can be used to drive independent-learning that ultimately makes courses more efficient.

Aknowlegements.

Teaching Quality Enhancement Fund support of £4200 was gratefully accepted.

References.

Bice, D.M. *(2001). Using STELLA models to explore the dynamics of Earth systems: experimenting with the Earth's climate system using a simple computer model. Journal of Geoscience Education, 49: 170-181.*
Cox, B. *(1994). Practical points for University teachers. Kogan Page Ltd, London.*
Crawford-Brown, D., & LaRocca, S. *(2006). Teaching systems principles and policy applications using a reduced-scale carbon cycle model for global warming. Journal of Geoscience Education, 54: 301-311.*
France, D., and Fletcher, S. *(2007). E-learning in the UK: perspectives from GEES practitioners. Planet, 18: 3-5.*
Johnson, D.R. *(2006). Earth system science: a model for teaching science as state, process and understanding? Journal of Geoscience Education, 54: 202-207.*
Menking, K.M. *(2006). Creation of a computer modelling course for undergraduate Earth Science Students. Journal of Geoscience Education, 54: 464-470.*
Sheldon, N. *(2006). Teaching quantitative skills and integrative thinking in earth sciences using object-oriented computer models. Planet 17: 44-47.*
Sibley, D.F., Anderson, C.W., Heidemann, M., Merrill, J.E., Parker J.M., and Szymanski, D.W. *(2007). Box diagrams to assess students' system thinking about the rock, water and carbon cycles. Journal of Geoscience Education, 55: 138-146.*

The geography curriculum and sustainable development: a didactic research process

Dr Emilia Sarno

Emilia Sarno, University of Molise, via De Sanctis

Abstract

This paper presents an applied piece of research produced in collaboration with teachers and students from Molise, a region of Italy. Both the research process and the geography curriculum (centred on sustainable development) are documented. The teachers have concentrated on the issue from a theoretical point of view, and have perfected some didactic approaches based on field lessons and reflections on the experience. The experiment (pilot) has demonstrated the validity of the research. The teachers have established the guide-lines of a geography curriculum for sustainable development which can extend from primary to secondary school. It is hoped that Planet readers in the UK and elsewhere will find it interesting to learn about how education for sustainable development is being taken forward in schools in part of Italy.

The Research Process

This research has two aims: to spread teaching approaches relevant to sustainable development in Italian schools and to supply teachers with new and innovative methods to consolidate in a positive way the relationship between students and the environment.

This applied research, produced in collaboration with teachers and students from Molise, a Region of Italy, is based upon field research with the intention of observing teaching methods through repeated statistical surveys which have permitted an increased understanding of the issues involved. The debate on sustainable development has spread and is a subject widely cited in Italian school curricula at every level. Italian teachers, however, have difficulty in dealing with the issue and in translating it into practical teaching. Meetings have been held with teachers at every school level to shape ideas on the complex subject of sustainable development, its epistemological basis, and the fundamental role of geography as a major point of reference. The next stage has been to evaluate which methodologies will allow the establishment of an educational approach to sustainable development and to apply a direct form of experimentation so as to test the value of the research through the results obtained.

The Theoretical Presuppositions

The teachers have clarified the concept of Sustainable Development, which, according to specific literature, includes a respect for the integrity of the ecosystem, a rational utilization of resources, and social equity to the advantage of a better relationship between man and nature (Vallega, 2005). In the Italian context, the recent book, *Energia e Ambiente*, edited by Paolo degli Espinosa of Italian Institute for Sustainable Development in 2006, has been very important.

The basic theme of Sustainable Development is the relationship between man and his environment, taking into account the transformations which have already taken place and the possible changes in the future, changes which should respect both human needs and the resources of the environment (Sarno, 2005).

The anthropization of the environment is the fundamental concept to be applied in order to understand the diverse behaviour of human groups (Armiero-Barca, 2004). The social and technical revolutions, from the neolithic, highlight changes and modifications up until the most recent period characterized by perturbed environments (Delort-Walter, 2001).

In the second phase the teachers were concerned with identifying the principal subject to be used as a reference point so as to have a precise object in the learning process. This subject is geography because it is knowledge structured by human groups as a reaction to their continuous interrelationship with ‘geographical space’, starting from a group’s own territory and its moving out into unknown environments. Geography has, then, the following educational ambit: it indicates the relationship between society and environment and teaches how to explore and represent this experience. Geography, however, can and must work together with other subjects that deal with the environment, favouring interdisciplinary interaction with, for example, history and the natural sciences (Pawson- Dovers, 2003).

The following topics need to be studied in greater depth: climate changes, alterations to the ecosystems, the utilization of water resources, and desertification. Pollution of the atmosphere creates an imbalance which has effects on the entire biosphere. Water is a precious resource which is being polluted and which is scarce in some areas of the earth. Deforestation accelerates the loss of biodiversity and causes hydrological imbalance.

The last point to be dealt with by teachers was to choose the didactic methods with which to deal with the subject with their students and, above all, to create didactic projects which were practical and which allowed the development of students' abilities through direct experience.

Education for Sustainable Development must be participative, based upon research and discovery (Sarno, 2006b); particular attention must be given to observation and interpretation. Two phases can be outlined when elaborating a geography curriculum of study: one for Primary education and another for Secondary education. At the primary stage of education, exploration, direct experience and first-hand observation are fundamental; whilst at the secondary level, reflection upon the sources of knowledge, documentary research and attention to planning are primary concerns (De Vecchis-Staluppi, 2004).

The Experimental Stage

After having perfected these guide-lines, the teachers began the experimental phase of the research: they programmed the didactic plans which were composed of field work, periods of study, and the development of projects. They aided the students in appreciating the importance of a first-hand discovery of environmental problems and issues, and they stimulated them towards a personal reflection and the development of project-work. In this way they become directly involved with sustainable development.

For each school level a plan was established in the school's region which included a study of a specific issue (waste products, water pollution, uncontrolled forest clearing), data collection and information, and analysis of the forms of sustainable management of resources or materials.

The first set of data collected was from elementary school pupils. It was observed that the children not only had little knowledge of the subject, but also little familiarity with their environment. It thus becomes even more necessary to favour an improved familiarity with the environment and to make the pupils pay greater attention to the environmental affects of human activity. The pupils' drawings highlighted a growing awareness of the issues faced. They also engaged in trying to find possible solutions for each individual issue.

This experiment clearly demonstrated its utility. It was also advantageous in promoting a greater knowledge of geography as direct personal experience was an incentive to study and allowed for the development of the necessary skills.

The results of the research and the development of the geography curriculum for sustainable development

Following the experimental phase, the teachers thought it opportune to apply similar programmes in schools of every level and type, as well as to develop a valid curriculum for Sustainable Development in line with a knowledge of geography. They also indicated the topics to be dealt with and the teaching methods to be used in schools. I cooperated with the teachers in planning the curriculum for Sustainable Development as outlined below.

3.1 Primary School

Space is a category of knowledge which develops due to a continuous interaction with the environment, which is understood as both a place of sensory input and of orientation. In this sense, the exploration of the environment is of fundamental importance and requires a capacity of observation in order to understand the territorial structures. An internalization of this logic, through spatial-environmental activities, allows the development of cognitive mapping and facilitates graphic representation by creating a link between observation and description. Exploration of the environment predisposes primary school children to relate knowingly and aids the development of cognitive mapping. Children will also learn the importance of the environment and develop a sense of respect for the natural world.

3.2 Elementary School

Upon moving to elementary school, the interaction between society/environment has to be both experienced and reflected upon in an abstract manner, that is to say it becomes necessary to reason about the relationship which exists between the two. Teaching must be presented on a local scale via analyses of both specific situations and of the transformations brought about by human activity: use must be made of direct personal discovery. The elements present in the geographical spatial context reveal how every aspect of the territory is the result of socio-economic and cultural processes. The gradual exploration of the territory system will make comprehensible the modifications made by man through time. Students will begin to think of how to use the resources available in an equitable manner. This stage must be linked to students creating their first personal idea on sustainable development and how to live sustainably.

3.3 Middle School

During the middle school years students should learn a deeper form of analysis of the society/environment relationship using the different spatial scales, by studying the European regions. Their interest should be directed to the industrial process in all its complexity and to the different forms of social and environmental impact it produces. This analysis should be linked to the study of the political process behind development so as to be able to determine how the industrial system developed, the differences between the rich nations and the poor (those outside the process of industrial development) and the different forms of pollution.

Learning must be accompanied by an understanding of policy; students should learn about how to make positive modifications to the environment, to improve deteriorated landscapes, and to propose responsible utilization of resources.

3.4 Secondary School

Two major themes need to be dealt with in secondary school: the interrelationship between society/environment at the global level and an adequate analysis of the philosophical dimension of this relationship. Knowledge at the global level is necessary in order to understand international protocols and the interdependence between local and global political decisions. Furthermore, an analysis of globalization as an economic process will help to develop an understanding of the value of unified planning in dealing with environmental problems.

The geography curriculum will then be completed by a philosophical reflection on the relationship between society/geographic space because this will allow the students to become more aware of the use made of resources and of the importance of the environmental context for society. In this way they will acquire an understanding of Sustainable Development in a way which is appropriate both for society and for the natural environment.
The students should, in the final stages of the educational process, possess the tools necessary for an analysis and interpretation of environmental problems from the scientific, economic and political points of view. Finally, students should be exercised in the elaboration of functional interventions, by an appropriate use in their work of the language of cartography and information science.

Conclusions

This research has allowed the development of a curriculum for sustainable development to be included as a part of geographical knowledge and the organization of a series of didactic stages suitable for each student age. This was made possible by reflecting upon the epistemological aspects of this topic. However, the epistemological aspect of the subject can have a strong educational value if the ethical dimension is kept clearly in mind. Issues such as: respect for the environment, respect for resources, correct human approaches, and attention to those processes that will have an impact on future generations. Without these values, knowledge of this subject would be dry and unproductive. Knowledge of the anthropization of the environment must not be separated from discussing and debating ecological ethics and sound values.

References

Armiero, M., and S. BARCA *(2004) Storia dell'ambiente. Roma: Carocci Delort, R., and F. Walter (2001) Histoire de l'envinnement européen. Presses Universitaires de France.*
Degli Espinosa, P. *(eds) (2006) Energia e ambiente dopo Kyoto. Italian Isitute for Sustainable Development: Edizioni Ambiente*
De Vecchis, G.,and G.A.Staluppi. *(2004) Didattica della geografia. Torino: UTET*
MC Neill, J.R *(2000) Something new under the sun. A environmental history of the twentienth-century world. Norton*
Pawson, E., and S. Dovers *(2003) Environmental History and the Challenges Interdisciplinarity: An Antipodean Perspective in Environment and History. 9(1). 53-75.*
Sarno, E. *(2006a) On the environmental history in Molise:"an approach to the sources of the 1800's in Cultural heritage and sustainable forest management: the role of traditional knowledge. Warszawa. 521-524.*
Sarno, E. *(2006b) Modelli e indicatori della progettazione ambientale in Valutazione ed autovalutazione. IRRE Molise. 83-88.*
Sarno, E. *(2005) Vedute in prospettiva- I segni del tempo sull'ambiente in Sapere. 4. 62-69*
Sarno, E. *(2002) Ripensiamo la geografia, Roma: Kappa*
Vallega, A. *(1995) La regione, sistema territoriale sostenibile. Milano: Mursia*

Emilia Sarno, University of Molise,
via De Sanctis
sarno@unimol.it

Using criterion-referenced assessment and 'preflights' to enhance education in practical assignments

W. Brian Whalley[1] and Lyla Taylor[2]

[1] School of Geography, Archaeology and Palaeoecology, Queens University of Belfast
[2] Department of Animal and Plant Sciences, University of Sheffield

Abstract

This paper looks at the reasons students often complain of 'not enough time' in practical assignments. One reason is that they come across 'sticking points' at a late stage and cannot deal with them satisfactorily. The use of criterion-referenced assessment is one way to identify sticking points before a task is set. A 'preflight' (using Just-in-Time teaching ideas) is a short assignment which helps students identify difficulties in advance and get started on the main task even before it is set. The following identifies ways of building 'preflights' and criterion-referenced assessment into experiential education.

Introduction

Students often complain that they 'do not have enough time' to do continuous assessment assignments. In the field, the reason may be because they have not planned sufficiently well, while in the laboratory, perhaps, because they did not do a measurement correctly and have to repeat it. Whether in the lab or field, task feedback can be very nearly instantaneously provided by a demonstrator or tutor; 'Try it this way, don't forget you have to…' etc. This is useful experiential learning and the feedback helps to make sure that the activity is accomplished before the departure time etc. What frequently needs to be shown is some piece of tacit knowledge and to make this more explicit.

When students are writing on their own, this 'lack of time' is often manifest in that common human trait, 'procrastination'. When problems arise here, there can be extreme difficulties; of failure to do as well as expected (by student or tutor) perhaps by non-completion of a part of the task, or, indeed, failure to submit a piece of assessed work. A less immediate, but no less serious, problem may arise when knowledge needs to be built upon and an earlier misunderstanding might be shown as a subsequent error in an examination or practical work. This paper presents some ways in which these difficulties can be recognised and minimised, if not avoided.

The concepts and practical issues discussed here are designed be part of the learning experience of practical work. The first is the development of criterion-referenced assessment (CRA), both by detailed examination to help identification of students' 'sticking points' and its subsequent utility as a marking scheme that students can relate directly to their learning experiences. The second intervention is the use of 'preflights' before practical work (or a lecture) takes place. These interventions are aligned to assessment by the use of CRA.

The ideas and implementations presented here are part 'tutor focussed' and part 'student focussed', but can be implemented with little difficulty. Some examples are provided. Quotations by year two students (in italics) from their web-folios are used to illustrate some experiences using these tools. ***(BC waiting to hear who where these students are from and what year they were investigated)***

Experiential learning

Active student participation is an important part of learning (Healey and Roberts, 2004). In fact, rather more than 'participation' is required. What tasks are students actually asked to do? There is good evidence from education and cognitive psychology that experiential learning is a major way in which people 'learn' (Dror, 2006a; Dror, 2006b; Humphrey, 2006). This is a good justification for field trips and laboratory work. However, there is also a need to make learning experiences part of a pedagogic construct which provides alignment of tasks. Following Biggs (2003) we should therefore provide learning experiences that are consistent between curriculum (the structure rather than the content of what we teach – the syllabus), teaching methods, learning environments, and assessment procedures used. Constructivist ideas figure largely in this approach and although not elaborated upon here, a problem based learning approach (Coles, 1997; Savin-Baden and Major, 2004) is an important methodology where tutors require their students to have good learning experiences in the laboratory or field.

Problem based learning (PBL) can be directly related to constructivist approaches; a good discussion is presented by Savery and Duffy (1995). Following Lebow (1993), they suggest eight instructional principles which follow from the constructivist and PBL approach outlined above:

1. Anchor all learning activities to a larger task or problem
2. Support the learner in developing ownership for the overall problem or task
3. Design an authentic task
4. Design the task and the learning environment to reflect the complexity of the environment they should be able to function in at the end of learning
5. Give the learner ownership of the processes used to develop a solution
6. Design the learning environment to support and challenge the learner's thinking
7. Encourage testing ideas against alternative views and alternative contexts
8. Provide opportunity for and support reflection on both the content learned and the learning process.

Such principles are all very well in *designing* learning activities, but there still remain the instances of students (as individuals or in groups) who have problems in understanding the basic principles behind an experiment or piece of practical work. Further, if we are to be suitably student-centred, how (well) do tutors know the problems students have? In any subject there are concepts to be understood before progress can be made. Several authors have indicated these 'threshold concepts' and their importance in students' understanding (Cousin, 2006; Land et al., 2005; Meyer and Land, 2003).

There is often a general tutor complaint that students' work schedules are too crowded to fit in more practical work. However, as suggested in the introduction, this is often because students leave things until the last minute and relatively minor difficulties for the experienced can become major problems for the inexperienced. The devices outlined in this paper largely have to do with principles 2, 4, 6 and 8 listed above. Although here we are concerned with practical tasks in physical geography and geology, these ideas could also be used in many educational settings.

Difficulties with concepts, tacit knowledge base and 'sticking points'

Students frequently have problems with specific ideas or concepts (e.g. 'regression', 'pH') or generalities (e.g. 'numbers'). Examples of these 'threshold concepts' and 'troublesome knowledge' have been recorded in Planet 17 (2006) where ideas and interventions to alleviate the problem have been discussed. However, there are also problems students encounter with a new topic, perhaps that delves further than their previous knowledge and these, too, are usually easy to identify. Less easy to spot are difficulties when *students think they know* about a subject, perhaps from A Level or from a previous year. We have found that this is particularly true for techniques (such as sampling) or tools (such as Excel). Further, there are topics that *tutors believe* their students *should* know about, and this is often the case with module systems where students have forgotten something, perhaps have not understood it fully, or believe they have understood it. Finally, there are problems concerned with tacit knowledge. Tacit knowledge, following Polanyi (1967), is that which is not made explicit. It has become increasingly discussed in a wide variety of knowledge environments beyond the educational (Baumard, 1999; Collins, 2001; Eraut, 2000; Goranzon and Ennals, 2005). This will not be discussed further here in detail: suffice it to say that it is increasingly significant in informal learning, such as provided by groupwork

Type	Problem style	Example
Theory based	Failure to appreciate a fact or theory	i That particle sizes defined in Phi (p) units can have negative values ii values of radians=tangents=sine for small angles
Practically Based	Failure to know how to do something	i That an Excel spreadsheet can be used for modelling ii
Tacit Knowledge	Failure to know *what* to do or do better (NB practically based problems may often grade into tacit knowledge.)	i That you can blank a PowerPoint screen by pressing B on the keyboard ii That plotting x and y values in a 'scattergram' can give more useful information than calculation of population statistics iii That equation 1 on page 23 of '….' is incorrect and should be '……..'

Table 1. A simple typology of 'sticking points' (see also text related to 'troublesome knowledge').

in practicals and laboratories. Furthermore, tacit knowledge is likely to be important in situated learning, where social learning is important and individual help usually close at hand (Mayes and de Freitas, 2007).

We call issues which cause the variety of difficulties mentioned above 'sticking points'. Sometimes, a few minutes of instruction or guidance (which may come from other members of a group or the tutor) will solve the issue. How then can these sticking points be identified? Perhaps neither staff nor students realise their presence – perhaps not until very late in a period for a practical submission? We have tried two methods of identification—'advance feedback' and 'preflights'. The former consists of a list of mistakes or things not done well or correctly as identified from previous years and which are reported on the module website, before the students start their practical. This feedback material might be a substantial list on the website. However, despite students being shown this at the start of the practical, many often fail to use it. One might expect good marks if all the information was used, but students frequently fail to exploit such resources. The reasons for this failure to use material are not clear. It may just be that the list is too long and that students cannot identify from it the mistakes or omissions that they are about to make, or have made. However, it does point to a problem; that if people do not use feedback from previous years why is this (when it could gain them extra marks)? What does this imply about using the feedback from their own work? Before explaining about 'preflights' we turn to a method which is important both in assessment, and in helping to identify 'sticking points'.

Criterion-Referenced Assessment (CRA)

We have no data on the marking schemes for practical work used by tutors at our or other institutions in GEES subjects or more generally. There may be generalised criteria for essays and examinations with essay answers, but these are not applicable to reports and practical work. However, asking colleagues (at several GEES meetings) suggests that many practical and fieldwork submissions are graded according to a *perceived notion* of expectations for the piece of work; a mental checklist of items that students should include. The expectations may provide a mark scheme but one that is implicitly approved by the marker. This has been called a 'connoisseur approach' (Rust et al., 2003). For preference, a criterion-referenced assessment scheme should be used (Harvey, 2004; Whalley, 2008). Such schemes are supported in the current literature as being explicit and student-centred, and they improve student understanding and provide consistency in marking (Price and O'Donovan, 2006; Saunders and Davis, 1998; Woolf, 2004). Our experience supports the use of CRA in practical reporting and for fieldwork note books. We shall report this work and the tool used in detail elsewhere. Here, we report some ways in which CRA can be used for the identification of 'sticking points' and to produce better student understanding and attainment.

Detailed evaluation of the task is used to produce a set of criteria which correspond to the main activities in the practical piece of work. There may be any number of criteria (eg fifty or more) depending upon the task set. This requires careful reading of student submissions, and thus takes considerable time. However, it does provide a basis for subsequent CRA and the production of a simplified mark scheme for tutors *and* students. Use of detailed marking schemes has shown instances of students not appreciating features pointed out on a fieldtrip, things being pointed out incorrectly (by a postgraduate assistant), incorrect use of a formula etc. The patterns of problems are identified by this detailed CRA approach. Problems identified were, or could subsequently have been, 'sticking points' and so detailed criterion marking helps to show where correction, additional instruction or feedback is needed.

Students are presented with a much simpler scheme, usually from six to twelve categories or sub topics, with marks accordingly from five to twenty marks. Figure 1 is an example for a field and laboratory practical in which students examined grain size variation from a beach to dune system. This scheme was explicit to students before they embarked upon the work. There is thus alignment between the student participation, practical requirement and their assessment. Student marks in each category are mailed back after marking, together with appropriate comments (Figures 2 and 3). Students can, thus, see their marks against each part of the task and this provides specific feedback. Furthermore, the statistics of the class as a whole can be included (on the module website together with more detailed comments) or mailed to each student (Figure 4).

> *Due to [the] marking system I was able to see where I went wrong and therefore hopefully work on these things in future practicals.*

Mark scheme for Practical 4

There is a **one page report** and a **single page A4 poster** due for this practical. The specifications are given in the table below. A header page is in addition to the above for paper hand in.

In general, you have to report on your field and lab observations and calculations and present them in summary form in both types of report. Remember that the reports are for two *different* audiences and you have to reflect this in your material. You will have to do a bit of background research and refer to this appropriately. Both reports will be marked together as below

Sub-topic	Marks/Weight	Comment
1. Field data, sampling sites on cross section, location	10	Reporting site info including diagrams, maps etc
2. Calculation and presentation of cumulative size distribution and brief descriptive statment on results	10	Reporting analysed results, Weights etc not needed, the graph summarises and is important. check labels and axes and units
3. Calculation of summary parameters and statements about what they mean. Comments on materials including particle form parameters.	20	You don't need to say a lot -but it has to be good and use the correct terminology. Image of typical grains.
4. Reporting **your** results, including reference to diagrams and profile data of all the profile.	20	Comments on comparison with results from other groups and their locations on the profile taken. Reference to theory and findings from the literature. How do you interpret *your* results?
5. Reporting analysis of **all** results, including summary stats, etc in a larger context of location, time, magnitude frequency etc	10	General comments about the site and your observations and interpretation overall at the site of what is happening and has happened
6. General comments about your findings, context etc, and related to published investigations from *other areas* concerned with the problem/aim	10	Critical overview of data collection and results as specified, include appropriate references and comments about this work and related findings
7. Overall layout of written report completeness in 1 page	5	Layout of text page, diagram legibility, annotation, keeping within specification, readability, legibility of graphs etc

Figure 1. A criterion referenced assessment for a practical in a year 2 geomorphology module.

Forename	Email	Total	1	2	3	4	5	6	7	8	9	Remarks
brian	b.whalley@qub.ac.uk	100	10	10	20	20	10	10	5	5	10	Too many things left out, especially interpretation of findings

Figure 2. Part of spreadsheet mailed back to students individually showing marks achieved in each sub-topic (1-9) and the remarks made. The numbers in this instance for 1-9 are to check the spreadsheet and show maximum marks achievable for each.

'Preflights' and experiential tasks

If student 'sticking points' can be identified before going in the field or laboratory, then the learning experiences are likely to be maximised and made more enjoyable (and perhaps in the case of bad weather, less unpleasant). A basic design for a fieldwork or laboratory task suggests a formal linkage of pedagogic structure, student activities and tasks and assessment and feedback. How might this best be arranged and implemented?

'Preflights' help students tackle the various difficulties mentioned above. The name follows from pre-flight checks (rather than pre-publishing checks, although their derivation is the same); 'warm up' is an alternative name. These activities are done in advance of the events where they are required (lecture, lab or fieldwork). The idea has been developed in particular by Novak et al. (1999) as part of a 'just-in-time teaching' arrangement.

The various schemes devised by Oliver and Herrington (Oliver et al., 2007; Oliver and Herrington, 2001) provide a good starting point to set up an appropriate pre-flight in conjunction with the identification of 'sticking points' mentioned above (Figure 5). The important aspect is that the preflights should not be major task for students – although we feel that they should be as experiential as possible in tackling the problem or warming up for the event. They should involve an active task, not just 'read up on' – although this may be a necessary part of the task. Examples we have used include: 'write a spreadsheet to do this calculation', 'define these terms via Wikipedia', 'plan the sequence of events to do x', 'using theory, plan what you will do in the field' and 'write a

Hello [[Forenames]],
Here are the marks for P4:
Total = [[Total]]
Made up of the following sections (please see mark scheme for details):

1. [[1]]
2. [[2]]
3. [[3]]
4. [[4]]
5. [[5]]
6. [[6]]
7. [[7]]
8. [[8]]
9. [[9]]

remarks: [[Remarks]]
More comments will shortly be on the module website together with the class statistics for this practical.

Days late (if applicable) [[Lateness]]

Please mail me if you would like to discuss the marks you achieved.

Thanks

Brian

Figure 3. Generalised list of marking criteria. The mail facility inserts an individual's name, marks and appropriate comments from the spreadsheet listing as in Figure 2.

	Overall	1	2	3	4	5	6	7	8	9
mean	59.8	5.6	5.8	12.0	12.1	5.3	5.7	3.1	3.4	6.7
Std dev	4.7	0.7	0.7	1.0	1.1	0.6	0.8	0.6	0.7	0.5
Max	69	7	7	15	15	7	7	4	6	8
mode	61	6	6	12	12	5	5	3	3	7
N	56	56	56	56	56	56	56	56	56	56

Figure 4. Spreadsheet section mailed to students to show where they stand in relation to the class.

simple HTML index file'. In essence, these can (and should) be done in a short period of time, perhaps 20 minutes. If the task does take longer than expected then students know that there is a problem. How students (and tutors) tackle this emergent problem depends upon circumstances and the support mechanism(s) provided (Figure 5).

> *'Preflights provided the basis for practical work and were a great asset.'*

The preflights can be e-mailed in to the tutor and may be assessed or not, made advisory or mandatory before going to the event (field or laboratory). From experience, we suggest that preflights are assessed, not as standalone assignments but integrated into the summative CRA scheme (e.g. Figure 1). The marks may only be 5% of the whole but are achieved with self-checking by individuals or groups as much as the tutor.

If submitted, e-mails can be checked rapidly to see whether students have accomplished the task or not. In fact, depending on what is set up, you may only need to see that students have done the task rather than scrutinise the actual result. In other cases, students can be asked to check their results with a pre-derived answer which is sent to them or placed on the module website. It is then their responsibility to see what they did; if correct then fine, if there is an error then they need to revisit the 'preflight' task. This process involves students in their own learning and can provide self-generated feedback.

> *'Again at the beginning I thought pre-flight's were time consuming and I was annoyed at the fact that they weren't graded. However, after completing a few pre-flight's I realised that they helped me plan for my practicals and helped me understand the practical more.'*

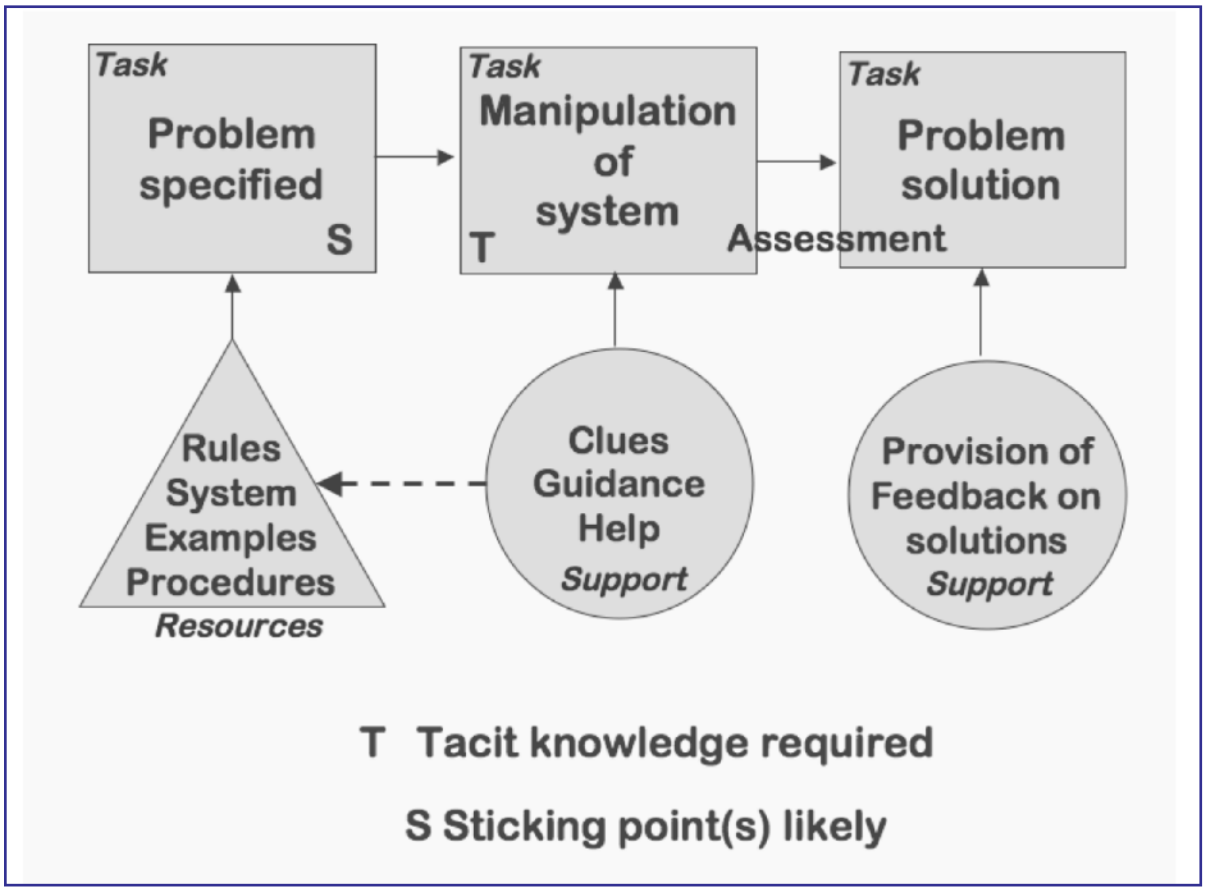

Figure 5 Temporal 'Activity diagram' modified from Oliver et al. (2007) for a rule-based learning design. Designs are also available for incident-based, strategy-based and role-based systems.

Poster 1 should contain your name and title. This need not be on the second poster. The following criteria refer to both posters. (Items marked * refer to the preflight reqirements.)

	Item	Notes	Approx. %
1.	Title and author, text, background*	Position, size, lettering, colour	5
2.	Map of the general area. Location of major towns and features	Download, annotate	5
3.	General geology	Info about the area	15
4.	General geomorphology	Citations and information	20
5.	Processes involved	Citations and information	10
6.	Chronology and Historical aspects	Citations and information	10
7.	Captions and remarks for each image used	Your observations on each,	10
8.	Summary of findings	In separate box, organised	10
9.	Reference list (*basic)	Not over long, max say 6 refs, layout, completeness	5
10.	Layout, lettering, organisation etc	How well you have done this	5
11.	Discretionary extra	Layout and organisation but especially extra content considered to be of merit	5
		Max %	

Figure 6. A practical mark scheme where element 1 was automatically given if the preflight was sent in advance. In this case the task was to set up a PowerPoint page in poster format; element 9 also counted in the pre-flight task.

'I found completing these preflights rewarding as they gave you an early insight into what to expect in the actual practicals.'

As the previous student comment shows, not all preflights need to be marked, although some were, and the experience and value was assumed to continue. The first practical task, however, had an automatic mark awarded if the 'preflight' was submitted five days after having been published (Figure 6). This was only 5% and might not have been 'worth' 5% of the total, but another element was also incorporated. The importance here is not just to identify sticking points, valuable though this may be, but to get students started on the task and to provide incentives (Hogarth and McKenzie, 1991). They know that they will be rewarded just for doing this. Such 'marks in hand' incentives are akin to 'conditional cash transfers' in aid development (Rawlings and Rubio, 2005).

Even though setting up the equation didn't take long, the fact that it was already taken care of in a preflight helped relieve the pressure.

JiTT and 'Warm ups'

Just-in-Time Teaching (JiTT) is:

a technique for teaching and learning that uses the Internet to improve student success in college science courses by enhancing and extending classroom instruction via the Web. (Marrs and Novak, 2004).

Novak et al. (1999) in their presentation of Just-in-Time Teaching equate 'preflights' (based on US Air Force Academy) and 'warm ups' (Indiana University Purdue). Here we use the former, for a more formal check that all is well before and, perhaps, part of an assessed piece of work – something that needs to be done. Here we view a 'warm up' as a formative task to get students involved, perhaps before a lecture. In effect, there is little to differentiate between the two, other than in the style of implementation. Tasks for both can be set in class, although web-based technologies provide the main flexible medium of operation. Novak et al. (1999) list examples of such tasks and activities, although all are in physics and engineering. Some geomorphological examples of 'warm ups' are given at: http://web.gg.qub.ac.uk/people/staff/whalley/teaching/jitt/warmups.html.

Students 'preflighting' their own work

We have found that students often fail to achieve their potential for a piece of assessed work, by not carefully re-reading it and looking for mistakes and non-sequiturs (perhaps themselves the result of 'sticking points'). Unsurprisingly, this is often because they leave things until the last minute. Unfortunately, they then have little time to re-read. This is partly because they lack experience in this requirement and a 'save-print-hand in' attitude is common, particularly where the time left for this may be of the order of a few minutes before a deadline. One way of showing the benefits of a re-read is by making a practical submission a pre-flight itself. For example, an extra day can suddenly be allocated on submission day, students can then re-read their work and (re-)submit. During this time they have the chance to re-read and make corrections, thus seeing the advantage and importance of this time allocation. In this sense, the 'preflight' is similar to debugging a computer program. However, this ploy cannot be done more than once a session or students will begin to expect extra time!

Summary: Problem-based learning, apprenticeships and tacit knowledge.

It has been argued elsewhere (Whalley, 2008) that students need experience in skills and problem solving techniques, and that these tasks need to be experiential. However, students cannot easily be taught how to solve problems, although some techniques and schemes (Allen and Allen, 1997; Eco, 1980) can be very helpful. In effect, students need an apprenticeship, especially to experience and practise the tacit items of a knowledge base and tricks of the trade. For the most part, providing course content is not a problem. Identifying sticking points is a way to provide this assistance. E-learning can be brought into this in ways which can be tailored to the modules and local circumstances (Savin-Baden, 2007). 'Preflights' and warm ups do not need to be mandatory or summatively assessed. Using preflights depends upon a certain amount of imagination, but coupled with criterion, references assessment helps the learning experience and gives students confidence. Class variability does not allow us to say statistically that late submissions have been reduced, or that marks have been 'better'. Nevertheless, these techniques, especially when coupled, make for better student engagement and involvement and can use CRA itself as one form of feedback. 'Preflight' activities provide active engagement as well as helping to avoid 'sticking points', and can be mediated by a variety of web-based technologies such as web form submission. Imagination from tutors and ease of use by students are also important in identifying sticking points and troublesome knowledge, and in implementing devices in an active and experiential learning environment.

References

Allen, R. E., and Allen, S. D. *(1997). Winnie-the-Pooh on Problem Solving. London: Methuen.*

Baumard, P. *(1999). Tacit knowledge in organisations. London: Sage.*

Biggs, J. *(2003). Teaching for quality learning at university. Buckingham: Open University Press.*

Coles, C. *(1997). Is problem-based learning the only way? In The challenge of problem-based learning. (D. Boud, and G. Feletti, Eds.). London: Kogan Page 313-325.*

Collins, H. M. *(2001). What is Tacit Knowledge? In The Practice Turn in Contemporary Theory. (T. R. Schatzki, K. Knorr-Cetina, and E. von-Savigny, Eds.). London: Routledge 107-119.*

Cousin, G. *(2006). An introduction to threshold concepts. Planet 17: 4-5.*

Dror, I. *(2006a). It is not what you teach, but what they learn that counts! Learning Light October: http://www.learninglight.com/FileRetriever.aspx?id=129 (Accessed 28 March 2008).*

Dror, I. *(2006b). The architecture of human cognition paves the way to efficient and effective learning. Learning Light October: http://www.learninglight.com/FileRetriever.aspx?id=119 (Accessed 28 March 2008).*

Eco, U. *(1980). The name of the rose. London: Picador Books.*

Eraut, M. *(2000). Non-formal learning and tacit knowledge in professional work. British Journal of Educational Psychology 70: 113-136.*

Goranzon, B., and Ennals, R. *(2005). Dialogue skill and tacit knowledge. Chichester: Wiley.*

Harvey, H. *(2004). Assessment criteria: reflections on current practices. Assessment & Evaluation in Higher Education 29: 479-493.*

Healey, M., and Roberts, J. *(2004). Engaging students in active learning: case studies in geography, environment and related disciplines. 140. Geography Discipline Network, University of Gloucestershire, Cheltenham.*

Hogarth, R. M., and McKenzie, C. R. M. *(1991). Learning From Feedback: Exactingness and Incentives. Learning 17: 734-752.*

Humphrey, N. *(2006). Seeing Red: A study in consciousness. Cambridge, Mass, London: Belknap, Harvard University Press.*

Land, R., Cousin, G., Meyer, J. H. F., and Davies, P. *(2005). Threshold concepts and troublesome knowledge (3): implications for course design and evaluation. Improving Student Learning–equality and diversity, Oxford: OCSLD.*

Lebow, D. *(1993). Constructivist values for systems design: five principles towards a new mindset. Educational Technology Research and Development 41: 4-16.*

Marrs, K. A., and Novak, G. *(2004). Just-in-Time Teaching in biology: creating an active learner classroom using the internet. Cell Biology Education-Life Sciences Education 3: 49-61 (http://www.lifescied.org/cgi/content/full/3/1/49) (Accessed 24 March 2008).*

Mayes, T., and de Freitas, S. *(2007). Learning and e-learning: the role of theory. In Rethinking Pedagogy for a Digital Age: Designing and Delivering E-learning. (H. Beetham, and R. Sharpe, Eds.). London: Routledge 13-25.*

Meyer, J. H. F., and Land, R. *(2003). Threshold concepts and troublesome knowledge (1): linkages to ways of thinking practising within the disciplines. In Improving student learning – ten years on. (C. Rust, Ed.). Oxford: Oxford Centre for Staff Learning and Development. Also at ETL project Occasional Report 4.*

Novak, G. M., Patterson, E. T., Gavrin, A. D., and Christian, W. *(1999). Just-In-Time Teaching. Upper Saddle River, N.J.: Prentice Hall.*

Oliver, R., Harper, B., Wills, S., Agostinho, S., and Hedberg, J. *(2007). Describing ICT-based learning designs that promote quality learning outcomes. In Rethinking Pedagogy for a Digital Age: Designing and Delivering E-learning. (H. Beetham, and R. Sharpe, Eds.). London: Routledge 64-80.*

Oliver, R., and Herrington, J. *(2001). Teaching and learning online: a beginner's guide to e-learning and e-teaching in Higher Education. Edith Cowan University, Mt. Lawley, Western Australia.*

Polanyi, M. *(1967). The Tacit Dimension. New York: Doubleday.*

Price, M., and O'Donovan, B. *(2006). Improving performance through enhancing student understanding of criteria and feedback. In Innovative Assessment in Higher Education. (C. Bryan, and K. Clegg, Eds.). Abingdon: Routledge 100-109.*

Rawlings, L. B., and Rubio, G. M. *(2005). Evaluating the Impact of Conditional Cash Transfer Programs. The World Bank Research Observer 20: 29-55.*

Rust, C., Price, M., and O'Donovan, B. *(2003). Improving students' learning by developing their understanding of assessment criteria and processes. Assessment & Evaluation in Higher Education 28: 146-164.*

Saunders, M. N. K., and Davis, S. M. *(1998). The use of assessment criteria to ensure consistency of marking: some implications for good practice. Quality Assurance in Education 6: 162-171.*

Savery, J. R., and Duffy, T. M. *(1995). Problem based learning: An instructional model and its constructivist framework. In Constructivist learning environments: Case studies in instructional design. (B. Wilson, Ed.). Englewood Cliffs, NJ: Educational Technology Publications 135-148.*

Savin-Baden, M. *(2007). A practical guide to problem-based learning online. London: Routledge.*

Savin-Baden, M., and Major, C. H. *(2004). Foundations of problem-based learning. Buckingham: Society for Research into Higher Education and Open University Press.*

Whalley, W. B. *(2008). What should a (Geography) degree for the 21st century be like? Planet 19: 36-41.*

Woolf, H. *(2004). Assessment criteria: reflections on current practices. Assessment & Evaluation in Higher Education 29: 479-493.*

The Development of Fieldwork Problem-Based Exercises in the Applied Geosciences

David Giles, Malcolm Whitworth and Andrew Poulsom

School of Earth and Environmental Sciences, University of Portsmouth

Abstract

This paper will outline the development and continual enhancement of a suite of field-orientated problem-based exercises with associated suitable field sites for the applied geoscience courses at the University of Portsmouth. The two principal degree pathways considered are BEng Engineering Geology and Geotechnics and BSc Geological Hazards. Some of the material developed is being enhanced further for use on the MSc Geohazard Assessment and MSc Engineering Geology programmes.

These exercises developed include innovations in the learning, teaching and assessment of the field-based skills required of a modern applied geoscientist. The key aspects of student engagement, lateral thinking skills and resource use are developed within these field-based programmes and associated scenario-based exercises.

Introduction

Geology and Applied Geology are principally field-based disciplines. For undergraduate students the 'field' could be considered as their most significant learning environment.

For over 40 years staff in the now School of Earth and Environmental Sciences at Portsmouth have developed and led fieldwork programmes, yet despite this long experience very little work has been undertaken in the research and learning development of this work outside of the actual trips themselves. All such development has usually been undertaken during the 'live' field visits with the undergraduates. Very little time was available in the field for the reconnaissance of new potentially more suitable sites for the exercises. Over this period the field-based learning has progressed from simple 'lectures in the field' to more sophisticated student-orientated exercises that have been designed to develop more individual skills such as self-reliance; the ability to work in teams; and the ability to organise, manage and report a field-based programme of investigation, all based around a variety of geological settings and applied geoscience problems.

Increasingly, we are using problem-based exercises to develop these key skills that are required of a geoscientist such as engineering geologists and geological hazard specialists graduating from the School. A portfolio of such exercises is now available in its initial form. This is undergoing further development and research to engage the participating students, to further refine these innovations in learning, teaching and particularly assessment in this field-based environment.

The current Applied Geoscience fieldwork programme at Portsmouth is a major element of the degree pathways and comprises some 75 to 80 days spread over the three years of the courses. The emphasis in the first two years is strongly towards providing the observational, recording, synthesising and problem-solving skills required of a modern applied geologist. Areas such as the Isle of Wight, Dorset, North Devon and Kent are currently visited in the UK, with overseas trips to various regions of France and Spain.

The courses culminate in a study tour of geological hazard and engineering geological sites (currently in France) that integrate the various strands of the pathways and provide an overview of the diversity of geological hazards and engineering geological problems in the natural world.

Level 1 Applied Geoscience Programme

The Level 1 field programme is principally concerned with introducing students to basic field geology and no previous geological experience or knowledge is assumed.

At the end of the year, the students embark on their major field course for the session, which is an extended trip, developing further field geology and introducing basic geological mapping techniques. Currently this work is undertaken in the Sierra Norte Mountains close to Madrid. This more exotic location, compared, for example, to the more conventional sites such as the Lake District, acts as a major incentive for students throughout their first year at the university.

Locality	Activity
St Catherines, Isle of Wight	Introduction to landslide geohazards.
Isle of Portland, Dorset	Continuing the theme of geohazard assessment with specific reference to slope instability and landslides.
Lyme Regis, Dorset	Introduction to geomorphological mapping.
Whitecliff Bay, Isle of Wight	Introduction to basic field geology.
Sandown Bay, Isle of Wight	Developing field geology skills including an introduction to stratigraphic logging.
Lulworth Cove, Dorset	Introduction to geological mapping.
Sierra Norte, Madrid, Spain	A 12-day trip to further develop lithological mapping techniques including the generation of a geological map.

Table 1. Locations and activities undertaken for the Level 1 Applied Geoscience fieldwork programme.

Level 2 Applied Geoscience Programme

The Level 2 field programme is primarily a series of techniques-based trips where the fundamental applied geoscience field skills are developed.

These skills include Quaternary sediments logging, geomorphological mapping, rock mass assessment, discontinuity surveys and thematic geohazard assessments.

Level 3 Applied Geoscience Programme

At Level 3 more specialised fieldwork is undertaken with the focus on the integration of the applied geoscientific skills developed within the Level 2 programme.

Locality	Activity
North Norfolk	A 3-day trip investigating at the glacial geology and geomorphology of a former ice-sheet margin. Activities include geomorphological mapping and glacial sediment logging.
Bath, Malverns & Cotswolds	A 3-day trip firstly considering aspects of periglacial geology around Bath. In the Malverns the key exercises are the development of rock mass assessment techniques. Students undertake a number of exercises aimed at characterising a rock mass in terms of its strength and engineering behaviour. At Broadway in the Cotswolds geomorphological mapping techniques are introduced on the Cotswold escarpment.
North Devon	More aspects of geological field skills are developed in this 3-day trip, specifically with regard to palaeoenvironments and sedimentary depositional basins.
Meon Valley, Hampshire	Hydrological techniques and flood hazard assessment.
Osmington Mills, Dorset	Stratigraphic logging techniques.
Villerville, Normandy	Students undertake a more advanced geomorphological mapping and geohazard assessment exercise, fine tuning their field techniques before embarking on their summer field data collection for their final year projects.

Table 2. Locations and activities undertaken for the Level 2 Applied Geoscience fieldwork programme.

Locality	Activity
Kent	A 3-day trip to Kent to study various aspects of the landslide and slope stability geohazards.
Ventnor, Isle of Wight	A 2-day trip to the Isle of Wight considering aspects or urban landslides and slope instability within the town of Ventnor.
Barton on Sea, Dorset	A site visit considering aspects of coastal management and protection along this stretch of Dorset coast.
France	The culmination of all of the Applied Geoscience degree pathways is a 2-week study tour to France. Areas including the Auvergne, Provence and the French Alps are visited, where a variety of geohazard, engineering and environmental geological problems are considered.

Table 3. Locations and activities undertaken for the Level 3 Applied Geoscience fieldwork programme.

Problem-based Exercises

Increasingly, the focus of these fieldwork programmes has been to introduce specific 'problems' associated with the area visited that applied geoscientists might need to solve. These problems could be real, for example, a by-pass for the Cotswolds village of Broadway, or they could be hypothetical, such as a deep level nuclear waste repository for the Malvern Hills. Table 4 outlines the current portfolio of these 'real world' exercises and Box 1 gives an example of the problem set for the Villerville exercise. Increasingly, the field-based activities are being supplemented with pre and post workshops at the University in Portsmouth.

Locality	Exercise
Broadway, Cotswolds	An option-engineering problem considering a suitable route for a by-pass through landslide prone terrain.
Malvern Hills	An exercise in characterising an area to test its suitability for a radioactive waste disposal site.
Folkestone Warren, Kent	An exercise involving an insurance claim from a homeowner living on top of the Folkestone Warren landslide complex.
Lac du Castillon, Provence, France	A road improvement scheme through a hard rock terrain, dominated by structural geological problems leading to major rock falls onto the carriageway.
Claps du Luc, Drome, France	A seismic forensic problem to ascertain whether a major landslide was seismically triggered or was caused by other factors.
Boulc, Drome, France	An exercise to establish why a tunnel was constructed to re-establish the route to several remote villages, on the site of a total failure of a remote road.
Malpasset Dam, Frejus, France	A geotechnical forensics exercise to establish why the dam at Malpasset failed and to investigate the feasibility of reconstructing a new dam at the same site.
Sinard Landslide, Isere, France	An exercise to establish the limits of instability, construct a ground model of the problem, and promote engineering or other solutions to deal with the hazard of a major landslide complex (if affecting several villages and the reservoir to a major dam).
Overstrand, Norfolk	Another insurance based problem with the student being required to evaluate a coastal landslide complex and determine who should be responsible for the remediation.
Villerville, Normandy, France	Geomorphological terrain evaluation and hazard assessment exercise considering a new route for a coastal road.

Table 4: Some examples of the current portfolio of problem-based exercises in the applied geosciences.

Box 1. Example of a Problem Based-Exercise in Villerville, Normandy

Geomorphological terrain evaluation and hazard assessment of the Villerville-Cricqueboeuf region, Normandy, France.

1. Location
This investigation will concentrate on a section of the Calvados coast in Normandy, France, between the towns of Villerville and Hennequeville, an area that has been repeatedly affected by landslides. The site is of particular interest following a particularly intense rainstorm, which produced a sequence of slope failures and the presence of a large-scale coastal landslide complex, which has resulted in the total or partial destruction of local buildings and road infrastructure.

2. Scope of the investigation
Following an intense rainstorm in May 2003, several towns on the Normandy coast experienced severe flooding and a number of landslides occurred in the Villerville region, resulting in significant damage to local infrastructure and housing. The problems have been further compounded by the presence of a series of active coastal landslide complexes in the region.

As a result, Portsmouth Geomorphological Services has been commissioned to undertake a rapid terrain evaluation and hazard assessment of the coastal area between Villerville and Hennequeville, and produce a series of maps and short reports for the local planning team. As part of this investigation, you will work in teams of four and undertake a rapid reconnaissance of the area over three days to collect field information from which a hazard and risk assessment will be produced.

Student Feedback

As part of the evaluation and review of the developed field programmes, students were asked to provide more 'colloquial' feedback than would normally be provided via the University's formal unit-based feedback system. While away on the trips, they were asked to complete a series of daily fieldwork logs or 'Flogs' (aka Blogs!) containing the following:

- ***What I enjoyed and thought was good about the field day***
- ***What I didn't enjoy about the field day***
- ***How I would improve the field day if I was running the course***

The returns were generally much higher than with the more formal system. Generally, the comments were positive and, interestingly, virtually no students commented on how to improve the various trips. They very much enjoyed the group and problem-based work, commenting that it was good to experience and put into practice what they had learnt in the campus based lecture programme. Apart from the usual complaints about the weather, the hotel food and, surprisingly, some concerns about being cut off by the tide, and staff minibus driving, the main issue raised were about trip preparation. Many students felt that a more formal classroom briefing would have been helpful, together with some preparatory reading and references. Several of the field courses have pre-reading lists, but not all. None of the fieldwork has an explicit technical briefing session before arrival in the field area. Once in the field, the students very much liked being left to organise themselves and get on with the problem-based tasks. They enjoyed the teamwork and dealing with real problems. They liked 'working it out for themselves' with appropriate support from the staff. The main skills issues that they brought up were concerning some basic map reading problems, dealing with the more systematic and perhaps tedious tasks, such as logging and understanding the difference between concave and convex when geomorphological mapping!

Conclusions

Applied geoscience fieldwork lends itself well to problem-based exercises. The students greatly enjoy the scenarios that are set and benefit from the team-based approach to solving the various problems. The field remains the key learning environment for geoscience and should be considered as their most significant learning environment, where the integration of all of the major learning skills can be integrated in an interesting and innovative manner.

Acknowledgements
This project has been part funded by the GEES Subject Centre Small-Scale Project Funding Scheme 'Bringing the Real World into the GEES Student Learning Experience'.

Dave.giles@port.ac.uk
Malcolm.whitworth@port.ac.uk
Andrew.pouldom@port.ac.uk

Plate 1. Students developing a series of applied geoscience skills in the Malvern Hills. Rock mass assessment, discontinuity surveys and scan lines together with some basic field surveying techniques are taught.

Plate 2. The seismic forensic exercise at the Claps du Luc landslide, Drome, France.

Geoverse: piloting a National e-journal of undergraduate research in Geography

Dr. Helen Walkington, Oxford Brookes University

Abstract

This article argues that there is a gap in the research cycle / research process as experienced by undergraduate geography students. In response to this, a national undergraduate research e-Journal of geography called Geoverse has been established and has been piloted initially across four universities. This article outlines the justification for the journal and briefly describes how it functions across diverse institutions. Early research findings are reported from two student groups. The motivations of postgraduate student reviewers (the Editorial Advisory Board) for involvement in the project include the desire to gain experience of the publication process and to feel part of the wider geography academic community. For the students who have written journal articles, the benefits which they reported included a sense of achievement, enhanced writing skills, the 'coming together' of knowledge and development of critical skills. Key decisions in the process of creating the journal are discussed and the way in which it has the potential to stimulate curriculum innovation is reported.

Introduction

This article traces the development of an electronic journal (e-journal) for undergraduate researchers in Geography. It was established in an attempt to address the gap in the research cycle which can form part of the student experience in degree programmes which culminate in a dissertation or research project in the final year of study. The research cycle as experienced by academic researchers is complete because when data has been analysed and results shared through publication a process of peer review provides feedback to the researcher who is able to make modifications to the work before it goes into print and the comments received, and the findings themselves, may spark further research questions. The student experience of research at undergraduate level is significantly different. Once the dissertation or final project is submitted it may be read only by a marker and supervisor and the summative feedback may be of limited value for the student about to graduate. The findings are often forgotten and rarely developed further.

The opportunity to broaden the audience for their research through publication and to complete the research cycle is attractive for undergraduates. Writing for publication is also an important transferable skill which can enhance employability. Students are required to adopt a more concise style and to distil significant findings for a broader audience. When students receive feedback from an audience outside their own institution, it gives a sense of 'real world' publication experience.

The development of a research journal begs the question 'What counts as undergraduate research?' The publishing gap in the research cycle is most noticeable in relation to the dissertation, but clearly undergraduate research can be much more broadly defined to include experiences such as developing research questions, reviewing literature, writing an argument, developing a project design, analysing and interpreting data and reporting findings. It is likely that all undergraduate geography courses offer these experiences in some form or other, but perhaps separated into discrete learning outcomes in different modules across a programme. These diverse experiences are usually brought together at the end of the final year as a project or dissertation, what the Boyer Commission (1998) refers to as a 'cap-stone' experience.

Linking Teaching and Research – The undergraduate experience

Linking teaching and research is most commonly interpreted as linking published research, particularly a lecturer's own research, to the curriculum. Healey (2003) reviewed the limited number of studies of student perceptions of the relevance of research to their learning. While students reported advantages in staff being involved in research (for example, prestige for their degree course), as well as disadvantages in terms of a lack of staff availability, they continued to see themselves as passive recipients of research, rather than actors. In some departments students have been encouraged to become more actively engaged by interviewing academics about their research (Jenkins, 2003). However, this approach still maintains a power balance where student learners are perceived as recipients of knowledge and the outcomes of research.

Research and scholarship are inseparably intertwined, and both help academics to reach higher levels of understanding in their fields than they would if the role is merely to relay knowledge gained by others

(Pepper, 1997:16)

If this quote holds true for academics then it surely also holds true for students. Therefore, a more radical approach to the 'linking teaching and research' scenario is to link student research to the teaching/ learning process. McGuinness & Simm (2003) demonstrated that student research conferences have the capacity to increase the range of learning experiences for students and improve student employability prospects. Healey (2003) also noted that those students with a desire to be involved personally in research saw clear employability benefits.

Developing undergraduate research and publication as part of the curriculum does have resource implications. Charlesworth and Foster (1996) reported on the impact of an undergraduate journal at Coventry University linked specifically to two hydrology modules. Although the assessment started as papers based on primary research it became necessary to change the requirements to submission of review articles, to overcome the resource constraints posed by large classes. However, regardless of the type of papers called for, they reported that the idea of publication continued to motivate students.

The most significant benefit is the improvement in motivation. The stimulus is provided by the competition to produce a paper which may be published in the journal.

(Charlesworth and Foster,1996: 52)

Geoverse

Geoverse is the pilot for a national e-journal of undergraduate research in Geography.

Currently the journal is based upon a collaboration between Oxford Brookes University, The University of Reading, The University of Gloucestershire and Queen Mary, University of London. Geoverse publishes student-led original research based on theoretically considered and empirically based investigations undertaken at undergraduate level. The scope and aims for the journal can be found in Figure 1.

The aim is to motivate and reward students for producing innovative and best undergraduate research practice, and then give them support through the review process before disseminating their work through publication. Geoverse welcomes articles based on undergraduate research, which can be submitted from single or multiple authors. Author guidelines are provided on the journal website: http://geoverse.brookes.ac.uk/

Undergraduates submit articles, which are reviewed by a team of postgraduate students, as well as

Geoverse – Aims and Scope

Geoverse publishes the very best of original undergraduate research and scholarship in physical and human geography, with particular emphasis placed on:

- Publication of geographical research undertaken by individuals and groups during, or as part of, undergraduate degrees;
- All aspects of geographical thought, investigation and critical reflection, with a balance of human, environmental and physical geography;
- The publication of research findings undertaken using a wide range of research approaches, design and methodologies;
- Ensuring rigorous standards of refereeing, and exposing students to the process of academic publication.

The aims of Geoverse are:

- to allow students to develop research writing skills in a supportive but rigorous environment of review. The latter exposes students to the process of academic publication.
- to allow high quality undergraduate research to be accessed in the public domain.

Figure 1: The aims and scope of Geoverse

being monitored by an editorial panel, where constructive feedback is given.

Successful undergraduates can benefit by using this published article as evidence within their portfolio, so enhancing their employability prospects, as well as providing a stepping stone into a career in research. This geography e-journal was designed to provide a project template in order to increase and promote undergraduate research nationally.

Geoverse's Editorial Board comprises two members of staff from each of the partner institutions; this ensures that each institution has an academic member to cover the breadth of geographical research approaches. In addition, the postgraduate students who review the papers form an Editorial Advisory Board. The 16 students have expertise in a very wide range of subjects within geography coming from diverse backgrounds and following research careers in a variety of directions.

In the four institutions undergraduate geography students were already engaged with research projects within modules or as dissertations but few saw their work read by others besides supervisors and module leaders. This project has aimed to develop a critical skill which is currently being missed in dissertation work, of succinctly presenting research work for an external audience. Students may also find that in a competitive job market they have the edge if they can take a copy to show prospective employers as part of their portfolio.

Establishing the journal

Enhancement of the student learning experience comes from the constructive feedback which undergraduates receive from the editorial team. This helps them to improve work prior to publication. Even with this framework there are many different types of journal which could have arisen from a desire to close the research cycle for students. From the outset there were important decisions to take which had to involve negotiation between team members, in particular with regard to the focus of the journal, the standard to set, the degree of student involvement, the format to adopt and the procedures and logistics to ensure its smooth running across disparate institutions.

Journal focus

This pilot project was funded by the GEES subject Centre and one of the first decisions to be taken was whether to include all GEES disciplines in the remit of the journal. It was decided that in order to provide a balanced geographical journal, welcoming social science and physical geography perspectives, the remit of the journal was already broad. It is hoped that this experience of developing a geography journal will offer ideas for geology and environmental science colleagues to develop complementary linked national journals.

Academic level

An acceptable academic standard for publication of undergraduate research was difficult to define. Despite a desire to make the journal as welcoming and inclusive as possible, it became apparent that clear criteria must be set in order to judge an acceptable standard and that once articles were published these would set the benchmark. The aim was, therefore, to strive for articles which represented the best from the four departments. I had also set up a departmental journal for Oxford Brookes geographers which showcases the variety of work at all levels carried out by undergraduates. Table 1 summarises the differences in pedagogic approach between the journals.

Student and staff involvement

The decision to involve postgraduate students as a review panel (The Editorial Advisory Board) created academic credibility and a supportive environment of review for the postgraduates who could work collaboratively through a wiki, with the support of the academic editor assigned to the specific paper if required. Wiki's are websites that allow users to share documents and redraft comments, so they provide the ideal tool to allow collaborative writing and in this case collaborative reviews. In this way the journal enhanced the student learning experience of a broader range of students. It was later decided to broaden the number of editors to two from each institution to cover a wider remit of geographical research areas.

Format

While there were obvious advantages to producing a journal as a printed product, the benefits of an electronic format were seen to outweigh these. Whilst striving to mimic other academic journals, the team was also aware of the potential that an electronic format could have in terms of allowing alternative content such as video files and sound, in addition to text. But it was felt that in the first instance a standard academic journal format would have a greater motivating influence.

Process

At the outset of the project, a wiki was seen as the panacea to working in geographically distant

Journal	Geoverse	Geoversity
Student body	National, piloted at 4 universities initially: Oxford Brookes University, Gloucestershire University, University of Reading, Queen Mary (University of London).	Oxford Brookes University undergraduate geography students
Aim	A professional publication to showcase undergraduate research of the highest standard.	Showcase the range of research work carried out in the department. Use for Open Days and course marketing.
Process	Rigorous standards of refereeing across 4 institutions 8 academic staff editors 16 postgraduate reviewers	Refereeing 1 Undergraduate student editor 4 postgraduate reviewers
Range	Wide range of articles based on student dissertations. Student directed research.	Articles based on a limited range of topics, heavily related to taught modules e.g. U21180, dissertation and independent studies. Supervisers acknowledged.
Purpose	To establish a national journal for undergraduate research in Geography	As a pedagogical tool to benefit Brooke's geography students
Values	Highly selective but supportive	Inclusive and supportive

Table 1: The differing approaches adopted by the two journals.

locations, to managing the workflow of the journal and to recording our thoughts and reflections as the project progressed. However, the process of customizing the wiki so that some areas are confidential spaces for reviewing and others for recording discussions was time consuming. The potential of a wiki as a collaborative writing tool was particularly useful when the project was first established as the editorial board could keep editing author guidelines and agree on meetings and training course schedules. It was also useful as a repository for documents for the reviewers and as an aide memoire for meeting minutes. The postgraduate training day ended by using the project wiki to complete a collaborative evaluation of the training, as a means of active learning! For the actual process of doing a collaborative review, the wiki was perhaps less useful. To some extent the standard issuing of copies of the article to separate reviewers would have made the review process double blind, whereas by being able to see a shared space with the article on it meant that reviewers would pick up on each others' comments. However, it was felt that this would provide a more supportive environment for first-time reviewers.

Results

Early results from this research project focus firstly on the postgraduate students who make up the Editorial Advisory Board and their motivations for joining the project, then secondly the impact which the writing of articles has had on the undergraduate students in one module at Oxford Brookes is reported.

Postgraduate motivations for involvement as reviewers.

In response to a pre-training course questionnaire (see Figure 2 for representative quotes) student comments were dominated by the desire to gain experience of the publication process and the

"Gain experience in reviewing the work of others… working with a publication"

"Engage with the wider geography network"

"An interest in the linkages between research and teaching to support and improve student learning."

"To improve my own writing … CV enhancement … Working as part of a team."

"I think it sounds a fantastic opportunity and novel idea and therefore I would love to be part of it!"

"It is something I would have really appreciated as an undergraduate. A great opportunity."

"Interest in the subject and contemporary issues."

Figure 2: Postgraduate reviewers' motivations for being involved in the Editorial Advisory Board.

feeling that participants would feel part of the wider geography network, especially outside their own institution. Many noted that they would acquire skills as a result of collaborative reviewing as well as contributing to the learning of undergraduates. At the time wikis were not something that many of the students had experienced, so this provided a further skill that the students reported they would develop.

Evaluating the undergraduate writing experience

The existence of Geoverse has meant that module assignments can be aligned to generate potential articles. For example, at Oxford Brookes the module U21180 'Geography, Research and Practice' has small-group tutorials to support students to write articles, in accordance with its author guidelines, based upon primary research carried out during the Year 2 residential field course. The following are evaluative comments from the students who had written an article in this module in 2007.

The most frequent student response was a sense of achievement. For example:

> *'Writing up the work from the field trip gave the field trip and this paper a purpose. Being able to see the whole 'journey' from start to finish was extremely worthwhile.'*

> *'I feel that I've accomplished something! It was difficult but I'm proud of it! Being able to use this field work for the basis of the article was rewarding.'*

> *'It was good to see that you can achieve something to a high standard as a published journal. It gave me a real sense of achieving a good research project.'*

Another frequently mentioned theme was the understanding developed. Students experienced a sense of their knowledge coming together:

> *'It was good to get all the hard work that I did in the field and see it coming together as something academic.'*

> *'It was also good to really begin to understand what I had researched last term.'*

Students clearly enjoyed the freedom of the creative process, being able to think outside the box and report genuinely new findings:

> *'I enjoyed the freedom of opinions and sources used, it was very interesting following up a previous field study and expanding on it.'*

The final theme was that of ownership, being able to use one's own unique data:

> *'[I enjoyed] the challenge of writing an article that comes from my own experiences.'*

> *'The chance to write about something that had never been written about before.'*

Conclusion

The Boyer Commission (1998) outlined the need to make an explicit link between student learning and undergraduate research for America's research universities. In the UK most universities are now putting student-centred approaches and social learning at the forefront of their thinking about the student experience and their academic offering. Undergraduate research opportunities are likely to become an increasingly important part of the student learning experience and suggestions have been made as to how these can be embedded within the curriculum (Huggins, Jenkins and Scurry, 2007). Geoverse has been developed as a national journal for undergraduate research in Geography, but it provides a model which could be applied to the other GEES disciplines. Its key aim is to increase student support, motivation and to reward innovative and best undergraduate research practice through publication and wider dissemination. This project addresses the current gap in the research cycle by publishing undergraduate research so that it is available for future students to read, perhaps providing a stimulus or model for their own research, and provides a published record and recognition for the students involved. In addition, the journal has already begun to stimulate curriculum innovation in the participating institutions through the creation of a broader range of undergraduate research experiences.

Acknowledgements

The author would like to thank the undergraduate authors who have submitted their work so far, the postgraduate students on the Editorial Advisory Board and the project team composed of editors and web and wiki developers. This research stems from a GEES funded small scale research project.

References

Boyer Commission *(1998) Reinventing Undergraduate Education: A Blueprint for America's Research Universities. Stony Brook, New York: Carnegie Foundation for the Advancement of Teaching.*

Charlesworth, S. M. and Foster, I. D. L. *(1996) 'Water and Environmental Systems': achieving student-centred learning objectives with an undergraduate journal. Journal of Geography in Higher Education 20: 1: 45-54.*

Gilbert, S. F. *(2004), 'Should students be encouraged to publish their research in student-run publications? A case against undergraduate-only journal publications', Cell Biology Education, 3: 1: 22-23.*

Healey, M. *(2003) The Research-Teaching Nexus in GEES. Planet, Special Edition 5: 5-10.*

Huggins R, Jenkins A and Scurry D *(2007) Undergraduate research in selected US universities, http://www2.warwick.ac.uk/fac/soc/sociology/research/cetl/ugresearch/*

Jenkins, A., Breen, R., Lindsay, R. and Brew, A, *(2002). Re-shaping Higher Education: Linking teaching and research. London: Kogan Page/SEDA.*

Jenkins, A. *(2003) Designing a curriculum that values a research-based approach to student learning in GEES. Planet, Special Edition 5: 2-5.*

McGuinness, M. & Simm, D. *(2003) Linking Teaching and Research through Departmental Research Conferences for Student Project Work Planet, Special Edition 5: 21-24.*

Pepper, D. M. *(1997) Editorial II. JGHE: twenty-one this year Journal of Geography in Higher Education, 21, 1: 15-16.*

Helen Walkington
Department of Anthropology and Geography,
Oxford Brookes University.
hwalkington@brookes.ac.uk

E-Learning or a-Gimmick? Evaluating the use of rich media in Geography fieldwork

Dr James Newman[1] and Dr Richard Jones[2]

[1] Department of media communications and film studies, Bath Spa University
[2] Department of Geography, University of Exeter

Abstract

This paper provides a report on our evaluation of the use of rich media in Geography fieldwork—a project funded by the GEES Subject Centre's small-scale project funding grant.

About the project

This project set out to tackle a number of questions related to the use of mobile devices and rich media (a combination of text, audio, still images, animation, video) in the context of geography fieldwork.

- Which is the best mobile platform to deliver rich media to support student fieldwork learning?
- Distracting or enhancing? Does the use of rich media in fieldwork make students more or less sensitive to their physical surroundings?
- Digital media vs paper handouts? e-Learning or a-Gimmick?

In order to answer these questions, the project team created a bespoke audio-visual tour of Historic Bath to be tested on a variety of mobile digital media devices (MDMD). The evaluation was undertaken by volunteer undergraduate students whose comments and observations on the usability, suitability and effectiveness of the various systems form part of the evidential basis for our assessment of the merits of the platforms. The opinions of lecturing staff across the GEES community were also taken in the hope of gaining an insight into the negative / positive implications for the expanded use of MDMD in higher education. Finally, the project team offer their observations on the issues surrounding the creation of the audio-visual tour materials and their translation and conversion to each of the target platforms and devices. By presenting an authoritative evaluation of these popular and widely used MDMDs, this project seeks to build on Stott's (2007) work and contribute to the debate surrounding the use of (mobile) digital media devices in learning and teaching.

Learning with – and despite – digital media

Recently some universities have realised that the popularity of portable digital media amongst undergraduates presents the University with a mechanism to enhance student engagement with their taught courses by tapping into the skills of the 'multi-media savvy' generation (e.g. Anderson and Blackwood 2004, Armatas *et al* 2005, Duncan-Howell and Lee 2007). There is more to this than fashion or populism. Regardless of their ability to irritate in certain situations, in others, these devices appear to offer genuine affordances by placing rich media in the hands of students in a form they are comfortable with and with which they may engage at their own pace and in their preferred times and locations.

Fieldwork is an obvious area where mobile media can help to improve the student experience. Depending on the specific affordances of the device, they offer the potential to provide students with detailed site information and even to facilitate students' recording of their fieldwork activities through notetaking applications. Perhaps most importantly, site information and learning support materials may be made available as rich multimedia that combines images, audio, and video and while the initial costs of deploying such devices might seem high (compared with paper-based solutions) the cost of adding multiple images and hours of video is comparatively small. As such, MDMDs seem highly suitable for the use in location-specific contexts. However, selecting a specific platform or device from the myriad available remains a significant challenge. As such, as well as assessing the current generation of iPods, our project is motivated by a desire to harness other popular and pervasive media devices such as mobile phones – precisely the kinds of devices owned and used by our students rather than the PDAs and smartphones typically wielded by our managers (HEFCE 2005).

Project design

The project was split into three main sections
1. Selection of MDMD and production of material
2. Student – Staff evaluation of MDMD
3. Project Tutorials

1: Selection of MDMD and production of materials

A number of projects and studies that have considered the use of m-learning ('mobile'-learning) have turned their attentions to the use of PDAs (see the Dewesbury examples -HEFCE 2005, Stott 2007). While it is true that PDAs typically offer considerable power and flexibility, a survey of Exeter Geography Undergraduates indicated that very few possessed these devices, preferring to spend their money on cheaper mp3/games consoles. Moreover, with power and flexibility comes complexity. For lecturers, teachers and tutors, the demands of creating even the simplest JAVA applications to run on the proprietary operating systems is a significant and possibly insurmountable barrier.

The three devices used in this study were chosen on the basis of their commercial success, the high incidence of personal ownership among University of Exeter and Bath Spa University students and the provision of a wide range of formats for distributing the audio-visual material. It should be noted that we are in no way claiming that any of these devices enjoy ubiquity and we are aware of the significant financial barriers to entry as well as the marked differences in IT literacy between and within generations of school-leavers (see Facer et al 2003 for instance on contemporary 'digital divides'). The devices evaluated in the field test were mobile phones (Samsung D900i, Sony Ericsson W800i), a games console (Sony PlayStation Portable -PSP), and media players (Apple iPod touch, Apple iPod – 5th generation).

A walking tour of the Bath's centre (podtour) was devised and a series of waypoints defined. For each point on the tour, a package of audio-visual materials was created (images and video, ambient audio, as well as a specially recorded voiceover). The audio-visual materials were assembled using freely available software included with all new Macintosh computers ('GarageBand' and 'iMovie 08'). As with our choice of target MDMDs, these software applications were selected because of their widespread availability and familiarity.

2. Staff and student evaluation

The project evaluates e/m-Learning resources alongside traditional paper-based solutions such as workbooks and handouts, polling student opinion and tutor appraisal of the learning process, and considers methods for integrating new media resources and 'traditional' learning and teaching materials. Providing a basis for a comparative analysis was considered to be vital so students were presented with the opportunity to use each of the devices under scrutiny along with the paper-based worksheet. Students were given a brief tutorial explaining the aims of the exercise, outlining the key questions for consideration, and running through the basic operation of the various MDMDs. With this completed, the students were left to undertake the tour using each device and the paper worksheets. While we were keen to allow students to input as fully as possible and direct the course of the subsequent discussions, we had a number of key areas we wished to address in the semi-structured interviews that followed the fieldwork exercise. These included:

1. Overall ease of use (hardware and software). We were specifically interested in the experience of locating and navigating materials.
2. Visibility of displays in a variety of conditions (this is a function of screen size, resolution, and brightness).
3. Audio quality (use of headphones versus built-in speakers).
4. Suitability for task (e.g. form factor, robustness, battery life).
5. Suitability as an input device (note-taking etc).
6. Distraction. Specifically, our interest here was whether the use of rich media and 'fashionable' modes of delivery made students more sensitive to their surroundings and the tasks at hand.

All but the last question above, centred on assessing which of the devices were most suitable. With the last question, we maintained our scepticism, by being careful to consider the general suitability of digital media devices in these fieldwork learning and teaching contexts.

Results and discussion
Overall, each of the devices performed successfully and students reported satisfaction, identifying no critical problems with any platform. Full details of the functionality and usability of the devices (quality of the displays, audio, response times and system navigation as well as issues with developing media), along with the paper based materials, can be found in the full report at: http://www.gees.ac.uk/projtheme/smallfund/2006/projs06.htm#evalrichmed

General comments – Students
It was evident that the students enjoyed the process of field testing new technologies and felt that the rich audiovisual materials had enhanced their learning experience, increasing their awareness of surroundings and the issues relating to a task. Broadly, there was consensus that participation and engagement were increased by the use of the audiovisual tour materials and that the temptation to 'skip through' passages of printed text was obviated. Interestingly, a number of students noted that the visual component of the virtual tour guide proved somewhat distracting as it commanded their undivided attention thereby drawing their focus away from their physical environment. As we discuss below, the use of visual elements requires careful consideration and in some cases may have a detrimental effect compared with audio-only materials.

In addition to these general comments, the students raised a number of specific issues and questions, including:

1. Who would provide the equipment? Although the MDMDs were provided in this field test, students expressed a number of concerns that centred on the potential misconception of widespread ownership of such devices; a general reluctance to use their own devices in fieldwork contexts (one student commented that this was tantamount to funding learning and teaching innovation); liability for the use of equipment both in terms of students using university equipment and any damages students might incur if required to use their own devices.
2. Is this just a way of reducing staff-student contact time? Although the experience of using the devices was broadly positive, there was some concern expressed that the driver for such innovation may be practical rather than pedagogical. As such, there is a clear need for a 'marketing campaign' to ensure that the pedagogical value of the approach is fully appreciated by the target audience.

General comments – Staff
For staff, a number of issues arise. Beyond convincing oneself of the pedagogical merits of using MDMDs, the ability to embed their use in the learning and teaching fabric of the fieldwork exercise, not to mention the need to effectively communicate this to the student body, has a number of implications. First, although like Stott (2007) the devices we have selected here are comparatively inexpensive, once the costs are multiplied to accommodate a large group of students, the total outlay can be considerable. As we note above, students who own these devices themselves can be reluctant to use their own personal property in fieldwork contexts where they might be subjected to extremes of weather.

A decision needs to be taken on the issue of upgrades. Without doubt, one of the attractions of the devices arises from their newness. The cachet that this brings potentially reflects favourably upon the department. However, the ground is constantly shifting and new media do not remain new for long. It is essential to strike a balance between upgrading for the sake of functionality and for the associated benefits of fashionability and cultural currency. Moreover, while there may be implied value in the use of MDMD in geography fieldwork, it is important to consider the converse. In situations where MDMD are not deployed – perhaps for entirely pedagogically sound reasons – student perception may be unfairly tainted in believing such activities lack the forward-thinking innovation of their 'teched-up' counterparts.

Perhaps the greatest challenge for staff, however, remains the production of the materials, particularly in relation to SENDA (disabilities issues) and also the maintenance of the devices. Based on the concerns of some of the GEES community practitioners we interviewed throughout the project, we have created a number of tutorials that document the production processes for both Mac and Windows operating systems. However, even these tutorials require some basic IT proficiency as well as data management skills (to organise the images, audio, and video materials). Maintenance issues also present a challenge to departmental budgets. If departments are to supply MDMDs for students, it is paramount that they be kept in good working order, the integrity of the files is maintained, and that software updates and patches are applied. This is in addition to more pragmatic matters such as ensuring that batteries are fully charged and headphones are supplied.

3. Project Tutorials

Based on feedback from staff and students, a series of tutorials have been produced to guide practitioners through the simple process of producing rich media resources for MDMDs. These tutorials can be found at:
http://www.gees.ac.uk/projtheme/smallfund/2006/projs06.htm#evalrichmed

Conclusion

Students reported higher level of satisfaction and engagement with all of the digital devices and rated them more useful and enjoyable than the traditional paper-based worksheets that acted as our control. The delivery of rich media and the translation of printed text into spoken voiceover was welcomed by all the students who found that these media added richness and nuance to their understanding of the tour.

More negatively, several students reported that they felt somewhat conspicuous when using the MDMDs in public due to the high monetary value of the devices and the fact that they were University property. The cost of the equipment was also highlighted in our staff interviews by those concerned about high levels of expenditure, especially when deploying the devices for large groups. Additionally, we echo the comments of a number of our respondents who drew attention to the importance of maintaining and updating the hardware and software for the devices and the associated costs that this brings to bear. The varying levels of IT competency and the demand for training and support for staff was also a common discussion point.

One area in which paper-based materials scored more highly, however, was in their facilitation of notetaking. While mobile phones and the iPod touch may allow this as we comment above, this means dropping out of the media player and into a separate Notes application. With paper, notes may be easily jotted in the margins and annotations added to images, for example. For the GEES community, this may be of particular concern as the maintenance of field notebooks and research diaries may be considered a critical element in the learning, teaching and assessment processes.

It is clear from our study that there are benefits to incorporating rich media into contemporary fieldwork practice and although there is an element of fashionability surrounding mobile phones, PSPs and iPods they are far from being a-Gimmick.

References

Armatas, C., Holt, D., & Rice, M. *(2005). ' Balancing the possibilities for mobile technologies in higher education'. Paper presented at the 22nd ascilite Conference, Brisbane, 4-7 December.*

Anderson P and Blackwood A *(2004). 'Mobile and PDA technologies and their future use in education'. JISC Technology and Standards Watch: 04-03.*

Duncan-Howell, J. & Lee, K.T. *(2007). 'M-learning: Finding a place for mobile technologies within tertiary educational settings. In ICT: Providing choices for learners and learning'. Proceedings ascilite Singapore. http://www.ascilite.org.au/conferences/singapore07/procs/duncan-howell.pdf*

Evans, C., *(2008). 'The effectiveness of m-learning in the form of podcast revision lectures in higher education'. Computers & Education, 50 (2), 491-498.*

Facer, K., et al *(2003). Screenplay. Children and computing in the home. London and New York: RoutledgeFalmer.*

France, D. and Wheeler, A., *(2007). 'Reflections on using podcasting for student feedback'. Planet, No. 8, 9 – 11.*

HEFCE *(2005). 'Innovative Practice with e-Learning: Case Studies Empowering learners'. <http://www.elearning.ac.uk/innoprac/practitioner/resources/dewsbury.pdf*

Maskall, J., et al, *(2007). Supporting fieldwork using information technology. Planet vol 8, 18 – 21*

McMorrow, J., *(2006). 'Using a web-based resource to prepare students for fieldwork: evaluating the Dark Peak Virtual Tour'. Journal of Geography in Higher Education. 29 (2): 223-240.*

Poland, R et al., *(2003). 'The Virtual Field Station (VFS): using a virtual reality environment for ecological fieldwork in A-Level biological studies—Case Study 3'. British Journal of Educational Technology, Volume 34 (2), 215-23.*

Stott, T., *(2007). 'Evaluation of low-cost Personal Digital Assistants (PDA) for field data collection and fieldwork leadership by students and staff'. Planet No. 8, 12 -17.*

Winterbottom, S., *(2007). 'Virtual lecturing: Delivering lectures using screencasting and podcasting technology'. Planet No. 8, 6 – 8.*

Ethical and critical dimensions in learning and teaching: the case of geodemographics.

Dr John Robb

Changing Landscapes Research Group, Department of Geography, Bath Spa University

Abstract

Geographers face a challenge in reconciling the more formal signalling of ethical and moral dimensions in our practice, with the growing emphases on business relevance and graduate employability. This is most strongly felt in the sub-field of geodemographics, a valuable modern skills vehicle with a clear pedigree in quantitative social geography dating back to the 1970s. This paper asks how the students of this sub-field might be enabled to construct their own 'moral geographies' after recounting the very different attitudes and conceptions of the GIS 'cheerleaders' and their academic critics. It suggests, finally, a simple starting point for discussing and classifying critical and ethical issues.

Introduction

> *'Managers like information and reports. If the report includes a map they can suddenly become your best friend or start to besiege you with further requests for similar reports. … In Chapter 12 we explain the best ways to maximise the impact of maps and graphics.'*
> (Chainey and Ratcliffe 2005, p. 25)

Higher Education (HE) tutors face a challenge in scholarship and teaching arising from the more formal signalling of ethical concerns (Kearns *et al* 1998; Cutchin 2003; Valentine 2005), and the saliency of corporate interests in such matters as graduate employability and curricular relevance (Owen 2001; Brown 2004). It seems to be increasingly difficult to maintain ethical responsibility and critical credibility, at the same time as orienting students' skills and attitudes toward entrepreneurial and industry-relevant outcomes.

This paper aims to chart the troubled terrains encountered in teaching the subfield of geodemographics at Honours level. Following Valentine (2005, p. 486), the paper goes on to propose a framework for students themselves to negotiate the ethical and critical issues which are largely avoided in the key texts. The result, it is hoped, will be seen as a more complete 'reading' of geodemographics, allowing proper scope for ethical and critical evaluation. In so doing, at a fundamental level, learning *how* can be extended into learning *why*, a process that can only enhance the position of similarly 'applied' studies in the HE curriculum.

Geodemographics has existed as an Honours option at Bath Spa for twelve years. At inception, and since, part of the rationale was to recast urban social geography into a more practical, applied and career-relevant sub-field of geography. A prominent theme linking theory and practice has been the conceptual and methodological legacies of interest in neighbourhood types and patterns of deprivation, carried through the inductive innovations of the 1960s to the modern commercial products and their uses today.

This narrative may seem overly 'whiggish' in outline, though the detail has a rougher, less predictable quality owing as much to changes in conceptual and methodological direction and the work of individual facilitators as to the onward march of technology. Census data are easily available, and critiques of the data and their geographies are a staple of student project work and exam answers. Until recently, ethical considerations have been 'dealt with' only by reference to regulatory minima, in relation to census anonymity and data protection. The focus on the census as the main data source is now outdated as non-census databases have mushroomed in the UK in the past five years (Longley, 2005).

The twin focus at Bath Spa on 'public sector' applications, related to long-standing academic interests in urban structure and social inequality, is also now questionable in a truly balanced account. Students, lately, have been encouraged to think about the implications of the 'surveillance society' in one class towards the end of the semester, but the critical and ethical 'content' of the syllabus has been limited and formal. There is no obligation on students to include ethical judgements in their projects to date. These are conceived as simulated briefs from companies or organisations with objective GI needs that the students are encouraged to meet in ways that maximise their virtuosity with data summary and visualization techniques, rather than exercise any ethical or critical oversight of the brief itself. In other words, the students have been implicitly placed in subaltern positions, responding as 'junior employees' rather than 'consultants to the board'.

Geodemographics is an important demonstrator of geography's applicability to the informational needs of a wide range of contemporary organizations, in both the public and private sectors. It belongs to a larger set of GIS techniques the practitioners of which are beginning to assert independent conceptual rationales (e.g. Schuurman, 2004) alongside more conventional 'how to' texts (e.g. Harris *et al*, 2005). The usefulness of GIS and GI-related skills to graduate employability is surely beyond doubt (Brown, 2004), though their attractiveness to students who may lack confidence in more conceptual studies does need exploration. It may be argued by some that sub-fields such as geodemographics, even GIS as a whole, have no place in the HE curriculum if only that students are entitled to a brief period of respite from corporate interests, and such interests can only distort, or undermine, the pursuit of intellectual excellence.

Encouraging undergraduates to take applied options, such as geodemographics, risks compromising their intellectual independence at a critical period in their development. A more practical objection might observe the short-term rise and fall of applied skills as technology continues its headlong rush, and that HE should be about enabling more generic capacities of intellectual development. I agree that students should have an informed choice of optional studies to suit their abilities, interests and career aspirations. It behoves us as tutors and guides to deal with critical and ethical questions more openly, as part of the curriculum. This includes going beyond the standard literatures, which can broadly be divided between 'cheerleaders' and 'critics', and include consideration of corporate responsibility, human rights and academic discourse.

The 'cheerleaders'

The mainstream GIS literature has progressed beyond the 'how to' stage, though given the complexity of the field it is understandable that technical content should continue to dominate (Harris *et al*, 2005; Longley, 2003, 2005, Sleight, 2004). However, the critical terrain around the practice of geodemographics is rather narrowly defined. Sleight (2004) acknowledges that the central clustering technique demands subjective judgement by someone with experience: 'one needs to be able to recognise an 'acceptable' solution.' (91) The labelling of the resulting types is 'a difficult process' and can take much longer than the original analysis'. (92) Geodemographics 'should' not be about constructing differences where none exist, but the reifying of neighbourhood types is seen largely in the narrow sense of arbitrary boundaries and the modifiable areal unit problem (Harris et al 2005, p. 210).

Crucially, pragmatism is extolled in favour of 'academic theory' in orienting the reader towards business attitudes. 'Does it work for me?' is the test, and the solution appears to be that it does, though most of the evaluations are taken from the public sector, illustrating starkly the commercial sensitivity of even this most crucial defence for geodemographics, that it is cost effective. Clusters are seen in this rationality as benign. As the regulatory environment has become more hostile, and as more consumers elect to invalidate the use of their valuable lifestyle data, cluster-based neighbourhood profiles can 'fill the holes in databases' without recourse to intrusive personal data. This is interesting, as the long foretold demise of Census-based neighbourhood typologies may not now occur. 'Rooftop marketing' may be too intrusive even in the US in the long run. The insider dilemma appears to be between using 'accurate' but intrusive personal data, or stereotyped but anonymous clusters. The opinion from the cheerleaders is pretty clear!

Schuurman (2004) contrasts the external view of GIS as overwhelmingly positivist in epistemology but suggests that pragmatism as actually dominant. She endorses Foucault's (1979) idea that governments and businesses operate within specific 'rationalities', and designates the post 9/11 developed world as existing under a state of 'carto-security' (Crampton, 2002), accompanied by the collection, commodification and cross-matching of large inventories of personal data, much of which is available to both state and corporate surveillance technologies, such as geodemographics. Schuurman (2004) detects important cultural differences between US and European governance and regulatory mechanisms, quoting the chair of Sun Microsystems at one extreme – 'You already have zero privacy. Get over it.' – (Schuurman, 2004; p. 130) and Article 8 of the European Convention for the Protection of Human Rights and Fundamental Freedoms at the other.

Ethics only make sense in cultural context, ergo the rationality dominant in the USA need not and does not apply in European geodemographics. This is heartening: the basic message is that the use of technology is dependent on the rationality, or variant, locally practised rather than being inevitably subservient to a globalising imperative.

However, rationalities can change: the tightening of UK security after 7/7 is an example. More generally, the boundary between public and private has changed through history, and people will adjust their behaviour to mitigate changes in surveillance. Public participation GIS use is contrasted with 'rooftop marketing' to illustrate the broad applicability of the method across a range of public goals and rationalities, though to Goss (1995) non-profit and electoral applications can be seen as special cases of 'social marketing' that belie the hidden intent to control (Goss, 1995, p. 172).

The critical terrain as laid out by the mainstream literature is one concerned primarily with better data, better technologies and more timely decision support. An optimistic, progressive 'firstspace' (Smith, 2005) narrative enshrines the idea that society produces the spatial patterns that geodemographers have discerned, mapped and made use of for economic gain and social advancement. Indeed, Longley (2003, 2005) goes as far as to maintain that GIS is on the brink of rejuvenating and enriching measures in class, consumption and citizenship (Longley, 2003, 114-5), that the 'meaningful representation of individual behaviour in something approaching real time is becoming a reality' (Longley, 2003, p. 118), and that GIS and geodemographics research is in the vanguard of social science research, and that the neighbourhood classifications they spawned 'work in the real world' (Longley, 2005, p. 61). Where an ethical dimension is articulated, this has generally been seen to lie in the direction of personal privacy and anonymity within a grand compromise, that the citizen's contribution to better governance and more market choice is a redefining of the public and private spheres and the 'commodification' of personal data.

Critical and ethical dimensions

A more nuanced reading of the challenges geodemographics poses to society can be found in Goss (1995a, 1995b), Curry (1997) and Graham (2005). These take two forms, critical and ethical. The former mode is subtly and carefully composed in the rich language of the cultural turn. To Goss (1995a), for instance, 'geodemographics displays a strategic intent to control social life', as it is based on 'an instrumental rationality that seeks to bring the processes of consumption further under the control of the regime of production' (Goss, 1995a, p. 172). The critiques do include military and positivist discourses, in stirring prose, establishing for itself a privileged, Archimedian position from which to survey and manage the life of the other, the language of manipulation, omniscience, distancing and control, the use of consumer 'targeting' and market 'intelligence' etc. (Goss, 1995a, p. 182-183).

Market segmentation is 'ordered and managed' rather than sensitively portrayed, involving nothing more than a 'rhetoric of intimacy' (Goss, 1995a, p. 185). Lifestyles and citizenship is crudely summarised as consumption. The wide flux of social identity is crystallized into this meagre ground, normalizing choice based on individual values and marginalizing income, workplace, race, gender and other solidarities, with the implicit privileging of higher ranking groups. (Goss, 1995a, p. 189) Neighbourhood types become hard, homogenous, reified entities ever more closely linked to 'constellations of commodities'. 'The targeting of specific types of neighbourhood may effect a *de facto* redlining of social life', shutting out places and people from full participation in consumption.

Curry (1997) adds that geodemographics is redefining the objects and groups that make up social life, no less. Rather than reflecting social realities, classifications can result in residents feeling insulted by tags such as 'X-Tra Needy' and 'Zero Mobility' (Curry, 1997, p.691), to which one might add individual lifestyle categories such as 'Staid at Home' and 'Put Kettle On' (Harris et al 2005, p. 244). Further, the socially motivating bonds between individuals and social groups risk being replaced by assigned membership of 'evanescent' lifestyle formulations, dismissive of memory, history and continuity. Places constructed around the 'bare contingency' of geodemographics deviate markedly from the ways people actually construct places that are laden with other meanings. The result is a 'digital puppet' or virtual individual. 'The filtering of information to what I 'really want' means I have lost control of my life.' (Goss, 1995a, p. 694) the solution is to be able to regulate our 'virtual selves' according to European notions of intellectual property rights.

To Graham (2005), the 'worlds of code' require urgent excavation to reveal how they 'continually constitute, structure and facilitate the place-based practices of the material world' (Graham, 2005, p. 563) after Dodge and Kitchin (2004). This is located within a broad shift from Keynsian welfare states to splintered post-Keynsian regimes of infrastructure, service and space production and consumption. (Dodge and Kitchin, 2004, p. 565) This 'splintering' allied to consumer surveillance allows unbundling and customization of niche services. The mobilities and freedoms accorded to privileged groups and places can be reconfigured to exclude the unprofitable.

Further, there is a tendency that virtual place-types, based on statistical summaries that obscure small-scale variation, become reified as social realities that provoke unequal or 'area-based' corporate and state actions. The public availability of these types exerts a powerful influence, crucially enabling 'strategically inclined social groups' to find 'their' place within increasingly complex and dynamic urban systems. People and communities can be actively matched. Graham foresees a general polarization as privileged groups secede from the remaining collective bonds of public services and universal citizenship, whilst those excluded from online GIS see their places and prospects worsen.

These accounts situate geodemographics in a moral geography, implicated and condemned as regressive in effect, however laudable the insiders' declared intent. The Joseph Rowntree Foundation has joined the critical chorus, emphasising the segregative agency enabled by internet-based neighbourhood information systems, and some of the new social risks foreseen (Cross, 2005). Journalistic interest in this theme has implicated geodemographics in the mis-selling of credit by targeting a neighbourhood type – 'Happy Families' – said to be a 'culture that is keen to take advantage of easy credit' (Ronson, 2005, p. 17). The profile of a suicide who died owing £130 000 on 22 credit cards is powerful and moving, and hinges on a simple question: why are some households 'bombarded' with credit offers whilst others are not? This line of investigation takes Ronson to meet Richard Webber (the most influential figure in facilitating the corporate adoption of neighbourhood taxa in the UK), and claims to reveal the rapacious, impersonal nature of credit targeting, the lack of effective protection for consumers and subsequent high levels of unsustainable consumer debt.

Is it possible to compile a moral balance sheet for geodemographics? To the cheerleaders, a separation of technology and ideology of use is paramount: 'it's not the technology that's evil, its what people do with it. After all maps have always been used as a military device.' (Stan Openshaw quoted in Davies, 1995, p. 19). In this conception, it is enough that geodemographics can be demonstrated to work, by implication, and it is up to the 'watchers' to join the 'doers' in turning the technology to more benign uses.

Ethical objections include routinized 'consumer espionage' and loss of personal privacy. The main threats are seen as error, which is cumbersome and difficult to correct under US statutes, and data combination, which can enable covert uses not approved by the subject. Curry (1997) pursues the privacy question in some depth, providing some evidence for Schuurman's assertions about the cultural relativity of ethics. US courts have taken a fairly consistent and implicit view of 'autonomous technology' such as wire tapping, aerial surveillance and tracking devices which have progressively undermined the traditional model of domestic privacy (Curry, 1997; p. 687).

The combination of data and the use of compounded datasets for purposes unforeseen by the subject is not therefore seen as an issue separate from the 'inevitable and natural' advances in technology. Software sorting as practised is not transparent, ironically protected by proprietary confidentiality. Transparency is essential in revealing how greater freedom for the privileged has as its corollary the undermining of the prospects for marginalized groups and communities. (Graham, 2005; p. 575) Graham finishes on an optimistic note: the inherent flexibility of systems allows grassroots GIS to create alternatives that are at once empowering and progressive.

In ethical terms, Goss (1995) sees geography challenged by geodemographics, as geography graduates are sought after for their expertise. This places a responsibility on the subject 'due to its pedagogical role, its familiarity with theory and methods, and its increasingly sophisticated understanding of the spatial constitution of relations of power in contemporary society' (Goss, 1995; p. 175). Geographers, then, are best placed to challenge the instrumental rationality behind geodemographics, whilst preparing graduates for well-paid work in the sector Openshaw. How is this to be done?

Firstly, it is necessary to distinguish meaningfully between academic criticism of geodemographics, and ethical concerns. Clearly, criticism often raises ethical dilemmas, but how is the student to navigate a personal position in relation to the technique and its products should they be encountered in professional life? It is important that some attempt be made to distinguish critical from ethical challenges, and to evaluate their relative magnitude in a clearly charted moral geography.

It is necessary in my view for students to be able to distinguish meaningfully between academic criticism of geodemographics, and ethical concerns around many of its applications. Clearly, criticism often raises ethical dilemmas, but how is the student to navigate a personal position in relation to the technique and its products should they be encountered in professional life? The grid (below) is suggested as a starting point. It encourages students to separate 'problems' with geodemographics into one or both of two columns, those that derive from academic criticism and those which pose more profound ethical challenges in the world of work. In the following discussion of the grids, individually compiled at first, levels of agreement and dispute can then contribute to a more 'clearly charted moral geography'. The outcome should reassure students discouraged by the tone of the academic criticisms, yet they will remain aware of the ethical dilemmas as yet so little acknowledged by geodemographics practitioners.

Issue:	**Critical issue?** *(tick)*	**Ethical issue?** *(tick)*
Privacy		
Data accuracy		
Data combination		
Imposed identities		
Homogenization		
Segregation		
Exclusion		
Redlining		
Secrecy		
Exclusivity, priority		
Filtering		
Misrepresentation		
Secession		
Imposed values, opinions		

References

Brown K. (2004) *'Employability of Geography graduates in the GIS and GI-related fields', Planet, 13, 18-19.*

Burrows, R. and Ellison, N. *(2004) 'Sorting places out? Towards a social politics of neighbourhood informatization', Information, Communication and Society, 7, 321–26.*

Chainey S. and Ratcliffe J. *(2005) GIS and crime mapping, London: Wiley*

Crampton J. *(2002) Guest editorial, Environment and Planning D: Society and Space, 20, 631-5.*

Cross M. *(2005) 'Surfing our way to segregation', The Guardian, 25:08:05, Inside IT supplement, 15.*

Curry M. *(1997) 'The digital individual and the private realm'; AAAG, 87 (4), 681-99*

Curry M. *(1998) Digital places: living with geographical information technologies, New York: Routledge*

Cutchin M.P. *(2003) 'Ethics and geography: continuity and emerging syntheses', Progress in Human Geography, 26 (5), 656-664.*

Davies J. *(1995) 'Chart hits?' Times Higher Education Supplement 27:10:95, p19.*

Foucault M. *(1979) Discipline and Punish, New York: Vintage Books*

Goss J. *(1994) 'Marketing the new marketing: the strategic discourse of geodemographic information systems' in Pickles J. (ed) Ground Truth: the social implications of Geog Info Syst, New York: Guildford Press, 130-170*

Goss J. *(1995) 'We know who you are and we know where you live'; the instrumental rationality of geodemographic systems', Economic Geography, 71 (2), 171-198*

Graham S. D. N. *(2005) 'Software-sorted geographies', Progress in Human Geography 29, 5, 562–580*

Harris R., Sleight P.and Webber R. *(2005) Geodemographics, GIS and Neighbourhood Targeting, Chichester: Wiley*

Kearns R. Le Heron R. and Romaniuk A. *(1998) 'Interactive ethics: developing understanding of the social relations of research' Journ. Geog. In HE, 22 (3), 297-310.*

Longley P.A. *(2003) 'Geographical Information Systems: Developments in socio-economic data infrastructures', Progress in Human Geography 27 (1), 114-121.*

Longley P. *(2005) 'Geographical Information Systems: a renaissance of geodemographics for public service delivery', Progress in Human Geography 29, 1 pp. 57–63.*

Owen E. *(2001) 'What key skills do employers need?' JGHE, 25 (1), 121-126*

Phillips, D. and Curry, M. *(2003) 'Privacy and the phenetic urge: geodemographics and the changing spatiality of local practice', In Lyon, D. (ed),Surveillance as social sorting: privacy, risk and digital discrimination, New York: Routledge, 137–52.*

Ronson J. *(2005) 'Who killed Richard Cullen?', The Guardian, 16:07:05, Guardian Weekend, pp. 15-21.*

Schuurman N. *(2004) GIS a short introduction, London: Blackwell.*

Sleight P. *(2004) 'Geodemographic classifications and analyses', in Dugmore K. and Moy C. (eds.) A Guide to the 2001 Census; Essential Information for Gaining Business Advantage, London: TSO, 89-102.*

Smith S. *(2005) 'Society – space', in Cloke P. Crang P. and Goodwin M. (eds.) Introducing Human Geographies, 2nd ed, London: Hodder Arnold, Ch 2, pp. 18-33.*

Thrift, N. and French, S. *(2002) 'The automatic production of space', Transactions of the Institute of British Geographers, NS 27, 309–35.*

Valentine G. *(2005) 'Geography and ethics: moral geographies? Ethical commitment in research and teaching', Progress in Human Geography 29, 4, 483–487.*

Podcasts to support student learning in the GEES subjects

Ming Nie

Beyond Distance Research Alliance, University of Leicester

Abstract

This article reports on a research project called IMPALA 2, exploring the broad pedagogical benefits of using podcasting to support learning and teaching in the GEES subjects. The work was funded by the GEES Subject Centre's small-scale project funding and involved six institutions in the UK.

The article introduces the background to the project, the research outputs and provides a number of examples of how podcasts can be integrated into the curriculum to address specific learning and teaching challenges faced by GEES colleagues. Some key findings based on students' feedback, particularly in relation to the effectiveness of podcasting in improving learners' cognitive and motivational aspects of learning, are also included.

Background to podcasting in Higher Education

From 2005, podcasting started capturing the attention of academics in Higher Education (HE). At Duke University in the US, first year students were given iPods and academics were encouraged to develop applications that could be used with iPods to support student learning (duke.edu/ddi). Early uses at Duke included course content, classroom recordings, field recordings, study support, file storage and transfer (Belanger, 2005). At Stanford University, students can subscribe to Stanford on iTunes U (itunes.stanford.edu), and download courses, faculty lectures and interviews and listen to them from their iPods. Another early pilot was held at Georgia College and State University (ipod.gcsu.edu) where they began to introduce the iPod to a range of courses in Liberal Arts from 2002. Since 2006, podcasting initiatives have started to span academic disciplines and student university life in HE in many countries.

In Australia, a large project researching the broad educational benefits of student-generated podcasts has been underway at Charles Sturt University since 2005. It began with a small pilot group of undergraduate on-campus students studying Information Technology, but it soon expanded to include a wide range of undergraduate and postgraduate subjects and to involve both on-campus and distance learning students. A series of publications based on this project revealed that this student-centred approach is beneficial for both student producers (McLoughlin, Lee and Chan, 2006) and listeners (McLoughlin, Lee and Chan, 2007).

In the UK, early in 2006, a research project called IMPALA (impala.ac.uk), funded by the UK Higher Education Academy (HEA), was carried out at the University of Leicester. The project set out to explore the subject-specific pedagogical benefits of podcasting to support students' learning. Around 20 university lecturers and 500 students across six topics, subjects and disciplines and different modes of learning were involved. The project has shown that there is a wide range of intrinsic advantages offered by podcasting that can have a positive impact on student learning in a wide range of subjects (Salmon and Nie, forthcoming).

The IMPALA 2 project

Interestingly, five out of ten case studies involved in IMPALA focused on the use of podcasting for supporting GEES subjects. The enthusiastic uptake of podcasting by GEES practitioners prompted the GEES Subject Centre to invite the IMPALA team to carry out another podcasting project – IMPALA 2, specifically to explore the potential of podcasting for supporting GEES disciplines.

Six UK institutions (Leicester, Nottingham, Leeds, Sussex, Gloucestershire, and Kingston) were involved in the project. A full write up of the research work is now available at http://gees.ac.uk/projtheme/elearning/del/IMPALA2rept.doc. Some key findings are briefly outlined later in this article.

The IMPALA 2 project provided GEES practitioners from around the UK with a platform for exchanging ideas, sharing experiences of using podcasts, and disseminating findings. This was supported through two workshops.

The workshops were attended by GEES colleagues, both experienced and new to podcasting, from different universities across the UK. Many colleagues presented their approaches to using podcasts to support their specific module or course.

In the second workshop practitioners were given an opportunity to create a video podcast.

As an outcome of preliminary research activity and the workshops, eight pedagogical approaches for using podcasts to support student learning in the GEES subjects were identified:

- Podcasted lectures
- Podcasted students' presentations and discussion
- Video podcasts to provide lecture summaries
- Video podcasts to support software teaching and learning
- Video podcasts on field techniques and equipment use
- Video podcasts to provide a field guide
- Podcasts to provide additional information about the subject
- Student-created digital stories

Using podcasting to support student learning in the GEES disciplines

The approaches outlined above can be seen in the following examples identified during research and the workshops:

Supporting fieldwork

The widespread availability and the falling cost of mobile technology have resulted in considerable interest in off-campus learning (Maskall et al, 2007). Podcasting can be used across learning spaces and can support knowledge continuity and transfer from the classroom to the field. Some practitioners from the GEES disciplines use podcasting to provide instructions and information to support fieldwork, a crucial component of teaching and learning in these subjects. For example, Thomas (2006) reports on an experiment in providing audio instructions to support student field trips in an Earth Sciences course. Students listened to instructions provided as MP3 audio files and completed three field trips in their own time. In another study, field instructors delivered PowerPoint presentations, instructional DVDs and CD-ROMs to students on a bus while they were travelling to the field site, via a portable audio and video system (Elkins and Elkins, 2006). A comprehensive discussion on how to use podcasts to support fieldwork, including fieldwork preparation, providing information and instruction in the field, demonstrating field techniques and equipment use, and using student-created video podcast as a means for assessment, is documented in Downward et al (forthcoming).

Two colleagues participating in IMPALA 2 developed a podcast library of geographical techniques. They wanted to help students do more independent learning in the field by empowering them with mobile devices and technology (Jarvis and Dickie, 2008).

Improving learner engagement and motivation

GEES subjects are inherently visual. Lim (2005) suggested that "the nature of the discipline lends itself far better to the use and /or authoring of video podcasts than audio ones."

IMPALA 2 colleagues were enthusiastic to explore the effectiveness of video podcasts in promoting learner engagement and motivation. One technique engaged first year students in digital storytelling, giving them active, independent, collaborative and reflective learning experiences (Jenkins and Lonsdale, forthcoming). Another approach involved the practitioner producing supplementary material in video documentaries to engage students with the topic and motivate them to learn more about it. Other colleagues examined how video podcasts can engage students and help them learn geographical software more effectively (Mount and Chambers, forthcoming)

Fostering collaborative learning

GEES subjects often involve introducing students to controversial and debatable issues. Earlier studies in Information Technology (Lee, McLoughlin and Chan, 2007), and English Language and Communication (Edirisingha, et al, 2007) have revealed the effectiveness of using podcasting in collaborative learning. Podcasts can provide alternative perspectives to enhance a student's understanding of the subject matter.

One GEES practitioner working on the IMPALA 2 project developed podcasts that included interviews, conversations and debates with colleagues, local residents and site managers. He aimed to increase the breadth and depth of student learning by exposing learners to different viewpoints about a controversial issue through podcasts. Another colleague podcasted students' presentations and discussions. He wanted to examine the effectiveness of peer-discussion in developing students' in-depth understanding and critical thinking of the issue covered.

Offering flexibility and learner control

Winterbottom (2007) reports on a study of delivering lectures using podcasting technology for a second year Environmental Science module. Students' feedback showed that they enjoyed the flexibility that podcasting brought to their study, 'as they could then view the lectures at the time of the day most situated to their learning styles, rather than be constrained by lecture times' (p.8). This approach can also allow the lecturer to cover basic principles with a podcast and use the face to face session to explore the subject matter in more detail with the students.

Providing effective feedback

Podcasting has been used to provide assignment feedback to students studying GEES subjects (France and Wheeler, 2007). Their study suggests that podcasting offers an opportunity of providing students with a more personalised and effective feedback than traditional written feedback.

Enhancing understanding of subject-related troublesome concepts

Certain concepts and ideas in the GEES subjects can be difficult to understand and learn. Podcasted lectures or summaries can offer an opportunity to reinforce and enhance student understanding of course material through repeated listening (Winterbottom, 2007; Salmon and Nie, forthcoming).

The use of podcasts to enhance students' understanding of difficult and complex concepts is not unique to GEES. Other studies have found that podcasts based on discussions of key or difficult concepts were effective in addressing students' common misconceptions and enhanced their understanding of subject-related issues in subjects such as Information Systems (Newnham and Miller, 2007), Information Technology (Chan and Lee, 2005), Physics (Aliotta et al., 2007), and Sports Science (Abt et al., 2007). However, these studies have not revealed sufficient evidence of how the improvement of students' conceptual understanding related to an improvement of their performance. A few studies marginally reflected a slight but positive impact of podcasting on student learning in relation to their learning outcomes (Aliotta et al., 2007; Abt et al., 2007).

Overview of IMPALA2 outputs

A full write up of the research findings collected from student focus groups, interviews and questionnaires, and staff interviews is included into a final report now available at http://gees.ac.uk/projtheme/elearning/del/IMPALA2rept.doc. The research was based on a number of examples outlined in the previous section.

Key findings from interviews with students regarding their use of podcasts as a learning tool are very positive. Students' feedback showed that podcasts were effective in engaging them and promoting learning motivation, improving their cognitive learning, particularly in relation to enhancing their understanding of subject-specific difficult concepts, and improving their practical-based learning. Feedback also showed that incorporating visuals and perspective-taking were valuable in contributing to students' cognitive and affective learning in GEES subjects. Seven user-exemplars based on different approaches of using podcasts adopted by IMPALA 2 colleagues and students' feedback are now available at http://www.impala.ac.uk/impala2/outputs/index.html

Staff interviews showed that IMPALA 2 colleagues are keen on the idea of building a digital repository of reusable podcasts for GEES practitioners to share. Some planned to build a podcast archive for their own module. Some have already established initiatives in sharing their podcasts with colleagues who work in other institutions both within and outside the UK through their personal links. The project team developed a podcast repository that included real podcast examples contributed by IMPALA 2 colleagues, now available at http://www.impala.ac.uk/impala2/outputs/index.html. We hope that by building this repository, we can encourage GEES colleagues to use and contribute to it, and further explore the key issues and enablers for sharing and reusing podcasts across GEES disciplines.

Resources generated from the two workshops, such as the PowerPoint presentations given by experienced GEES colleagues and the video podcasts created by participants, are available through the project wiki at http://www2.le.ac.uk/projects/impala2.

The project team also delivered a model of podcasting for GEES subjects. This model guides GEES practitioners through the process of developing their own educational podcasts and accommodates their own teaching and learning challenges and contexts. Detailed information about how to use this Impala 2 model is included in the final report available at http://gees.ac.uk/projtheme/elearning/del/IMPALA2rept.doc.

References

Abt, G., Barry, T., and Mallabon, E. *(2007). Podcasting exercise physiology – enhancing the student experience. ALT-C 2007 programme and abstracts, 28-29, Nottingham, UK, 4-6 September 2007.*
Aliott, M., Bates, S., Brunton, K. and Steven, A. *(2007) Assessing the impact and potential of podcasts as pre-lectures. ALT-C 2007 research proceedings, pp.91-104, Nottingham, UK, 4-6 September 2007.*
Belanger, Y. *(2005) Duke University iPod First Year Experience Final Evaluation Report. cit.duke.edu/pdf/ipod_initiative_04_05.pdf (accessed 15 January 2008).*
Chan, A. and Lee, M.J.W. *(2005) An MP3 a day keeps the worries away: Exploring the use of podcasting to address preconceptions and alleviate pre-class anxiety amongst undergraduate information technology students, in D.H.R. Spennemann and L. Burr (eds) Good Practice in Practice: Proceedings of the Student Experience Conference, pp.58-70, Wagga Wagga, NSW, 5-7 September.*
Downward, S., Livingstone, D., Lynch, K. and Mount, N. *(forthcoming) Podcasts and locations, in G.Salmon and P.Edirisingha (eds), Podcasting for learning in universities. McGraw Hill.*
Edirisingha, P., Rizzi, C., Nie, M., and Rothwell, L. *(2007) Podcasting to provide teaching and learning support for an undergraduate module on English Lanuage and Communication, Turkish Online Journal of Distance Education, 8(3): pp.87-107.*
Elkins, J.T. and Elkins, N.M.L. *(2006) Improving student learning during travel time on field trips using an innovative, portable audio/video system, Journal of Geoscience Education, 54(2): pp.147-52.*
France, D. and Wheeler, A. *(2007) Reflection on using podcasting for student feedback, Planet, 18: 9-11.*
Jarvis, C. and Dickie, J. *(2008) Supporting experimental field-based learning: Interfaces and archives. Poster presented at Learning Futures Conference 2008, University of Leicester, 8-9 January.*
Jenkins, M. and Lonsdale, J. *(forthcoming) Podcasts and students' storytelling, in G.Salmon and P.Edirisingha (eds), Podcasting for learning in universities. McGraw Hill.*
Lee, M.J.W., McLoughlin, C. and Chan, A. *(2007) Talk the talk: Learner-generated podcasts as catalysts for knowledge creation, British Journal of Educational Technology, Published article online. www.blackwell-synergy.com/doi/ref/10.1111/j.1467-8535.2007.00746.x (accessed 27 February 2008).*
Lim, K. *(2005) Now Hear This – Exploring Podcasting as a Tool in Geography Education. homepage.mac.com/voyager/brisbane_kenlim.pdf (accessed 17 March 2008).*
Maskall, J., Stockes, A., Truscott, J.B., Bridge, A., Magnier, K. and Calderbank, V. *(2007) Supporting fieldwork using information technology, Planet, 18: pp.18-21.*
McLoughlin, C., Lee, M.J.W. and Chan, A. *(2006) Fostering reflection and metacognition through student-generated podcasts. Australian Computers in Education Conference (ACEC), Cairns, 2-4 October.*
McLoughlin, C., Lee, M.J.W. and Chan, A. *(2007) Promoting engagement and motivation for distance learners through podcasting, EDEN conference proceedings 2007, Naples, 13-16 June 2007.*
Mount, N. and Chambers, C. *(forthcoming) Podcasts and practicals, in G.Salmon and P.Edirisingha (eds), Podcasting for learning in universities. McGraw Hill.*
Newnham, L. and Miller, C. *(2007) Student perceptions of podcasting to enhance learning and teaching in an information systems course. ALT-C 2007 research proceedings, pp.104-116, Nottingham, UK, 4-6 September 2007.*
Salmon, G. and Nie, M. *(forthcoming) Doubling the life of iPods, in G.Salmon and P.Edirisingha (eds), Podcasting for learning in universities. McGraw Hill. Subject-specific exemplars, IMPALA (2007), www.impala.ac.uk/outputs/examplars/index_not_video.html#summary (accessed 15 April 2008)*
Thomas, C. *(2006) Designing an online science lab around self-paced MP3 player-based field trips. Philadelphia Annual Meeting, 22–25 October. gsa.confex.com/gsa/2006AM/finalprogram/abstract_108487.htm (accessed 15 January 2008).*
Winterbottom, S. *(2007) Virtual lecturing: delivering lectures using screencasting and podcasting technology, Planet, 18: pp.6-8.*

Geography Old Style

John Bradbeer

Formerly of the University of Portsmouth, now an independent scholar and consultant

Abstract

Geography has been well served by its historians in that there are several good accounts of the evolution of the discipline from its modern reformulation in the mid nineteenth century. These accounts identify some of the key thinkers and actors and the principal currents in the discipline. What they do not give is much, if any, impression of how the discipline would have been experienced by its undergraduate students. Probably the best source for this would be past examination papers and complete sets do not always survive in departmental archives. In this paper I want to urge geographers to explore the history of the discipline through students' eyes and by examination papers.

Introduction

My sources for the historical geography undergraduate experience are sets of examination papers for finals at the University of Oxford from 1966 to 1968. They are of more than parochial interest, in that Oxford's geography syllabus had changed very little in thirty years and could be seen as a good exemplar of the heyday of regional geography. By the mid 1960s, the winds of the quantitative revolution had begun to blow through syllabi in many United Kingdom geography departments and so there would not be too many of us who experienced regional geography in full flight.

I shall give an overview of the syllabus and then examine the style of examination papers in the light of the now extensive literature on assessment in higher education. Oxford was unusual in that its geography undergraduates did Preliminary Examinations in the second term of their first year and then faced no further public examinations until the Second Public Examination at the end of their third year. The curriculum comprised lectures on many, but not all, examination papers and college and university tutorials (often two per week) and on other papers. Tutorials were usually of an hour's duration and in the period between1966 and '68, there were standard formats: a tutorial one-to-one, and a tutorial with two students and a single tutor. In both cases, a student essay was to be read aloud and then discussed (or dissected!) by the tutor.

The Honours School in Geography (Second Public Examinations) had the following structure:

- Four compulsory "General Geography" papers; one each in physical geography; human geography; cartography; principles of regional geography and general philosophy of geography.
- Two compulsory "Regional Geography" papers; one on the British Isles (including Ireland) and one on France
- A paper on the "Regional Geography of a Developed Area"; choices here were: Central and Southern Europe; United States of America; the USSR.
- A paper on the "Regional Geography of a Developing Area"; the choices here were: India, Pakistan and what was then still Ceylon; the Middle East; Southern Africa; Southeast Asia; and added in 1968, Latin America.
- Two "Special Papers" on a single thematic topic, but usually with a regional emphasis. The choices available were: Landforms; Economic Geography of Eastern Canada; Social and Political Geography of Tropical Commonwealth Countries (essentially the Caribbean, west and east Africa); Settlement in Australia and New Zealand; Historical Geography of Britain; Cartography and Surveying
- A Regional Dissertation of some 15,000 words on an area of roughly 150 square miles.

All the written papers were of three hours duration and the rubric normally required that four questions be answered. The number of questions varied among the papers, as did the use of compulsory questions or sectioned papers. So, the General Geography paper on physical geography was sectioned, with the requirement to answer from both sections, A (with 6 questions on geomorphology) and B (with 7 questions on climatology, biogeography and soils). The General Geography paper on human geography had ten questions and the General Geography paper on principles of regional geography and the philosophy of geography had two sections, one on each of its themes and both had five questions. The General Geography paper on Cartography, uniquely, had a requirement to answer a compulsory question (changed in 1968 to a choice between two compulsory questions) and one other question from a choice of four. All the Regional Geography papers required the choice of four questions from ten, except that on France, which gave eleven questions to choose from.

The Special Papers generally had a common format of seven questions and a requirement to answer the first compulsory question and three others. Historical Geography reduced the choice to six questions and requiring that two compulsory questions and one other be answered. Cartography and Surveying demanded answers to five of the seven questions.

It is also worth noting that the ten papers were sat successively in six days, in my case, starting at 09-30 on a Thursday morning and, with just Sunday as a rest day, finishing at 17-00 on a Tuesday evening. I can testify to acute writer's cramp by 17-00 on Saturday evening!

There were some styles of question that were specific to individual papers. Not surprisingly, in the General Paper on Cartography, there was a compulsory question on map interpretation, with a choice offered as to whether you examined a British or a French map. In most years, the scales of the British and French maps were similar (1:63,360 and 1:50,000, for instance), although in 1966 the British map was at 1:25,000 and the French at 1:100,000. The Special Papers, except those in Cartography and Surveying, had a compulsory question requiring candidates to explain or amplify short quotations of around twenty to fifty words from original sources. In Cartography and Surveying, candidates were required to do calculations based on star sightings provided.

The papers, more generally, contained three broad types of question. There were questions containing the verbs 'assess' 'compare' 'describe' 'discuss' 'examine'. Eyes might be raised nowadays at a finals examination question containing 'describe', although it arose in a map interpretation question about the effects of glaciations to be seen. A second type of question contained an assertion, usually placed in single inverted commas, or a direct quotation from an author, although dates and other indications of provenance were not given. A typical examination paper had a third to a half of its questions of this type. The final type of question task was the simple question, such as:
Can one recognise in southern Europe the relief and other features of a distinctive Mediterranean morpho-genetic region? (Regional Geography of C & S Europe 1968); and Is the Soviet government justified on geographical grounds in making the Republic of Kazakhstan an economic region? How otherwise might it be treated? (Regional Geography of USSR, 1966)

The full range of question styles can be seen in the Regional Geography paper on France for 1968 and I offer a selection of questions to show what the detailed regional study might have entailed to undergraduates and how too it might have constrained lecturers and tutors. Note the great range of potential topics on the systematic geography of France (this selection perhaps stresses the economic over other aspects of human geography) and the relatively specific nature of questions on individual French regions. The questions seem to betray a very full and demanding syllabus.

Q1. Where is *marais* to be found in France and of what value are such areas to man?

Q3. Discuss the relationships between physical geography and human activity in *either* Normandy *or* the Rhône valley south of Lyon.

Q4. How do you account for the variety and importance of cereal cultivation in France?

Q6. Assess the role of pipelines in the economic geography of France.

Q7. In what respects does the climate of Aquitaine differ from that of the remainder of France? How are these differences reflected in human activity?

Q9. 'With an average density of 86 persons per square kilometre, France comes fourteenth in the scale of densities of the nations of Europe. This low density is one of the most noteworthy of the country's characteristics.' Discuss.

So, this was regional geography in its heyday. The questions set were not always as nuanced as would be expected today and, also to contemporary eyes, many questions did not offer enough by way of guidance as to what was expected. The breadth of the curriculum also would strike contemporary undergraduates as demanding. As for the general absence of choice compared to modular frameworks, that too would come as a shock to most contemporary undergraduates. Perhaps, with apologies to L P Hartley, the past was a different country where its regions were differently dissected.

UKRIGS/Earth Science On-Site: a contribution to the dialogue between Earth Science colleagues in Higher Education departments, and those in Secondary schools.

Rick Ramsdale[1] and John Reynolds[2]

[1] UKRIGS/ESO-S Education Officer
[2] UKRIGS

Abstract

In recent years, the sustainability of Earth Science as a discipline has become more of an issue for schools, Higher Education (HE) and industry. As a result, stronger links between these groups are becoming a focus. Since the advent of a National Curriculum, Earth Science has been increasingly taught by non-Earth Science specialists and the teaching of fieldwork in schools has reduced. This paper outlines, for the HE community, some good practice being implemented at a school level to support non-specialist Earth Science teachers to teach fieldwork.

Introduction

UKRIGS (United Kingdom Regionally Important Geological and Geomorphological Sites) is the organisation with responsibility for auditing and managing the use of aggregate quarry sites in England, after their original use has lapsed. The UKRIGS Earth Science On-Site (ESO-S) education project is funded by an Aggregates Levy Sustainability Fund grant disbursed by Natural England, and aims to support and encourage science teachers in conducting fieldwork for pupils at RIGS sites across England.

Documents for educational activities at 14 RIGS sites are available on the project website, and, on the basis that the Primary / Secondary transition is equal in importance to the one that follows, include both primary and secondary materials. The documents provide detailed guidance to the sites, background and access information and suggestions as to pedagogical approach, as well as links to related sources. Although the documents are designed to be downloaded and used "off the shelf" a significant aspect of the project is the encouragement of teacher In-Service training to adapt and adopt the ideas within individual departments, and, hopefully, between linked Primary and Secondary schools. It is intended that the materials, which draw on ideas developed by Earth Science Teachers' Association (ESTA) members over the years, may also be used as exemplars for adaptation to specific programmes of study, and other sites, perhaps more convenient to schools.

This article briefly outlines aspects of the Secondary Earth Science fieldwork context and the ways that UKRIGS ESO-S addresses some of the ideas of science learning in the field.

The Secondary Context

Prior to the advent of the National Curriculum, the teaching of Geology in Secondary schools flourished at the interface between the science and geography departments. The Association of Teachers of Geology (ATG) was founded in 1967 and continues to flourish as the Earth Science Teachers Association (ESTA), whose 2006 annual conference was reported in Planet (June 2007). To a great extent the teachers involved were a self-selecting, knowledgeable and confident, if somewhat mixed, group, and membership included significant members of Higher Education Institutions, amongst others. With the advent of National Curriculum in many schools specialist biology, physics and chemistry teachers suddenly found themselves responsible for teaching Earth Science as part of a large science curriculum. At the same time, additional pupil assessment and school inspection of a particular kind, raised the stakes for some teaching professionals who were less confident in their ability to teach all of the new Earth science curriculum to the same standard as their own subject specialism: and less confident in their ability to lead fieldwork, than they were in conducting laboratory sessions.

Over the last two decades the additional pressures operating against field work of all kinds include: schools having to cover for teachers who were away conducting field exercises; school managers dealing with complaints from other departments about the disruption of their teaching and assessment schedules caused by "absent" pupils; the greater costs of field visits, and the potential risks of adverse publicity caused by (rare) field accidents to pupils. The result is a spectrum of science field experience for pupils in secondary schools ranging from those with a rich and continuing tradition of activity to those where it seems virtually non-existent.

The Supporting Context

For some years now the Earth Science Education Unit (ESEU) based at Keele University, and supported by UKOOA (United Kingdom Offshore Oil Association) has been providing, free of charge, workshop facilitators for school teachers wanting to develop their skills and confidence in Earth Science teaching. Many of these well received workshops, developed by ESTA members, focused on demonstrating and explaining practical laboratory activities aimed at the key stage 3 and 4 curriculum demands. In addition, there were "out-of-doors" workshops, using school grounds and local churchyards as resources in the attempt to give pupils some field experience looking at "Earth materials".

In 2004, UKRIGS received an ALSF grant from English Nature (now Natural England) to fund an educational project to publish and make freely available, Earth Science teaching materials designed primarily for use in RIGS sites by non-specialist science teachers. The main aim was to address the serious problem of schools failing to undertake Earth Science fieldwork, an issue highlighted in English Nature report 523: The use of geological sites by schools prepared by the National Stone Centre. Close liaison with ESTA and ESEU have been evident from the start, with the ESO-S project drawing on, and benefiting from, partnerships with ESTA members as well as RIGS groups and Geology Trust members, familiar with the individual sites. The final selection of sites was influenced by considerations of safety, accessibility, parking, and geographical spread across the country, as well as geological significance and educational potential.

By March 2007, twelve ex-aggregate sites had been documented (see the map below), with a further two added March 2008. Most of these sites are open access, with footpaths running through them, and three have Country Park status. Although some have rock faces high enough for hard hats to be deemed essential, the ease of access and safety of school parties using these localities has been a consideration. Due to the limitations of the ESO-S funding criteria, all of these locations are centred on RIGS aggregate sites in England, although, of course, the general ideas may be applied elsewhere. Stratigraphically, the sites range from the unconformable Cambrian succession at The Ercall to the Quaternary deposits at Ryton Pools, Warwickshire, and the valley train deposits north of Mosedale, in the Lake District, with various limestone and dolerite sites in between. An important factor in the overall selection of sites was the need to provide easily accessible examples from as wide a range of geological features as possible, and, in particular, those specified in the National Curriculum.

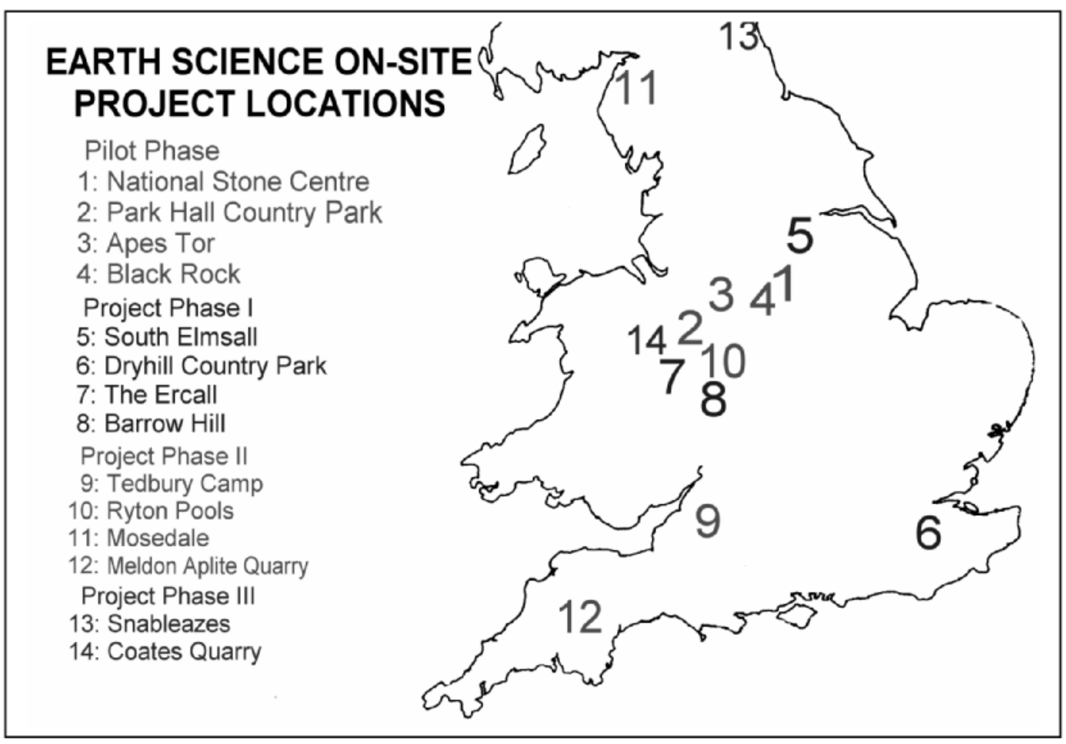

Figure 1: Map Of ESO-S Sites

Although there are many factors influencing the frequency of fieldwork, most are internal to schools, and difficult to influence from the outside. The project attempts to assist those already persuaded of the case for fieldwork by providing free access to a body of information and teaching ideas, the project reduces the effort threshold for those departments wanting to develop a learning-outside-of-the-laboratory approach, but who are not sure of their knowledge and information base. The ESO-S materials are on the internet at www.esos.ukrigs.org.uk, and are, essentially, straightforward, step-by-step directions through the project's sites, with suggested field questions and pupil exercises at each point. They also include preparation and follow-up ideas. The field guides and the range of suggested pupil worksheets are intended to be printed off and used on site by teachers planning a field visit, and then modified by them in the conduct of their field visit to meet the specific learning requirements of their teaching groups. The Index for each site allows users to navigate quickly to the documentation they need.

The Earth Science On-Site Educational Project

The project takes the case for Earth science fieldwork as self evident: science is the logical observation and interpretation of evidence, and much of that evidence (at Primary and Secondary levels) is in the field, not in a laboratory, specimen box, computer file, TV screen, or book.

Although each site presents different learning opportunities, the field exercises tend to focus at Key Stage 3 on the rock cycle, with additional, and more taxing, exercises introduced at Key Stage 4. The Primary field trails tend to use ideas of geodiversity to lead into more multi-disciplinary experiences. The exercises begin with field observations and move on to measurement and recording of various kinds of data, before exploring the application of geological principles to interpret and infer aspects of earth history from the evidence visible in the exposure. In addition, the relationship between geology and landscape is a recurring feature. Clearly, whilst in an ex-aggregates site, the uses of, and issues surrounding, the extraction of bulk materials is a learning opportunity too good to miss, and, depending on the site, forms a useful part of the experience.

The most recent ESO-S bid has included provision for on-site in-service activities for teachers at RIGS sites included in the project. This is in recognition that, now there is a body of material available, it cannot be taken for granted that it will automatically be used, and that its adoption may need some support. Half-day sessions on-site allow science teachers to discuss issues around the ideas, and techniques that may best be employed in the field to meet pupil learning activities. In this regard we have been well supported by the ASE and others in publicising this facility.

Anyone interested in viewing examples of the material should go to the website (www.esos.ukrigs.org.uk) and use the Index for any one particular site to navigate quickly to the documents that are available.

ENGAGE in Research: A new interactive resource for undergraduates

Gillian A. Fraser, Anne C. Crook and Julian R. Park

CETL-AURS, School of Agriculture, Policy and Development, University of Reading,

Engage in Research

ENGAGE in Research (http://www.engageinresearch.ac.uk) is an interactive resource for undergraduate students to support them in their research, from first principles, through to publication. The website provides generic information on a range of topics relevant to undergraduate research and includes the following sections:

- Getting Started in Science: What is research; what is a research topic/question and how can I develop these; what are hypotheses?
- Reviewing Literature: What is a literature review; where can I find sources of information; how do I reference correctly?
- Planning your Investigation: Is my research experimental, observational or opinion-based?; important aspects of experimental design; essentials of data collection; how to effectively manage your time.
- Step by Step Statistics: Basic statistics (mean, probabilities etc.); testing for differences; testing for relationships; what analysis should I use?
- Writing Scientifically: What's expected of field reports, lab reports and final year projects?; how to write scientifically: how to use scientific language.
- Presenting Science: Where can I present my work? What should I include in an oral presentation? Dealing with questions from the audience. Creating poster presentations. How to survive a viva.
- Going Professional: Can I publish my research? Which journal should I submit my work to? Who decides if my paper gets published?

Interactive Elements

As well as providing detailed information, each section contains a series of worked examples, formative exercises with answers and 'quick quizzes' for students to work through at their own pace. We have developed these resources to be used by students as an aid to learning, but all materials can also be downloaded by staff to be used as in-class teaching resources.

In addition, undergraduate students and colleagues at the University of Reading have recorded a series of Podcasts, which are embedded within the website, and which offer advice and 'top tips' to students on a wide variety of research-related topics. These range from a member of staff discussing the reliability of information sources, to a final year student discussing how she chose the research question for her final year dissertation. We also plan to incorporate video footage of undergraduate students engaged in research activities as the website develops.

ENGAGE in Research also has a 'Quick Tips' section, which provides downloadable (pdf) sheets on topics such as referencing, oral presentations and writing laboratory reports.

Using ENGAGE in Research

ENGAGE in Research has been designed and developed as a resource to encourage active learning through the inclusion of interactive activities. It is envisaged that students will use the website for a variety of reasons, for example:

- If they have an interest in scientific research and wish to find out more about the research process
- If they need information about a specific topic: for example, they may have been asked to write a literature review on a topic and they want to know how to get started.

We anticipate that ENGAGE in Research will primarily be used by undergraduates as an 'external' resource, although we would welcome colleagues to consider embedding it as a resource within their own courses/modules, where appropriate. The interactive elements of the website can be downloaded and used as teaching resources.

Resources
Webbed-foot: Numeracy Skills

Many GEES students in the U.K. are having problems keeping up with their numeracy skills. The transition from school to University seems to be especially difficult and problematic for both, students and tutors who are teaching basic mathematics to undergraduates and cannot find the appropriate resources and support they need.

In the last couple of weeks, the GEES Subject Centre has collected some very useful on-line resources to provide support to you and your students, helping with numeracy skills and basic maths in the GEES disciplines.

It would be very interesting to know how individuals and departments deal with this challenging topic. If you would like to let us know your strategy or you would like to share your resources with the community, please email info@gees.ac.uk.

Mathcentre –
http://mathcentre.ac.uk/staff.php
Mathcentre is an on-line mathematics support centre which provides resources to help students make the transition from school-level to university-level mathematics. The web page contains different materials relevant to various subjects; e.g. bioscience, health etc. (Unfortunately a GEES resource section is not available yet.) There are also resources and useful links for those who teach or support students.

METRIC Maths –
http://metric.ma.imperial.ac.uk
METRIC Maths, hosted by Imperial College London, aims to give students the chance to improve their skills and knowledge in their own time, or as part of their course of study.
The Metric Maths site consists of about 200 on-line activities; ranging from tools for plotting and calculation to exercises and notes for support. The page looks very impressive but the maths involved seems sometimes to be too advanced for what GEES students would need.

Mathaid –
http://www.plymouth.ac.uk/mathaid
This is a very comprehensive site from the School of Mathematics and Statistics at the University of Plymouth. The site consist of different interactive web based support packages. Each package introduces a variety of mathematical ideas and their rules, and tests students' knowledge with a quiz in the end. Although it seems to be the most relevant page, the level might be too high for GEES students.

The Math You Need, When You Need It –
http://serc.carleton.edu/mathyouneed/

WAMAP is a web based mathematics assessment and course management platform which is aimed at students in introductory geosciences. The tutorials are part of a series of student-centred web-based quantitative topics to support and promote students' quantitative learning without using classroom time.
WAMAP contains 5 modules: Unit conversions, trigonometry, rearranging equations, density and the hypsometric curve. Its use is provided free to Washington State public educational institution students and instructors.

Interactivate –
http://www.shodor.org/interactivate/
Interactivate from Shodor is a more generic site with a varied mixture of different materials. It contains activities, quizzes, extracts from textbooks, and nice graphical illustrations of concepts. Although it seems that the web site is aimed at younger students, there are a couple of the items which are useful and worth trying out.

Interactive Mathematics and Geoscience Education (IMAGE) –
http://www.es.ucl.ac.uk/undergrad/geomaths/front.htm
IMAGE is a project developed in the Department of Geological Sciences at University College London and aims to develop essential skills applicable to geoscience education, primarily under the subdivisions of mathematics and fieldwork. The computer-aided learning package is made up of three sets of maths modules: the revision modules, the first-level modules and the second-level modules. The package is intended to run alongside lectures together with postgraduate-provided support in the computer lab. Developed in 1996-99, this site seems to be a bit old fashioned in style, the links are not always up-to-date, and the quizzes are not interactive. But this page is still worth checking as it is aimed at geoscience students.

Coming up in 2008:

GEES Subject Centre Activities	Details
Planet	Each year, we produce two issues of *Planet*: The Special Issue is released in **December/January**, a few months after the GEES Subject Centre Summer Residential Conference, and contains the papers for each of the conference sessions. The General Issue is released six months later in **June/July**, after a call for papers. *The copy deadline for the Special Issue is 31 March and for the General Issue is 30 September each year.*
Small Scale Learning & Teaching Project Funding 2008-2009	Call for bids for the GEES SC L&T Project Funding will be open from **17 March–2 June 2008**. Do you have a curriculum development idea or an interest in research on student learning in the disciplines? If so, then try bidding for up to £5000. More information available from 17 March at www.gees.ac.uk.
A New and Aspiring Lecturers' Resource Pack.	A New and Aspiring Lecturers' Resource Pack is now available. For more information on the pack please contact esther.bobek@plymouth.ac.uk.
New and Aspiring Lecturers' Workshop	For new academic staff and post graduate teaching staff, we will be holding our annual workshop in Birmingham from **12–13 May 2009**. For more information please email elaine.tilson@plymouth.ac.uk or visit www.gees.ac.uk.
20 Departmental workshops	As usual, we are running and facilitating 20 departmental workshops throughout the year. If you would like to apply for a workshop next year (08–09), please contact esther.bobek@plymouth.ac.uk.

External Events	Details
3rd International Geological Congress	**5–14 August 2008**, the four-yearly international conference of the International Union of Geological Sciences, IUGS, Oslo, Norway http://www.33igc.org/coco/
RGS-IBG Annual International Conference	**27–29 August 2008**, 'Geographies that Matter', London, UK http://www.rgs.org/WhatsOn/ConferencesAndSeminars/Annual+International+Conference/Annual+International+Conference+2008.htm
Global Hazards Study Tour	**2–17 Sep 2008**, 'Western USA', Pacific Northwest of the USA http://www2.derby.ac.uk/1_home/schools/fehs/schools/science/gees/geotours/

HERODOT Conference	**4–7 Sep 2008**, 'Future Prospects in Geography', Oslo, Norway http://www.herodot.net/conferences/liverpool/HERODOT-liverpool2008.html
ALT-C 15th International Conference of the Association for Learning Technology	**9–11 Sep 2008**, 'Rethinking the digital divide', Leeds, UK http://www.alt.ac.uk/altc2008/
All Our Futures Conference	**9–11 Sep 2008**, 'Education Waking to Threat, Hope and Possibility', Plymouth, UK http://csf.plymouth.ac.uk/?q=allourfutures
Earth Science Teachers' Association Annual Conference	**12–14 September 2008,** 'Global Issues', Liverpool, UK http://www.esta-uk.org/main.html

* Please note that some of these dates are an approximation. Up-to-date information can be found on our website www.gees.ac.uk and is also circulated when it is available on the GEES Subject Centre announcement list (to sign up please visit http://www.jiscmail.ac.uk/lists/gees.html).

The GEES Subject Centre runs 20 FREE Departmental Workshops each year

To date, the GEES Subject Centre has co-ordinated and funded about 200 workshops in GEES departments. This programme has been designed to support the GEES communities' learning, teaching and assessment needs.
Current workshop topics include:

- **Independent learning**
- **Fieldwork**
- **E-Learning**
- **Problem based learning**
- **Key skills**
- **Practicals and Laboratory Work**
- **Student Transition and Retention**
- **Learning Outcomes and Assessment**
- **Work-based learning**
- **Linking Teaching & Research**
- **Personal Development Planning (PDP)**
- **Employability**
- **Developing an Inclusive Curriculum**
- **Entrepreneurship and Enterprise**
- **Education for Sustainable Development (ESD)**

Please be aware that, historically, these workshops are quickly filled. If you would like more information about how a workshop could benefit your department or you would like to express your interest for a workshop in 2009, please contact esther.bobek@plymouth.ac.uk or visit www.gees.ac.uk.

Earth Science Fieldwork Guide

Fieldwork is an extremely useful tool for learning and teaching Earth science and is highly valued by students and employers.

The GEES Learning and Teaching Guide, 'Teaching Geoscience through Fieldwork', by Rob Butler, was released by the GEES Subject Centre in May 2008, and is intended to support those who are teaching fieldwork in the Earth sciences within Higher Education in the UK.

This significant publication offers practical strategies and advice on fieldwork, including: how fieldwork fits into the curriculum, assessment, the different types of fieldwork, and costs involved. It also focuses on preparation for fieldwork, field activities, locations, health and safety issues, the new British Standard 8848, and equal opportunities.

To access the electronic version of this Guide, please see http://gees.ac.uk/pubs/guides/eesguides.htm or to order a hard copy of this or any other GEES Subject Centre publication, please email info@gees.ac.uk.

Watch this space...the Environmental Science fieldwork guide is due for release late 2008!