



Geological Society of London Higher Education Network Annual Meeting 2016: Sharing Educational Practice in the Geosciences

Programme: Monday 11th January 2016

- 10:00 Arrival – Central Teaching Laboratories, University of Liverpool.
- 10:20 Welcome and introduction
Prof. Doug Muir (University of Liverpool)
- 10:30 **KEYNOTE:** Enhancing Fieldwork Learning with Mobile Technologies.
Derek France (University of Chester)
- 11:10 Introducing Digital Field Mapping and Model Building to large classes.
Rourke, P. J., Bladon, A. J., Muir R. J. (Midland Valley Exploration)
- 11:30 Coffee/Tea
- 12:00 Teaching Basic Geological Mapping Skills in a Virtual World
Jacqueline Houghton¹, Clare Gordon¹, Geoffrey Lloyd¹, Annabeth Robinson² and Daniel Morgan¹ (1University of Leeds, 2Leeds College of Art)
- 12:20 On-campus geological mapping and field skills training for large classes of Earth Science students.
Gordon Curry & Tim Dempster (University of Glasgow)
- 12:40 Using iPads, apps and instruments to manage large field data sets.
Joanna Bullard (Loughborough University)
- 13:00 Lunch (to include AGM and optional discussion group)
- 14:00 **KEYNOTE:** Interactive, equipment-based practicals for 200+ students – lessons learned.
John Boyle and Richard Chiverrell (University of Liverpool)
- 14:40 Using team work and peer assessment to improve learning in practicals.
Alan Boyle (University of Liverpool)
- 15:00 Coffee/Tea
- 15:30 An investigation into the pedagogic effectiveness of interdisciplinary project-based learning (PjBL) for stage one GEES students.
Alison Stokes & Nichola Harmer (Plymouth University)
- 15:50 More technology is not always the answer – the power of sticky notes.
Lorraine Craig, Gerard J. Gorman, Christian T. Jacobs (Imperial College)
- 16:10 Personalising your teaching (< lectures/2 and >contact x2): some ideas for coping with TEF.
Brian Whalley (University of Sheffield)
- 16:30 Plenary and thanks
- 17:00 Close

INTERACTIVE WORKSHOPS

Programme: Tuesday 12th January 2016 (*provisional – final schedule TBC*)

- 9:00 Arrival – Central Teaching Laboratories, University of Liverpool.
- 9:15 Geoscience educational e-gaming to provide stimulating & effective learning.
Pringle, J.K.¹ & Bracegirdle, L.²
¹School of Physical Sciences & Geography, Keele University
²School of Pharmacy, Keele University
- 10:00 Exploring Geological Map Outcrop Patterns in a Virtual World.
*Jacqueline Houghton¹, Clare Gordon¹, Annabeth Robinson², Geoffrey Lloyd¹ and
Tajja Torvela¹.*
¹ School of Earth and Environment, University of Leeds
² Leeds College of Art, Leeds, UK.
- 10:45 Coffee/Tea
- 11:15 Introducing Digital Field Mapping and Model Building to large classes.
Rourke, P. J., Bladon, A. J., Muir R. J.
Midland Valley Exploration
- 13:00 Lunch
- 13:45 Equipment-based practicals for 200+ students
John Boyle, Richard Chiverrell, Lis Rushworth and Simon Martin
University of Liverpool
- 15:30 Close

Talk Abstracts

Keynote: Enhancing Fieldwork Learning with Mobile Technologies.

Derek France

University of Chester

Fieldwork is signature pedagogy in Geography and with the rise of affordable and popular mobile and digital devices there is potential to enhance the student learning-experience during fieldwork. Even with large student numbers Smartphones or Tablets can be utilized to take photographs, video, browse the web, enter raw data or as a tool to aid reflection, through tweets and simulation exercises; the potential is endless. This presentation reports on research findings from the Higher Education Academy project on *Enhancing Fieldwork Learning*, which seeks to evaluate student perception and experiences of incorporating digital technologies into a range of fieldwork settings. The rise of customisable mobile apps for field data collection (e.g. FieldTripGB and EpiCollect) provides a unique opportunity to best-fit a mobile app to the needs of teaching or research activities. The application of social media to enhance student engagement and large group interactions on fieldwork is a potentially useful tool, not withstanding its drawbacks and limitations.

A number of fieldwork-based case studies are presented, from Spain, Italy and the UK. In each best practice example, the learning objectives, delivery, platform and student/staff learning experiences of engaging with social media, as well as any potential mitigation strategies, are considered. It is hoped this presentation will facilitate further audience discussions on effective best practice experiences of applying social media in a fieldwork context.

Introducing Digital Field Mapping and Model Building to large classes.

Rourke, P. J., Bladon, A. J., Muir R. J.

Midland Valley Exploration, 2 West Regent Street, Glasgow G2 1RW

Geologists from Midland Valley recently arranged a 'Digital Mapping and Model Building' short course at the Geological Society of America Annual Conference in Baltimore, MA, USA. Through innovative use of 'cardboard rocks' a small patch of land close to the convention centre was utilised to allow attendees to digitally map a geological structure, analyse orientation data in the field and export their data in a variety of formats using Midland Valley's FieldMove Clino and FieldMove smartphone and tablet apps (<http://www.mve.com/digital-mapping>).



Advanced preparation was important, with each of the attendees having to preload a simple project that included a base map and simple stratigraphy. Data collected by the participants was then loaded into Midland Valley's Move software (provided free to universities through the Academic Software Initiative) and some simple cross-sections and 3D models were generated to illustrate the structure represented by the cardboard rocks. Teachers of field mapping felt that by introducing the students to digital mapping in a controlled environment, time spent at the real field location would be much more effective.

Teaching Basic Geological Mapping Skills in a Virtual World

Jacqueline Houghton¹, Clare Gordon¹, Geoffrey Lloyd¹, Annabeth Robinson² and Daniel Morgan¹.

¹ School of Earth and Environment, University of Leeds, Leeds, UK.

² Leeds College of Art, Leeds, UK.

We have created a Geological Mapping and Field Skills virtual world, using the Unity game engine, where students explore the three-dimensional landscape, with its rock outcrops, to learn to collect, plot and interpret geological data on to a paper copy map to make their own geological map. This is not a replacement for fieldwork, but a virtual space between classroom and field in which to train and reinforcement essential skills.

We presented an early version of this at the HEN meeting last year. We have now been using the virtual world in large class teaching as well as an alternative assessment for a student unable to attend field classes due to mobility issues. The project has received very positive feedback from staff and students. Our results show students make the same mistakes they make when learning in the field, verifying the realistic nature of the virtual world experience, and providing the opportunity to learn from these mistakes. It saves time in the field as skills are already embedded and increases student confidence in their abilities.

The link to the game is www.see.leeds.ac.uk/virtual_worlds/demo/



On-campus geological mapping and field skills training for large classes of Earth Science students.

Gordon Curry & Tim Dempster

School of Geographical & Earth Sciences, University of Glasgow, Glasgow, G12 8QQ

Geological mapping and field skills training has been transformed in recent years for increasingly large Earth Science classes at the University of Glasgow. A series of large precisely-orientated blocks of rock donated by industrial partners (“Rock Around the University (RAU)”) have been placed in carefully chosen locations around the campus to allow outdoor field skills training and geological mapping exercises to take place within two-hour laboratory sessions throughout the year. Using these exposures, pre-honours students not only receive outdoor training in basic field skills, such as field sketching, measurements, notebook entries, and geological mapping, but are also provided with the opportunity to test their equipment and outdoor clothing throughout the year, and to become familiar with good practice and safety procedures in a realistic but controlled environment. Through careful rock selection, we are able to eliminate ambiguities and uncertainties that are present in natural rock exposures, and hence ensure that students focus on the critical features. In addition the RAU resource has been designed for a range of expertise, from simple map construction to more complex polyphase deformation, so can be used throughout the degree programme. RAU has proved to be extremely popular with students, as they are able to reinforce their skills in their own time and at their own convenience. Preparing a geological map, a cross-section, and a geological history of the RAU outcrops represents a major practical assessment for the Level 2 Earth Science course, and introduces them to the application of structure contours in tracing geological boundaries. In effect the fundamental field skills are now taught much more progressively, and we believe much more effectively, throughout the semester in advance of residential field courses (which in consequence are much more focused on the application, rather than the development, of core geological field skills). Overall the standard of field skills in pre-honours students has improved considerably as a direct result of RAU.

Using iPads, apps and instruments to manage large field data sets

Joanna Bullard

Department of Geography, Loughborough University, UK.

This paper outlines how iPads are used with large groups for field data collection and management during a first year UK Geography field course on which 150-180 students undertake a project to study microclimate in the Peak District. Fieldtrip GB is a mobile mapping and data collection app developed by EDINA. We use Fieldtrip GB on iPads to design custom data collection forms for use in the field. Different types of data are recorded on a single form (e.g. text entry, photographs) and all records are time stamped and geo-located. The individual records are uploaded via wifi, and are managed using the Fieldtrip GB web-based Authoring Tool before being output in spreadsheet format. In addition to recording data on the iPads, they are also used to measure variables using instruments that plug in to the headphone socket such as the Vaavud Mjolnir Wind Meter. These measurements are entered on to the custom forms. Fieldtrip GP enables more rapid assimilation of records and quality control compared with paper record sheets. The custom form can be used to ensure students collect data using certain protocols which streamlines data management and reduces the likelihood of data entry errors. A key benefit therefore is the rapid creation of a single, large spreadsheet containing quality controlled field data that can be rapidly disseminated to students for subsequent analysis.

Keynote: Interactive, equipment-based practicals for 200+ students – lessons learned.

John Boyle and Richard Chiverrell

School of Environmental Sciences, University of Liverpool

Over the last 3 years we have been teaching 1st year physical geography practical exercises to classes of 180-220 students, and have been developing approaches to optimize the student experience, to maximize the use of specialized equipment, and use staff time efficiently and effectively. Essential elements of our approach include: all-day low intensity project work; working in groups (group membership no greater than 6); and assessment via electronic poster and discussion. The benefits include: a sound quantitative introduction to a number of important academic fields; training in critical measurement; greatly enhanced competency in data handling and basic statistical methods; high student satisfaction. Challenges that we are continuing to work with arise primarily from group working: management of disagreements on workloads, and how best to engage the unwilling.

Using team work and peer assessment to improve learning in practicals

Alan Boyle

Earth, Ocean & Ecological Sciences, University of Liverpool, Liverpool L69 3GP, U.K.

Many years ago, I took over an existing second year metamorphic petrology module comprising 12 lectures and 6 three hour practical sessions. In the practicals, each of the ~40 students had to complete a synthetic 'map and sample' based problem by the end of the six weeks. Because they were all working individually on the same material and problem, I had to stop them from talking to each other. After a few years of doing this, and marking a large number of very similar project reports with little time to feedback to the students, I changed.

I split the class into teams of 5 students, so that I had ~8 teams working on the project. I redesigned the project so that parts of it could be split up and allocated within teams (data collection), but parts required them to get together on a regular basis to check things were consistent (synthesis/evaluation). I wanted them to talk to each other within teams (affective domain), but encouraged the teams to be independent. The practical sessions became much more manageable. I could talk to teams about their progress, and it was easier to get around 8 teams rather than 40 individuals. The teams were naturally protective of their own intellectual copyright, so I didn't have to be a policeman; I could be a friend. The atmosphere changed from a closed one to a more open collaborative one and everybody became more engaged. The standard of work also improved, with reports being more thorough, partly because the teams had more collective time. I spent much less time marking, and so could afford more time to discuss the assessment outcomes of the project reports with each team in a post-submission 'viva' meeting, where they could talk their team mark up or down.

However, getting students to peer assess and agree on individual marks seemed to be an insurmountable problem. Three years ago, I discovered that an engineering colleague had persuaded my university to set up WebPA, an online peer assessment tool developed through JISC funding. In my experience over three years WebPA use in two modules, it works. It can use apparently disarming questions that students are happy to answer and WebPA then produces individual marks that correlate well with other performance indicators, like terminal exams and my attendance register. The class has grown to 80 this session, and I have sufficient confidence in student peer-assessment mediated by WebPA to discriminate learning outcomes that I have dropped the formal written examination. This module will now be assessed entirely from team work with peer moderation.

An investigation into the pedagogic effectiveness of interdisciplinary project-based learning (PjBL) for stage one GEES students

Alison Stokes and Nichola Harmer

School of Geography, Earth and Environmental Sciences, Plymouth University

In September 2015 Plymouth University introduced an 'enriched' curriculum with an increased focus on delivering academic content through active methods of teaching and learning. A key feature of this is the stage one 'Plymouth Plus' module, which involves both students and academic staff working in interdisciplinary teams to undertake project-based group activities.

To prepare for the delivery of the new project-based learning (PjBL) modules in the GEES (geography, earth and environmental science) disciplines, a series of trial activities was developed to investigate the effectiveness of interdisciplinary, group-based projects as a teaching and learning strategy at stage one. The first stage of the project involved a collaborative student-staff workshop aimed at identifying the key benefits and challenges of interdisciplinary project-based learning. The outcomes from this workshop were then applied to designing a project-based activity in which sixteen students from across the GEES disciplines participated voluntarily over three successive trials. Each trial ran over a three-week period with an interdisciplinary team of 5-6 students, starting with a staff-led introduction and ending with a student-led session in which they informally presented the outcomes from their project.

Qualitative and quantitative research data into the student and staff experiences of participating in the trials were collected using a combination of surveys, pre and post-trial interviews, and transcripts from group discussions. We report on the key findings from this research, and the implications for the design and delivery of interdisciplinary, project-based group work at the stage one level.

More technology is not always the answer – the power of sticky notes.

Lorraine Craig, Gerard J. Gorman and Christian T. Jacobs

Imperial College

Over the last 5 years we have developed an introductory-level programming course for first year geoscience undergraduates. This course is taught in a computer lab to a class of 80-90 students, using a blended learning methodology – mixing short lectures with in-class exercises to develop the students' understanding.

One of the most powerful tools we found for improving the course and boosting student engagement was the simple, but versatile, sticky note. We get students to post a green sticky on top of their computer's monitor when they complete a particular exercise – thereby giving a clear visual indicator of progress. Red sticky notes are posted by the student if they require assistance. This visual cue alerts the lecturer, allowing students to continue their work without needing to keep their hand raised until the lecturer is free. At the end of every lecture, students are encouraged to write anonymously at least one positive and negative comment on the green and red notes, respectively, and hand them in. This allowed us to quickly identify what works and address any problems arising. The quality of feedback, and the pass rate, has significantly increased since we started this technique.

Personalising your teaching (< lectures/2 and >contact x2): some ideas for coping with TEF.

Brian Whalley

University of Sheffield

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We want our students to do well and to become educated geoscientists, whatever our specialism. That is, thinking like a (geo)scientist in general. Yet, despite MOOCs and TEL and even flipped classrooms, we still operate in a Victorian educational system. We pile students into lecture theatres, talk to 'em long and examine 'em quick. Student participation (and contact hours) come incidentally in labs (with demonstrators) and fieldwork – but still probably with large classes. Rushing to teach all of the, ever-expanding, curriculum is assumed to promote better earth scientists. This instructivist educational philosophy still holds sway especially with large classes. However, we can all use some modern educational ideas to increase student participation and encourage active learning in the classroom by personalizing the situation. This, essentially connectivist, talk will start to explore practical ways to enhance student education. We shall touch on Brookfield's ideas on 'discussion' and Mazur's 'peer learning' with a touch of Novak's 'Just-in-Time teaching' ideas and the use of smart technology (what's yours?) in the light of Karl Popper's 'All life is problem solving'. The course texts (but do we need them?) are Nancy Kober's 'Reaching students' (2015) and Kastens and Manduca's 'Earth and Mind II' (2012).

Workshop Abstracts

Geoscience educational e-gaming to provide stimulating & effective learning

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Most current HE students will have grown up with computer and e-gaming technologies and may respond positively to education gaming as stimulating and effective learning tools. This interactive workshop will allow participants to individually use and evaluate two geoscience e-games that have been specifically developed for geoscience students and funded by the HEA. The egames are available to use on various commercial hardware, including on internet-connected computers, iPhone, iPad and Android mobile devices. Pilot study results of Keele University science undergraduates have evidenced this technology usefulness for large class sizes, student engagement, usability and usefulness as well as their potential for virtual employability skills.

Exploring Geological Map Outcrop Patterns in a Virtual World

Jacqueline Houghton¹, Clare Gordon¹, Annabeth Robinson², Geoffrey Lloyd¹ and Taija Torvela¹.

¹ School of Earth and Environment, University of Leeds, Leeds, UK.

² Leeds College of Art, Leeds, UK.

A geological map expresses the three-dimensional relationship between geology and topography in a two-dimensional form; to understand and interpret the outcrop patterns on a geological map it is necessary to be able to visualize the two-dimensional map in three-dimensions. However, three-dimensional visualisation and three-dimensional / two-dimensional relationships are concepts many students struggle with. Traditionally, these outcrop patterns have been taught using block diagrams, however, we have created a series of video game-style worlds, using the Unity game engine, with geological maps draped over a virtual landscape. In these worlds, students can walk and fly round the maps to understand the three-dimensional interaction of the geology with the topography and to compare with the two dimensional map. The topographic map has its own world, allowing three-dimensional observation of topography and landscape.

The virtual approach offers immersive and realistic appreciation of three-dimensional landscapes and relationships to geology, benefitting learning experience and outcomes of actual field training as more students pass the threshold into three-dimensional thinking. The workshop demonstration is an opportunity for people to explore these worlds. The link to the game is www.see.leeds.ac.uk/virtual_worlds/minimaps/

