The 3rd eSTEeM Annual Conference 2014

STEM Futures: Reflecting on Teaching and Learning

Conference Booklet

6th May 2014

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Dr Keith Williams, Director eSTEeM, Faculty of Mathematics, Computing and Technology

eSTEeM Project Leaders and Team Members

The Open University Audio Visual staff and Events and Catering staff

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PROGRAMME

Time	Session		Venue
8:45 – 9:25	**Registration and Coffee**		**Bay Reception / Medlar and Juniper**
9:25 – 9:30	**Welcome and Introduction** Nick Braithwaite and Keith Williams, eSTEeM Co-Directors		**Hub Lecture Theatre**
9:30 – 9:45	**Opening Address** Belinda Tynan, Pro-Vice Chancellor (Learning and Teaching) **Are we fit for purpose for designing the learning and teaching experience of the future?**		**Hub Lecture Theatre**
9:45 – 10:15	**Keynote Presentations** Martin Weller, Professor of Educational Technology (IET) **Learning Design - innovation & the institution.** Viki Burnage, Head of Curriculum Management (Science) and Maria Kantirou, Senior Manager (e-learning), (MCT) **Learning Design in Practice: What do you get out of it?**		**Hub Lecture Theatre**
10:15 – 10:30	**Coffee-to-go**		**Medlar and Juniper**
10:30 – 11:30	**Parallel Session - Short Oral Presentations**		
Parallel Session A **Chair: Maggie King**	Jon Rosewell	Practical activities in robotics: hands-on or simulator?	**CMR 15**
	Lee Page	Online Experimentation: Innovative Technologies to support Practical Investigations in Schools.	
	Elaine Thomas, Sarah Davies and Steve Walker	Hybrid/Digital Networked Learning scruffy mongrel or sleek new breed? Practices and implications of blending physical and digital resources for learning in HE – progress to date.	
Parallel Session B **Chair: Jane Roberts**	Emma Rothero	Flight of the Fritillary; an update.	**CMR 11**
	Nigel Mason, Rachel Ferris, Clem Herman and Rosaria Gracia	e-Ambassadors: Exploring innovative methods to embed employability in practice based STEM distance learning.	
	Martin Reynolds	Building a community of practice and employer engagement to enhance Systems Thinking in Practice.	
	Parallel Session – Workshop/Demonstration		
Parallel Session C	Tom Argles, Shailey Minocha and Brian Richardson	3D virtual geology field trip: Exploring its potential and limitations through a hands-on session	**Cedar Training Room, Wilson C Block**
11:45 – 12:30	**Poster Presentations**		**Hub Lecture Theatre**
12:30 – 13:15	**Lunch** Delegates are invited to continue browsing posters and speaking to presenters over lunch		**Medlar and Juniper**
13:15 –	**Parallel Session – Workshop/Demonstration**		

14:15			
Parallel Session D	Helen Donelan, Clem Herman and Ann Grand	How STEM academics are using social media: a game of snakes and ladders	**CMR 1**
	Parallel Session – Structured Discussion/Briefing		
Parallel Session E	Ruth Williams, Eleanor Crabb and Simon Collinson	Challenges of embedding (retrofitting!) PDP and Employability skills into an UG qualification	**CMR 11**
	Parallel Session – Workshop/Demonstration		
Parallel Session F	Nick Braithwaite, Iain Gilmour, Jonathan Silvertown, Emma Rothero, Ulrich Kolb and Eloy Villasclaras-Fernandez	Science and the citizen.	**CMR 15**
14:15 – 14:30	**Afternoon tea-to-go**		**CMRs 1, 11 and 15**
14:30 – 15:30	**Parallel Session – Short Oral Presentations**		
Parallel Session G **Chair: Tom Argles**	Victoria Nicholas, David Robinson and Steve Swithenby	Student perception of online practical science	**CMR 15**
	Janet Haresnape	Student perceptions of an assessed online collaborative activity on S366 (Evolution)	
	John Woodthorpe, Jim Donohue and Sarah Mukherjee	How students' use of language relates to learning, retention, and performance in assessment on TU100	
Parallel Session H **Chair: Keith Williams**	Chris Douce	What are the views of our e-business tutors? A focus group to inform tutor-centred pedagogic research	**CMR 11**
	Jeff Johnson, Paul Bourgine, Jorge Louçã Cristian Jimenez-Romero, David Rodrigues and Jane Bromley	The UNESCO UniTwin Digital Campus for Complex Systems: a global experiment in high-quality no-cost education	
	Helen Jefferis, Chris Dobbyn and Frances Chetwynd	iCMAs: Who needs them?	
15:45 – 16:15	**Closing Keynote Presentations** David Brannan, Emeritus Professor (MCT) **The Khan Academy: how it works for students and tutors.** Mike Sharples, Chair in Educational Technology (IET) **FutureLearn: massive open social learning.**		**Hub Lecture Theatre**
16:15	**Close**		

WELCOME AND INTRODUCTION

Welcome to the 3nd eSTEeM Annual Conference

The Faculties of Science and MCT (Mathematics, Computing and Technology) launched eSTEeM in December 2010 to bring together STEM academics to promote future innovation, scholarship and enterprise in open and distance learning. Since our first conference the Open University has reconfigured its undergraduate programmes in response to changes to student funding and we face the challenge of transforming our student support systems and enhancing student experience. Externally MOOCs have entered the spotlight as a potentially transformational innovation in higher education. The effective use of learning technologies at scale is at the centre of much of eSTEeM's activity; our portfolio of projects includes work on e-assessment and feedback, mobile learning, teaching practical science and engineering online, integrated with the use of virtual learning environments.

We welcome partnerships and are already working with universities and other agencies both within and outside the UK to help develop a distinctive and influential STEM agenda. We are joined today by representatives from a few such partnerships.

The aim of this conference is to highlight recent developments in eSTEeM and to reflect on the future of STEM-specific teaching and learning. The keynote lectures that punctuate the day are about the challenges and opportunities of designing formal OU learning together with reflections on the less formal, educational resources offered by FutureLearn and the Khan Academy. Workshops, discussions round posters and breaks for refreshment provide plenty of chances for joining the STEM scholarship debate and we look forward to your contributions.

We welcome you to our third conference and hope you have an informative, stimulating and enjoyable day.

Nick Braithwaite (pictured top) and Keith Williams (pictured bottom)
eSTEeM Co-Directors

OPENING ADDRESS SPEAKER BIOGRAPHY

Belinda Tynan holds the role of PVC Learning and Teaching at the Open University. Professor Tynan leads the sub-units of Learning and Teaching, the Open Media Unit, Learning and Teaching Solutions and the University Library which provide leadership and support for the University strategic objectives for the creation of exciting and innovative learning experiences. Her research interests are concentrated in the field of distance education and sub-topics of academic workload, student voices and academic professional development. She has more than twenty years of experience in the education sector in Australia, New Zealand, Singapore and the UK.

OPENING KEYNOTE SPEAKER BIOGRAPHIES

Martin Weller is Professor of Educational Technology at the OU. He chaired the OU's first major elearning course in 1999 with 12,000 students. He has been director of the VLE and SocialLearn projects, and was part of the team that acquired the funding for OpenLearn. He is currently the lead on the OER Research Hub project and Academic Director of the Learning Design project. His research interests are digital scholarship, open education, MOOCs and learning design. He blogs at edtechie.net

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Viki Burnage is joint Head of Curriculum Management in Science and also has a role as the Faculty e-Learning and Production Manager. As such she is involved in the planning and development of the curriculum and engages directly with production module teams in all aspects of learning design. She is currently developing processes in Science that incorporate costing and design models, learning design and student workload so that module teams have parameters to work to from investment case through to presentation. Viki has worked as a curriculum manager in Science for more years than she cares to count and previously as a lecturer in further education.

Maria Kantirou is Senior Manager - eLearning in the Faculty of Mathematics, Computing and Technology at the OU and is currently supporting module teams in the use of the Learning Design approach and tools. She started at the OU as a curriculum manager and then worked as a project manager in the Centre for Outcomes-Based Education. Before she joined the OU, she worked for private publishing companies for a number of years where she project managed the development of educational resources.

CLOSING KEYNOTE SPEAKER BIOGRAPHIES

David Brannan obtained a BSc in Mathematics and Natural Philosophy from Glasgow University and a PhD in Complex Analysis from Imperial College. He then worked at University of Maryland, College Park (1 year), Glasgow University (2 years) and London University (8 years) before joining the OU as Professor of Mathematics in January 1979. He was an OU Tutor in 1973-78 and has been an External Examiner at around a dozen universities.

David served as Head of Pure Mathematics for many years, before becoming the University's second longest serving Dean (of the Maths & Computing Faculty, 1996-2006). He has written two popular undergraduate books, on Mathematical Analysis and Geometry (now in its 2nd edition).

Externally, he served as Council and General Secretary (10 years) and then as Publications Secretary (10 years) of the London Mathematical Society, and later as Secretary of the European Mathematical Society (4 years).

Mike Sharples is Professor of Educational Technology in IET. He also has a post as Academic Lead for the FutureLearn company. His research involves human-centred design of new technologies and environments for learning. He inaugurated the mLearn conference series and was Founding President of the International Association for Mobile Learning. He is Associate Editor in Chief of IEEE Transactions on Learning Technologies. His projects include the nQuire: Young Citizen Inquiry, funded by Nominet Trust, to engage young people in online science investigations, the JUXTALEARN project on science. learning through creative media, and OpenScience Laboratory to offer practical science online. He is lead author of the Innovating Pedagogy series of reports and author of over 300 papers in the areas of educational technology, science education, human-centred design of personal technologies, artificial intelligence and cognitive science

CONFERENCE INFORMATION

Registration
Conference registration will take place between 8:45 – 9:25 on Tuesday 6th May in the Bay Reception. There is a map of the campus on the back cover of this booklet; the conference venue can be located at numbers 05 and 06.

At registration you will receive a personalised programme reminding you of the sessions you have registered for.

Helpdesk
A helpdesk will be manned by eSTEeM conference staff in the Bay Reception throughout the day to help you with any queries that you may have.

Conference sessions and recordings
The opening and closing keynote presentations will be recorded and made available as replays soon after the conference via the eSTEeM website.

Some of the sessions may be attended by a journalist or photographer; however this should not cause any disturbance. The video footage and photographs may be made available to the public via the internet. Audience members are participants in this process. If you have any concerns please speak to a member of the eSTEeM conference team.

Session etiquette and electronic equipment
We respectfully ask that all delegates use any personal electronic equipment with respect for session presenters and fellow delegates. We suggest using mobile phones and electronic equipment in silent mode.

Posters and demonstrations
There will be a poster presentation session before lunch between 11:45 – 12:30 in the Hub Lecture Theatre. Posters will continue to be displayed throughout the lunch break and the conference.

Session changes
We will try to keep session changes to a minimum but inevitably there may be some last minute changes or cancellations. Any information about changed or cancelled sessions will be posted on the notice board by the helpdesk.

Conference refreshments
Conference registration includes tea and coffee on arrival, morning and afternoon tea, and lunch.

GENERAL INFORMATION

Parking and transport
Due to the volume of staff on campus parking spaces can be limited. Therefore, we recommend using the South West, Church or East Parking overspill car parks. Any vehicle clearly parked in an unauthorised location will be issued with a parking charge notice by campus security.

Security
For security purposes, please ensure you wear your conference badge while on campus. If you have any emergency security issues please ring ext 53666 for the security lodge, or contact a member of the eSTEeM conference staff. Please do not leave personal items unattended. The University will not accept liability for loss or damage to personal items or equipment.

Disabled access and elevators
All venues at the Open University have disabled access. Please see a member of eSTEeM conference staff if you require assistance. Please contact us immediately if you have any mobility requirements of which you have not made us aware.

No Smoking Policy
The Open University operates a non-smoking policy. We ask you to respect this policy whilst on campus. All premises are designated smoke-free. Smoking is not allowed in any part of, or entrances to, any building, including bars and eating areas. Smoking whilst on site is only allowed outdoors in designated green areas.

Other queries
eSTEeM conference staff will be glad to help you with any other queries you may have.

Feedback
We welcome your feedback. If you have any issues or concerns, please contact a member of the eSTEeM conference staff.

BOOK OF ABSTRACTS

Opening Address

Are we fit for purpose for designing the learning and teaching experience of the future?

Belinda Tynan
Pro-Vice Chancellor (Learning and Teaching)

The big global trends of 2050 provide a challenge for all in an increasingly globalised culture. Five key areas have been identified by the Oxford Martin Commission (2013) which provides insight into what may be facing us in the areas of Health, Technology, Demographics, Geo politics, Mobility and Sustainability. Recently, the Higher Education Academy suggested six 'new pedagogical ideas' for the future of an increasingly flexible HE that could be the way forward. With this in mind I pose a challenge to colleagues to consider whether these are suitable responses and whether we are moving quickly enough to disrupt our own thinking about learning and teaching.

Keynote Presentations

Learning Design - innovation and the institution.

Martin Weller
Professor of Educational Technology (IET)

An overview of the learning design approach, and the approach to encourage innovation while using a universal approach across the University

Learning Design in Practice: what do you get out of it?

Viki Burnage[1] and Maria Kantirou[2]
Head of Curriculum Management (Science)[1] and Senior Manager (e-learning), Faculty of Mathematics, Computing and Technology[2]

In order for Learning Design to become an integral part of the planning and development of modules (and qualifications), module teams have to see the benefit of engagement during a period when time and resources are limited. This presentation will focus on the implementation of Learning Design within the Faculties of Science and MCT, how we have tailored the tools for our use, related the Learning Design output to the student workload calculator and how the output can inform the activity of the production team.

Parallel Session A – Short Oral Presentations

(25) Practical activities in robotics: hands-on or simulator?

Jon Rosewell
Faculty of Mathematics, Computing and Technology

The module *Robotics and the meaning of life: a practical guide to things that think* (T184) was an introductory course on robotics which ran from 2003-2011 and continues to run in an updated form. This is taught online but contains a strong practical element.
Practical activities in the initial plans for the course were designed around the Lego Mindstorms RCX robotics kit. Students would build and program an autonomous wheeled robot able to carry out a range of tasks of increasing complexity. A new programming environment, OU RobotLab, was developed at the Open University to support the needs of adult learners with no previous experience of programming and to make extended use of the capabilities of the Mindstorms kits.
However, it was not practical for the OU to provide LEGO kits for student use at scale in this module. Instead, RobotLab was extended to include a simulation of the robot. Students were thus offered the choice of carrying out practical activities either as simulation or using real hardware, provided they had access to a suitable kit.
Students were surveyed at the start and end of each presentation of the course to look at the attitudes and experiences of students to these different approaches to practical work. This gives us an opportunity to ask: can students learn practical skills at the computer or is it necessary to have hands-on practical experience?

(22) Online Experimentation: Innovative Technologies to support Practical Investigations in Schools.

Lee Page
Education Executive – Schools and Colleges, Royal Society of Chemistry

Many of the key Royal Society of Chemistry (RSC) strategic priorities can be achieved from a fully functioning Online Experimentation website:

- Improving the practical skills of students in schools.
- Disseminating chemical knowledge and fundamental chemical concepts.
- Encouraging the growth and engagement in the chemical sciences.

The site should feel like a community of chemistry enthusiasts and represent the best of practical chemistry education. Practical work demonstrates the wonder of science so much more effectively than words on the page of a text book. But there is a place for virtual experiments which can target difficult curricula areas and misconceptions 24/7. We need to ensure that all pupils are

exposed to exciting practical work and improve their understanding of key chemical concepts.

The key aspects required for the RSC's online experimentation project are:

- An updated and audited **Practical Chemistry** resource collection.
- **Collaborative Chemistry**: encouraging students to perform engaging chemistry experiments and to collect and post their data to offer new insights.
- **Interactive Screen Experiments** supporting practical investigations but supplying pre- and post- laboratory activities to quiz the student on the aims, methods, choices and results of the experiment.
- **Access Equipment:** where possible we will provide opportunities to learn about spectroscopy through hands-on experience.

The core offering will be aimed at secondary school and FE college students impacting the vast majority studying chemistry, not just the 5% who will go to university. It is clear that aiding the schools to university transition will be a natural added benefit.

This presentation will mainly showcase and prelaunch the RSCs first interactive screen experiment, the synthesis of Aspirin. We will discuss how we have used technology to meet the needs of the student and reveal much of the research and understanding we have gained from secondary school teachers in order to develop this product.

(17) Hybrid / Digital Networked Learning: scruffy mongrel or sleek new breed? Practices and implications of blending physical and digital resources for learning in HE – progress to date.

Elaine Thomas[1], Sarah Davies[2] and Steve Walker[1]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2]

The project is exploring how technological change and the blurring of boundaries between the digital and material worlds may hold the potential for radical innovation in STEM education. We are using the word 'hybrid' in the context of networked material artefacts and digital objects combined in ways that provide valuable learning experiences for students. These include resources which may be linked together over distance or be accessed remotely by students, such as remote laboratories and the use of sensors to collect and share data. These 'hybrid' networked learning resources go far beyond the purely digital, i.e. online learning materials and forums. There is substantial literature about how students learn in laboratories or in fieldwork and there is a growing body of literature about how students learn online. Knowledge about hybrid digital material networked learning lies at the nexus between theories about technology and society, theories about how people learn STEM subjects and theories about how people learn using networked learning technologies. This project is attempting to investigate this new emerging field using ideas derived from a critical realist view on sociomateriality.

Empirical work carried out to date entails a systematic review of literature to discover 'what is out there' in terms of reports of digital material networked learning already written up. As part of the systematic review we conducted searches of databases in the Open University's online library using combinations of search terms derived from a range of sources (including crowdsourcing at the 2nd eSTEeM conference). We devised three sets of search terms to encompass the materiality, the networked aspect and the learning components of the hybrid, and combinations of search terms from the three sets were used in the database searches. Results of each combination of search terms were recorded in a database and the papers produced were imported into Mendeley reference management software. Early results indicate that this approach has yielded useful data for the study. The next stage of the review entailed coding papers using the tagging facility in Mendeley.

Currently, the tagging process and selection criteria are being used to identify papers for more in depth study. Our early findings suggest that remote laboratories are the most common form of hybrid, although there are examples of technologies such as robotics, sensors and augmented reality being used as learning resources. Also, most of the literature found in our study is concerned with remote labs being used in Engineering, some 81.1% of papers, with relatively few reports on their use in Science, 5.4% for Biological and Physical Sciences combined. Some literature suggests that, depending on course design and content, remote laboratories may provide opportunities for new patterns of individual interaction with apparatus. This promotes an individual, constructivist form of learning, but there are also new opportunities for co-ordination and communication amongst students.

Parallel Session B – Short Oral Presentations

(13) Flight of the Fritillary; an update.

Emma Rothero
Faculty of Science

Background
Open University scientists have been organising volunteers to count snakeshead fritillaries on North Meadow National Nature Reserve (Wilts) since 1999. Patterns are emerging relating population changes to hydrology. Fritillaries are a rare species in Britain and are symbolic of a scarce floodplain-meadow plant community found on less than 1500 ha in the UK. Our data shows that on North Meadow snakeshead fritillaries display a dynamic ecology, seemingly responding to changes in hydrology. This member of the lily family relies on seeds for reproduction and their main pollinators are thought to be early season bumblebees.
Little is known about which species of bumblebee are important to fritillaries and whether the decline of bumblebee populations will prove a problem for them.

Project Objectives

- Increase the numbers of volunteers at North Meadow through wider advertising improved engagement and better feedback of results.
- Look at the other sites where fritillaries are currently counted and work with site managers and volunteers on at least two of those sites to encourage data collection in a standard way as well as assisting volunteers to compile and share their existing data.
- Provide information on the specific pollinators of fritillaries to volunteers, thereby encouraging them to collect information on which species are involved and to understand their behaviour better.
- Analyse the data collected and feedback findings to volunteers through feedback sessions, website and leaflets, thereby increasing levels of engagement.
- Assess the impact of our engagement with volunteers to understand which elements are the most important in getting and keeping volunteers.

Progress to date:

This talk will provide an update on the project after 3 years' worth of survey work and volunteer engagement and will cover:

- 3 different volunteer snakeshead fritillary counting groups and 3 new bumblebee survey groups; how did we encourage them to take part and have they stayed?
- The scientific data collected; how viable is it and at what level do the volunteers engage?
- Challenges in organising the count groups and feedback
- Spin offs from the initial project

Points for discussion:

- How do we assess the impact of public engagement in a meaningful way without being overly invasive and putting people off?
- How do we know how much the volunteers have learnt?
- How much impact assessment is too much?
- How much resource do we put in?

(16) e-Ambassadors: Exploring innovative methods to embed employability in practice based STEM distance learning.

Nigel Mason[1], Rachel Ferris[1], Clem Herman[2] and Rosaria Gracia[2]
Faculty of Science[1], Faculty of Mathematics, Computing and Technology[2]

This project aimed to investigate the use of online technologies for the delivery of employability support to distance learning STEM students. In common with other universities, the OU STEM modules are being encouraged to embed employability into the curriculum and student learning experience – online technologies present an opportunity for new forms of engagement with employers and industry experts such as webinars and forums. However so far

little is known about the efficacy of these approaches, and in particular for STEM subjects.
The study used a 'mixed methods' approach, and was conducted as a partnership between two Open University (OU) Faculties (Maths, Computing and Technology and Science), the OU Careers Advisory Service, and STEMNET.

The study commenced with an *online forum* with visiting experts from IT and Science industries, recruited by STEMNET as STEM Ambassadors, who volunteered to answer career related questions from students. Individual *telephone interviews* with student volunteers followed and explored and provided information on their career history, objectives and motives for study as well as the use and value of the forum experience. To deepen and add value to the earlier findings, a small self-selected *focus group* was brought together using the on-line conferencing system, Elluminate. This method provided an opportunity for interaction with the group and to address in more detail the themes that had emerged during analysis of the forum and telephone interviews.

Qualitative research methods were applied using 'open style' questions for both the telephone and focus group research and the forum data categorised by discipline, gender, date and topic. Themes emerging were analysed using a manual qualitative comparative analysis type of classification (those most common and least common). The analysis revealed some common topics of concern grouped under the following emerging themes: *career and progression* (employability profiles, responses to the forum, other sources of advice and support, being an OU student and articulating the value of the OU degree, age barriers to employment, embedding employability in module design, curriculum vitae and references); *skills*, in particular practical science and demonstrating achievements to employers and *tools to support employability*.

The analysis of the data also highlighted specific recommendations classified into three different areas. These are *specific OU issues*, such as establishing structured networks, forums and seminars to help students with career progression; more *general issues*, such as providing students with timely information on career issues and CV exemplars, and connected to *employability* and *professional networks*, the importance of the relationship between the OU and prospective employers, such as the inclusion of module teams in responding to employability concerns, and the provision of specific tools such as webinars, to support students' employability.

The project outcomes strongly suggest that there is an ongoing need for embedding such activities in the future, in order to enable STEM students to enhance their employability skills and make informed choices about career choice and progression. To this end we would recommend that MCT and Science Faculties continue to work in collaboration with the Careers and Employability Service to set up and run more events of this kind in the future.

(18) Building a community of practice and employer engagement to enhance Systems Thinking in Practice.

Martin Reynolds
Faculty of Mathematics, Computing and Technology

For well over 40 years the OU has been a recognised international leader in the provision of Systems education. More recent success with the launch of the postgraduate suite of qualifications in Systems Thinking in Practice (STiP) suggests an appetite for systems thinking skills from mature students working in a variety of different sectors ranging from healthcare and education to development, environmental and technology management. The peculiar challenges associated with Systems education and continual professional development for mature students in professional settings as well as academic staff (both Central and Associate Lecturers) responsible for effecting appropriate learning outcomes remain substantial. The eSTEeM project - *Building a community of practice and employer engagement to enhance Systems Thinking in Practice* - began in January 2014 as a means of exploring such challenges in seeking to transform them into opportunities for further pedagogic innovation.

The challenges are threefold – substantive content, pedagogy and assessment, and sustainability of learning. Firstly, contemporary OU systems thinking represent what The Independent newspaper in November 2013 in a review of some UK University provisions at postgraduate level described as 'Wacky'. The key point of wackiness derives from the epistemological shift in regarding systems not as ontological realities existing outside of human agency, but rather as an integral part of conceptual thinking which can be mobilised for literally thinking differently about the real world. Some students find it more difficult than others to make this shift. Secondly, aside from the challenges of pedagogy in distance learning generally, Systems teaching in STiP requires students to draw on experiential feedback drawing on their own professional work context. Associate Lecturers are required to assess students adaptation of Systems ideas for students' own context, rather than relying on a template prescribed adaptation using a common 'case study'. Relying on real-life student experiences in practicing craft skills in students' own work place is challenging both for learning and assessment, placing emphasis on students sharing their experiences within a module cohort. Thirdly, there often remains a disconnect between employers existing demands and students' aspirations of realigning the craft skills learnt in STiP modules to enhance professional experiences of work.

The eSTEeM-STiP project draws on two key assets for developing a more collaborative community of practice; an established well-practiced group of six ALs associated with the teaching of the two core STiP modules TU811 and TU812; and an established self-organised STiP alumni LinkedIn group with a vibrant community of over 400 STiP alumni. The presentation will outline the systemic inquiry used in the eSTEeM-STiP project to help meet the challenges of Systems education whilst fostering a model of community of practice that

draws in the enthusiasms and experiences of tutors, alumni and employers along with those of central Systems academics to effect more purposeful and sustainable Systems teaching.

Participants are anticipated to learn:

1. Core challenges of Systems education as practiced at the OU
2. Outline of the three phases of the systemic inquiry used to design a new model of Systems pedagogy
3. Progress of the eSTEeM-STiP project to date

Parallel Session C – Workshop / Demonstration

(20) 3D virtual geology field trip.

Tom Argles[1], Nick Braithwaite[1], Sarah-Jane Davies[1], Kat Garrow[1], Sara Hack[2], Shailey Minocha[3] and Brian Richardson[1]
Faculty of Science[1], LTS Media[2], Faculty of Mathematics, Computing and Technology[3]

As a part of The OpenScience Laboratory, (http://www.open.ac.uk/openscience/), an initiative of OU and The Wolfson Foundation, we have developed a 3D simulation of a Geology field trip based around Skiddaw in the Lake District, using the Unity 3D software (<https://learn5.open.ac.uk/course/format/sciencelab/section.php?name=skiddaw_1>). The interactions and the learning activities within the 3D environment are designed both to mirror the experience of a real field trip and to enhance it with additional functionality.

The Skiddaw field trip in the Lake District is an integral part of Earth science teaching at the OU; students carry out a real field trip and can also learn about it through DVD activities. The primary objective of developing an authentic 3D interactive simulation has been to provide an immersive experience to the users through sense of space. The virtual embodiment in the form of avatars and the multi-user environment will help give a sense of co-presence and provide opportunities for collaborative learning. The interactions and the learning activities within the 3D environment are designed to mirror the experience of a real field trip.

During this workshop, we will give a presentation and demonstration of this 3D virtual geology field trip and discuss the design and development process of this 3D simulation. After a brief demonstration, the workshop attendees will be given an opportunity to have a hands-on session with this 3D environment. The workshop will end with a discussion of the hands-on experiences in terms of the usability of the environment (how easy was it to find your way around and to carry out the tasks), and the attendees' perceptions about:
comparison of the 3D experience with 2D virtual field trips and real field trips;

limitations of 3D virtual field trips and the opportunities that 3D virtual field trips offer in both distance education and in campus-based teaching contexts.

Parallel Session D – Workshop / Demonstration

(10) How STEM academics are using social media: a game of snakes and ladders.

Helen Donelan[1], Clem Herman[1] and Ann Grand[2]
Faculty of Mathematics, Computing and Technology[1], Institute for Educational Technology[2]

The increasing popularity and availability of social media have sparked interest in how these tools can facilitate the changing landscape of higher education and support individual academics in their role. As well as social media's potential for supporting learning and teaching activities, its inherent context – online environments that encourage mass collaboration and participation – align well with current university strategies concerned with increasing public engagement with research and moves towards disseminating research via more open and accessible routes. Some academics are already using these tools successfully to achieve high professional visibility and have found extended audiences for their work. For many, however, there are still uncertainties about how to use social media to support their professional practice, especially given increasing workloads and greater demands on people's time. In addition, there is the question of whether there are measurable outcomes, both in terms of research impact, and for individuals' career progression and promotion.

This session brings together findings from two current research projects that have explored some of these points. The first is an eSTEeM project, Enhancing professional networking and engagement using social media, which explores the current activities of academics using social media and looks at the outcomes that they have experienced. It also examines the barriers that are preventing others from using these tools. The second is the OU's Catalyst for Public Engagement with research, in particular the digital engagement work package, which explores researchers' understanding of public engagement and how this is mediated through digital technologies. This interactive workshop will draw on findings from these two projects with the aim of encouraging participants to think about how they *currently* use social media, how they *could* use social media to support their role and what *support* they would need to realise these goals.

The workshop will be structured around two interactive sessions, accompanied by short presentations and plenary discussions. It will start with a brief presentation summarising the two projects mentioned above. This will be followed by the first interactive session, where participants will be encouraged to identify how, and to what extent, they currently use social media and to

explore their attitudes towards it. This will be followed by a brief presentation of the key findings from the two projects that illustrate how other academics are using social media, what they are using it for and the outcomes they are experiencing. The second interactive session will focus on small group discussions with the aim of identifying what is preventing people engaging with social media at a higher level and to develop suggestions that may inform university policies on supporting individual academics in their use of social media. A final plenary discussion will collate and summarise these suggestions into a set of recommendations to be passed on to the university committees involved in developing social media strategies.

Parallel Session E – Structured Discussion / Briefing

(23) Challenges of embedding (retrofitting!) PDP and Employability skills into an UG qualification.

Ruth Williams, Eleanor Crabb and Simon Collinson
Faculty of Science

This discussion relates to our eSTEeM project on "Graduate skills in chemistry: online delivery, assessment and tracking" which aims to embed the development of 'graduate' key skills in an incremental manner within an online chemistry curriculum.

The modules within the chemistry curriculum are currently being rewritten and will include a greater emphasis on graduate skills development and PDP, embedding this within core modules in the chemistry pathway. (This aligns with the recommendation that "*when undergraduate chemistry degree programmes are being revised, additional opportunities should be provided for developing generic skills"* [A Toland, HE STEM Employability skills review].) Skills will be developed and articulated via ativities linked to assessment, with feedback. Evidence suggests that formative assessment associated with such activities encourages engaged and deep learning.

Skills will be developed incrementally across the programme, with a tracking tool (based on a model initially developed by the Royal Society of Chemistry for full-time campus based students) linked to the skill descriptors and activities, to enable students to monitor their levels and progress through their degree. Peer and tutor assessment activities will feed into this process, which itself can be used towards PDP activities. The skill descriptors can also be used by students to inform their own practice during activities, similar to secondary school practice where pupils use key stage level descriptions as a motivation to progress.

The discussion will include a brief outline of the work completed and key findings to date. Particular issues for discussion include:

- Identifying key skills categories
- Defining skills categories – e.g. practical skills do not clearly fit within the employability skill set

- Encouraging student engagement with formative activities
- Student recognition of skills development and their articulation
- Providing exemplars to help students to engage with the process and articulate their skills to employers
- Retrofitting Employability skills development to existing qualifications/modules
- Changing composition of pathways as modules are rewritten
- Development (or not) of University PDP

Participants will be encouraged to share their own experiences and current practice.

Parallel Session F – Workshop / Demonstration

(28) Science and the citizen.

Nick Braithwaite[1], Iain Gilmour[1], Jonathan Silvertown[1], Emma Rothero[1], Ulrich Kolb[1] and Eloy Villasclaras-Fernandez[2]
Faculty of Science[1], Institute of Educational Technology[2]

Involving non-specialists in the gathering and analysis of scientific data is one way for publicly funded scientists to give added value to their funders. There are currently many public engagements in the form of "citizen science" activities and the OU has a number of fine examples: iSpot, Treezilla, Flight of the Fritillary and Sense-it. But what makes an effective citizen science task or enquiry and what type of progression can we offer to the citizen science community?

Parallel Session G – Short Oral Presentations

(4) Student perception of online practical science.

Victoria Nicholas, David Robinson and Steve Swithenby
Faculty of Science

Student perceptions of the value of practical science, as delivered on-line through distance learning, are likely to be influenced by their expectations of the experience of studying online. Online courses will become much more prevalent in the future and will contain practical components. We are capturing the experience of randomly selected students from two online practical science modules, ‘Scientific investigations and ‘Investigative and mathematical skills in science’. Anecdotal evidence suggested that students have a negative perception of the value of online practical science before starting such modules. Many appear to enrol only because the module is a

requirement of their pathway and are sceptical about how much “real science” they will be learning. The crucial question is whether their perceptions are affected by the experience. We use initial interviews and questionnaires to provide a baseline for perception prior to study. Then, after completing the module, phone interviews and questionnaires demonstrate any shift in perception. After they have completed the module, students appear to be more positive about the experience and the value of online practical science. The outcomes of this research will inform the development of online practical science skills in the science curriculum and will have a wider value for other parts of the sector that are moving towards more teaching and learning online.

(15) Student perceptions of an assessed online collaborative activity on S366 (Evolution).

Janet Haresnape
Faculty of Science

This presentation shows how weaker students on S366 (Evolution) were helped to grasp a difficult concept (genetic drift) through participating in a collaborative activity which is based on a series of wiki pages. The activity is adapted from a face-to-face tutorial activity which used the founder effect, which is a particular manifestation of genetic drift, to help students to visualise and understand the implications of this process. The activity begins with a simple, non-threatening sampling exercise using coloured beads, and progresses to an analysis involving some complex mathematics, which weaker students tend to find particularly difficult. The challenge was to create an equally beneficial learning experience in the online environment as that which had proved successful in the face-to-face context in helping weaker students to grasp this challenging concept.

This work explores student perceptions of the online version of this collaborative activity, both using telephone interviews and an online questionnaire, and compares the perceptions of weaker and more able students.

Telephone interviews, undertaken in 2011 and 2012, enabled the aspects of the activity which were particularly important to students to be identified. These aspects included its accessible nature (activity is presented in the form of photographs), its authenticity (it mimics a real practical exercise as done in a face-to-face tutorial), its collaborative nature (requirement to use data provided by other students and build on contributions from others to answer an assessment question) and the feeling of responsibility towards the group (students needed results from others to answer the assessment question). The importance of these different aspects was further explored in 2013 using an optional online questionnaire, which was completed by 30 of the 240 students who participated in the activity. Students were identified as weaker or more able on the basis of their module results.

Both weaker and more able students found the accessible and authentic aspects of the activity important, but indications are that the collaborative aspect was more important to the weaker students. Weaker students appear to have been able to build on contributions made by more able students, enabling them to complete an assignment question which might otherwise have seemed daunting and difficult. It is interesting that the feeling of responsibility towards the group also appears to have been more important to the weaker students.

The activity is now being adapted for use in other contexts in which a complex question, which could be approached from various different angles, is posed on a wiki, enabling students to build on each other's responses to gain a deeper understanding. The aim is to find ways of helping weaker students to grasp challenging concepts.

It is hoped that participants who come to this presentation might be able to adapt this design for use in other contexts, such that weaker students can gain confidence by seeing and building on suggested answers to complex questions given by their peers.

(27) How students' use of language relates to learning, retention and performance in assessment on TU100.

John Woodthorpe[1], Jim Donohue[2]and Sarah Mukherjee[2]
Faculty of Mathematics, Computing and Technology[1], Faculty of Education & Language Studies[2]

This presentation gives the background to a new eSTEeM project investigating assessment and language use in TU100 (My Digital Life), which continues previous collaborations between Level One Computing and IT modules in MCT and Open ELT in FELS, including work on the production of TU100. It will summarise the work done with module materials in MCT, Science and FELS and lead into the current project by discussing the issues for students, tutors and module teams.

The current project is investigating four hypotheses concerning assessment and language use in TU100:

- Student language use and performance in assessment are related
- Performance partly depends on reading and writing abilities
- Understanding how language relates to performance will help develop assessment strategy and tuition practices
- These developments will improve retention, attainment and satisfaction

A linguistic analysis of student assignments on TU100 is being undertaken and correlated with the student performance. The results of initial work show that that such a correlation does indeed exist, and will be presented here. Once that has been completed, a team of language specialists and TU100 ALs will produce a language and learning checklist to help in evaluating language use.

This will be followed by text analysis discussions with students and an investigation of student reading experiences and practices.

All these activities will feed into a review of the design of the assessment, tutor feedback, and language aspects of TU100. The objective is to contribute to the development of TU100 assessment and tuition practices in the context of MCTs retention project. This will be done by improving the language support for the module team in producing the assignments, for students in answering them, and for tutors in marking them.

Parallel Session H – Short Oral Presentations

(3) What are the views of our e-business tutors? A focus group to inform tutor-centred pedagogic research.

Christopher Douce
Faculty of Mathematics, Computing and Technology

A research project, funded by eSTEeM, aims to explore the experiences of associate lecturers who help to deliver the Open University web technologies module. One of the intentions behind the project is to understand the tutor experience, particularly some of the challenges that both tutors and students have to contend with. Potential outcomes include understanding the approaches that tutors use to help students who may be struggling, understanding the extent to which students are prepared to tackle the technical subjects that are presented within the module, and further understand how the university could help their tutors to offer effective and quality tuition. The research methodology is use a series of tutor-led structured interviews.

At the very start of this project, there was an opportunity to conduct what could be loosely considered to be a 'pilot research study'. Faced with the challenge of writing and preparing new level three modules, one thought was to organise what could be described as a 'tutor focus group' for experienced tutors who have been delivering a module entitled T320 ebusiness technologies. The aim of the focus group was very similar to the eSTEeM funded research (but was instead funded through a regional associate lecturer development fund). The objectives were to understand tutor experience, to appreciate areas of concerns, to identify issues that have arisen, and to learn lessons about potential improvements to OU module design. A further aspect is, of course, to gain another perspective on the student experience.

This presentation describes and summarises the findings from the T320 focus group. Key themes are identified, and pointers towards future research directions are also given. Finally, lessons from this pilot study project are then summarised in terms of how it could influence on-going eSTEeM research.

(21) The UNESCO UniTwin Digital Campus for Complex Systems: a global experiment in high-quality no-cost education.

Jeffrey Johnson[1], Paul Bourgine[2], Jorge Louçã[3] Cristian Jimenez-Romero[1], David Rodrigues[1] and Jane Bromley[1]
Open University, Faculty of Mathematics, Computing and Technology[1], Ecole Polytechnique Paris[2], University of Lisbon[3]

The Complex Systems research community includes many thousands of researchers worldwide. Thanks to support from the European Commission it is very well coordinated in Europe. In 2005 the Complex Systems Society was launched and currently it has 2000+ members. Since its early days the Society has recognised a need for many thousands of people trained at masters and doctoral levels, and the bootstrap problem that there are relatively few institutions and people able to provide this mass postgraduate education in Europe or elsewhere.

This structural problem has been addressed over the last five years by an attempt to build an international community sharing resources for research and education. The focus of this activity was to create a 'UNESCO UniTwin' network of universities and institutions linking Europe, Africa and Latin America. This has involved an extensive programme of meetings with scientists around the world aimed at recruiting their institutions to the network. To satisfy the UNESCO criteria, institutions forming a UniTwin must be committed at the level of their Vice Chancellors, Rectors or Presidents to participate in the network by sharing knowledge and resources. In 2014 UNESCO accepted a proposal by about a hundred institutions to form the CS-DC or Complex Systems Digital Campus. The Open University is a founder member of the CS-DC and is playing a major role in its development.

In parallel to forming this institutional structure, members of the complex systems community have been working towards the creation of low-cost high quality education. The Open University is the lead partner in a European project aimed at providing scalable internet-based education. The Etoile project (Enhanced Technology for Open Intelligent Learning Environments) is based on crowd-sourcing methods to provide study materials combined with scalable methods of marking on which to base certification.

In as much as they are intended to provide internet-based open education for large numbers of students the courses to be offered by CS-DC will be MOOCs (massive open online courses). However the background and motivation for our MOOCs is different to many other providers. In the short term our courses are aimed at postgraduate level where we can assume that students have good study skills and high motivation, with many working as graduate students or researchers in academic institutions. Thus we expect the study patterns of our courses to be different to many of the MOOCs currently available. Another difference is that we have the possibility of the CS-DC accrediting our courses providing certificates that are useful to students and members of the international complex systems community. For example, CS-

DC can provide useful certification to complement other sources in the recruitment of students and staff, the award of travel scholarships, and placements in labs in other countries and on other continents.

This talk will begin by briefly tracing the history of the CS-DC and its mode of working through e-laboratories. This will be followed by a discussion of our approach to providing no-cost education to large numbers of students distributed around the world, including the issues of: establishing curriculum relevant to the heterogeneous requirements of our growing number of members; providing learning materials in a fast moving research area; and implementing high quality scalable assessment for certification in service of the international complex systems community.

(31) iCMAs: Who needs them?

Helen Jefferis, Chris Dobbyn and Frances Chetwynd
Faculty of Mathematics, Computing and Technology

In this presentation we address moves to online assessment using interactive computer marked assignments (iCMAs). At the Open University, these tests offer the student 3 tries at each question with increasing amounts of feedback, and also multiple attempts at each assignment are allowed. The research (HEA funded) investigated students' motivations towards and views on the tests, and their patterns of engagement with them. Survey data on a student sample, VLE statistical data across the whole cohort (2500 students) and survey data on a large tutor sample were all acquired. A bare majority of respondents were using the iCMAs to review learning, but engagement with feedback was less certain. Most students did not attempt to increase their score after the first attempt. Based on student responses, suggestions for module teams have been formulated. This presentation also briefly reports on a continuation eSTEeM funded project.

Closing Keynote Presentations

The Khan Academy: how it works for students and tutors.

David Brannan
Faculty of Mathematics, Computing and Technology

Khan Academy is a [relatively] 'new kid on the block', offering learning resources to students and teaching resources to tutors, using a large collection of (mostly mathematical) screencasts. What makes it so successful? Why do learners like it so much? Why do tutors find it such a good teaching system?

FutureLearn: massive open social learning.

Mike Sharples
Institute of Educational Technology

FutureLearn is a new MOOC platform that has been developed to support massive-scale social learning, based on principles of effective pedagogy. As well as providing teaching from world-leading academics through video and text on multiple devices, our aim has been to create a community of FutureLearners who share ideas, hold engaging discussions, and support each other. And rather than struggling to prevent failure and dropout, we have chosen to reward success at each step. Each decision about design of the FutureLearn platform has been made to support these three principles of: world-class storytelling, social learning, and celebrating progress. I shall describe the design principles of FutureLearn, the theory-informed agile development process, and a summary of data and findings from the initial courses.

POSTER DISPLAYS AND PRESENTATIONS

(1) Co-ideation of communication and hazard preparedness strategies at Turrialba volcano, Costa Rica.

Saskia van Manen
Faculty of Science

This research focuses on developing and communicating hazard preparedness strategies in collaboration with local communities at Turrialba volcano, Costa Rica. After more than 100 years of quiescence Turrialba resumed activity in 1996. This has resulted in indefinite closure of the National Park that comprises the summit region of the volcano, the temporary evacuation of two villages, and devastation of local ecosystems.

Despite high levels of hazard salience communities are not or under-prepared to deal with a volcanic eruption. In light of Turrialba's continued activity engaging local communities with disaster risk management is key (DRM). DRM is the concept and practice of reducing disaster risks and associated losses through a wide range of strategies, including efforts to increase knowledge through education and outreach. However, recent studies have shown that frequently national policies result in little change at the community level, where DRM efforts can have the biggest impact.

At local levels culture (collective behaviours, interactions, cognitive constructs, and affective understanding) is an important factor in shaping peoples' views, understanding and response to natural phenomena. Therefore approaching hazard preparedness from a user-centred perspective, through a collaborative and iterative approach, is likely to result in DRM strategies that are considered more applicable and user-friendly by communities.

This poster will present results of two workshops held around Turrialba in February 2014. The workshops were designed to engage the community in ideation of concepts to increase levels of hazard preparedness. The results will be used to develop, through further collaboration with the end-users, DRM strategies tailored to the local situation. In addition, the process of conducing the workshops will be evaluated, highlighting challenges and opportunities encountered.

Please see page 40 for poster.

(2) Researcher–led online science.

David Robinson and Manfusa Shams
Faculty of Science

The aim of this project is to generate interest in researcher-led online science teaching, through a generic model.
On-line teaching and learning is expanding rapidly. In the STEM subjects, models are needed for integrating the practical skills concerned with observation and experimentation. Academic staffs in many universities generally offer a short course, often linked to practical work, to students in their final year. Such a course links a member of staff with a small group of students interested in their own research area. The course can often be presented using the most up-to-date research findings as the staff member is teaching in their research area. Despite the specialized nature of the subject area such courses teach generic skills.

In a distance learning environment, such direct links between students and staff engaged in research occur rarely. We are developing a model that provides a structure that would enable an individual member of the academic staff to offer a component of a module in their own research area, to a global student audience. The pre-prepared outline would have costs associated with it but would be as flexible as possible, to allow the academic to present the module in the most suitable way for their subject. The researcher would include some element of practice, particularly data acquisition and/or handling, with literature review, review writing, website construction and video/audio/photo presentations, dependent upon their research. The intention would be that a member of staff could potentially run a section of a module themselves with self-generated material.

We are seeking new modules that are interested in this approach in order to turn theory into practice. We are also looking for somebody with sufficient interest to take on this project within eSTEeM.

Please see page 41 for poster.

(5) Student perception of online practical science.

Victoria Nicholas, David Robinson and Steve Swithenby
Faculty of Science

Student perceptions of the value of practical science, as delivered on-line through distance learning, are likely to be influenced by their expectations of the experience of studying online. Online courses will become much more prevalent in the future and will contain practical components. We are capturing the experience of randomly selected students from two online practical science modules, ‘Scientific investigations and ‘Investigative and mathematical skills in science’. Anecdotal evidence suggested that students have a negative

perception of the value of online practical science before starting such modules. Many appear to enroll only because the module is a requirement of their pathway and are sceptical about how much “real science” they will be learning. The crucial question is whether their perceptions are affected by the experience. We use initial interviews and questionnaires to provide a baseline for perception prior to study. Then, after completing the module, phone interviews and questionnaires demonstrate any shift in perception. After they have completed the module, students appear to be more positive about the experience and the value of online practical science. The outcomes of this research will inform the development of online practical science skills in the science curriculum and will have a wider value for other parts of the sector that are moving towards more teaching and learning online.

Please see page 42 for poster.

(6) The use of smart phones to enhance teaching in environmental engineering and environmental science modules.

Suresh T. Nesaratnam and Shahram Taherzadeh
Faculty of Mathematics, Computing and Technology

Smart phones are becoming more and more popular, especially amongst the young, and have great potential to be learning tools. Our Project is aimed at finding out what is available in terms of smart phone apps which could improve the learning experience of students studying environmental engineering and environmental science modules through distance-learning. The apps can be a means of obtaining data that would previously have been acquired through equipment and chemicals (which are costly). An important part of the Project is the testing out of representative apps. We have accumulated information on apps related to measurement of pollution related to noise, water, and air. We have purchased a smart phone and have acquired some test strips for measurement of water parameters. We are considering which of the many Noise apps to use for testing. The plan is to use students to test out these apps in the field.

The Water Testing app will be field-trialled using a local secondary school, while the Noise app will be tested at the TXR120 / T176 Residential School. The Project is scheduled to be completed by August 2014.

Please see page 43 for poster.

(7) Formative thresholded assessment: Is it working?

Lynda Cook, Janet Haresnape and Sally Jordan
Faculty of Science

This poster presentation will discuss the Science Faculty's move to formative thresholded assessment and its evaluation. The use of formative thresholded assessment saves resource by enabling assessment material to be re-used, and it also enables ALs and students to focus on feedback rather than grade. However the implications for student engagement, retention, pass rates and plagiarism were largely unknown. The evaluation of the change in practice was split into small practitioner-led sub-projects including both quantitative e.g. comparing assignment completion rates before and after the change, and qualitative e.g. investigating student and tutor perceptions and opinion. Headline findings from the evaluation, due for completion later in 2014, include:

TMA and iCMA submission rates are slightly lower than with summative continuous assessment, but there appear to be no substantial changes as a result of the change in assessment practice. Students who submit all TMAs and iCMAs do better in the examinable component (unlikely to be a causal effect); however for some students, choosing to omit continuous assessment components in order to concentrate on revision appears to have been a sensible strategy.

There is very poor understanding by students and ALs of the fact that, for modules with a more conventional assessment strategy, students have to get over separate thresholds for the continuous assessment and examinable component for each grade boundary. This is in line with a frequently found finding that students have poor understanding of the nature and function of assessment (e.g. Carless, 2006; Orsmond & Merry, 2011).

There were some problems when students were taking a module with summative OCAS and a module with formative OCAS at the same time.
As an incidental side-effect of the project, we received some early warning signs of problems caused by the changing student population at level 1, and of overcommitted students at all levels.

Please see page 44 for poster.

(8) Associate lecturer and student views of Science Faculty feedback processes.

Sarah Allman, Claire Rostron, Pam Budd, Nicola McIntyre and Sally Jordan
Faculty of Science

This poster presentation will give the background to a new eSTEeM project which has funding from the Study Experience Programme New Models of Assessment and Tuition Project.

The work seeks to investigate student and AL perceptions of assessment feedback in the light of current Science Faculty assessment processes, including the use of formative thresholded assessment, the use of assessment commentaries and the use of learning outcomes grids. It builds on evidence from within the Open University (e.g. Walker, 2009) and elsewhere (e.g. Price et al, 2010) that our feedback practices may not be as effective as we would wish. We also suspect that students may not share our understanding of the nature and purpose of our feedback processes (Carless, 2006). This is supported by findings from the previous eSTEeM Project, 'Formative thresholded assessment: Does it work?"

This poster presentation will discuss the background to the work and our research methodology, which will include the use of questionnaires and focus group discussions with students and ALs on four contrasting Science Faculty modules, with the aim of identifying best practice and producing guidelines for module teams, ALs and students.

Please see page 45 for poster.

(14) Flight of the Fritillary; an update.

Emma Rothero
Faculty of Science

Background

Open University scientists have been organising volunteers to count snakeshead fritillaries on North Meadow National Nature Reserve (Wilts) since 1999. Patterns are emerging relating population changes to hydrology. Fritillaries are a rare species in Britain and are symbolic of a scarce floodplain-meadow plant community found on less than 1500 ha in the UK. Our data shows that on North Meadow snakeshead fritillaries display a dynamic ecology, seemingly responding to changes in hydrology. This member of the lily family relies on seeds for reproduction and their main pollinators are thought to be early season bumblebees.
Little is known about which species of bumblebee are important to fritillaries and whether the decline of bumblebee populations will prove a problem for them.

Project Objectives

- Increase the numbers of volunteers at North Meadow through wider advertising improved engagement and better feedback of results.
- Look at the other sites where fritillaries are currently counted and work with site managers and volunteers on at least two of those sites to encourage data collection in a standard way as well as assisting volunteers to compile and share their existing data.
- Provide information on the specific pollinators of fritillaries to volunteers, thereby encouraging them to collect information on which species are involved and to understand their behaviour better.
- Analyse the data collected and feedback findings to volunteers through feedback sessions, website and leaflets, thereby increasing levels of engagement.
- Assess the impact of our engagement with volunteers to understand which elements are the most important in getting and keeping volunteers.

Progress to date:

This talk will provide an update on the project after 3 years' worth of survey work and volunteer engagement and will cover:

- 3 different volunteer snakeshead fritillary counting groups and 3 new bumblebee survey groups; how did we encourage them to take part and have they stayed?
- The scientific data collected; how viable is it and at what level do the volunteers engage?
- Challenges in organising the count groups and feedback
- Spin offs from the initial project

Points for discussion:

- How do we assess the impact of public engagement in a meaningful way without being overly invasive and putting people off?
- How do we know how much the volunteers have learnt?
- How much impact assessment is too much?
- How much resource do we put in?

Please see page 46 for poster.

(19) 3D virtual geology field trip.

Tom Argles[1], Nick Braithwaite[1], Sarah-Jane Davies[1], Kat Garrow[1], Sara Hack[2], Shailey Minocha[3] and Brian Richardson[1]
Faculty of Science[1], LTS Media[2], Faculty of Mathematics, Computing and Technology[3]

We have developed a 3D virtual Geology field trip based around Skiddaw mountains in the Lake District, using the Unity 3D software (<https://learn5.open.ac.uk/course/format/sciencelab/section.php?name=skiddaw_1>). The geological fieldwork in a 3D immersive digital landscape has

been created using real world data from part of the northern Lake District in the UK. We have used a digital elevation model derived from airborne LiDAR data and terrain imagery to reconstruct the landscape faithfully enough to provide a real sense of presence for the user. The application is based around a 10km x 10km low to medium detail model of the terrain around Skiddaw with overlaid photogrammetry-derived mesh and textual imagery, and augmented with in-built Unity terrain and flora. The sense of immersion is heightened by ambient audio recorded on location, as well as spoken audio for teaching content.

In this poster, we will outline how the affordances of 3D virtual environments have been integrated within the design of the 3D virtual geology field trip such as: realism and high degree of fidelity; virtual embodiment in the form of avatars; the sense of exploration; real-time interaction and collaboration, sense of space; sense of presence and co-presence; and opportunities for collaborative and contextual learning. We will also outline the opportunities for students and educators such as: practising for and reflecting upon real life field trips; learning by self-exploration and in teams; seeing and doing what you can't in the real world such as cutaways into a mountainside to see the geology beneath, flying across the landscape, and exploring, observing and gathering data within a context, e.g. using a virtual microscope.

Please see page 47 for poster.

(24) Skills articulation within a module: goal setting and reflection within assessment.

Eleanor Crabb and Simon Collinson
Faculty of Science

The work presented here is part of an Esteem project on "Graduate skills in chemistry: online delivery, assessment and tracking" which aims to embed the development of 'graduate' key skills in an incremental manner within an online chemistry curriculum. Skills will be embedded via assessment activities, with feedback.

As part of the assessment in S347 Metals and Life, students are required to initially score their current performance against a number of key 'graduate skills' then set themselves a SMART goal related to one particular area that they wish to develop further. Students are then required to feedback on this as part of the final TMA.

Such assessment has been summative however in the current presentation continuous assessment has changed to be formative (with a threshold); initial evidence suggests that a reasonable number of students are still undertaking these activities. The uptake and motivation of students to complete these

activities with the different modes of assessment will be presented together with examples of the activities themselves.

Learning outcomes

- To explore use of skills articulation, goal setting and reflection within a module
- To discern, based on initial data, whether moving from summative to formative assessment effects the uptake of these types of activity
- To reflect on students motivations for completing such activities

Please see page 48 for poster.

(26) Engaging programming

Jon Rosewell
Faculty of Mathematics, Computing and Technology

TU100 *My Digital Life* and TM129 *Technologies in practice* (and previously T184 *Robotics*) are first level courses that both include introductory programming. They have radically different programming environments: Sense for TU100 uses a full graphical metaphor whereas RobotLab for T184/TM129 has text-based drag-and-drop program construction closer to the conventional languages that students will encounter in second-level modules.

Many students are now studying both TU100 and TM129 and this provides an ideal opportunity to probe how students learn with these two styles of programming environment. There is background concern that students perceive programming as daunting and may fail to engage with the programming aspects of both modules. This may translate into poor retention.

This project will take several approaches. Firstly, statistical analysis will probe pass rates, retention and TMA submission (eg patterns of late submission) and relate these to study patterns ie students studying TU100 and TM129 consecutively, simultaneously or with overlapping calendars. Secondly, surveys and interviews will probe student attitudes to programming. Finally, feedback from tutors will be sought to highlight student problems.

Please see page 49 for poster.

Co-ideation of communication and hazard preparedness strategies at Turrialba volcano, Costa Rica

Saskia van Manen[1], Geoffroy Avard[2], Maria Martinez[2]
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INTRO

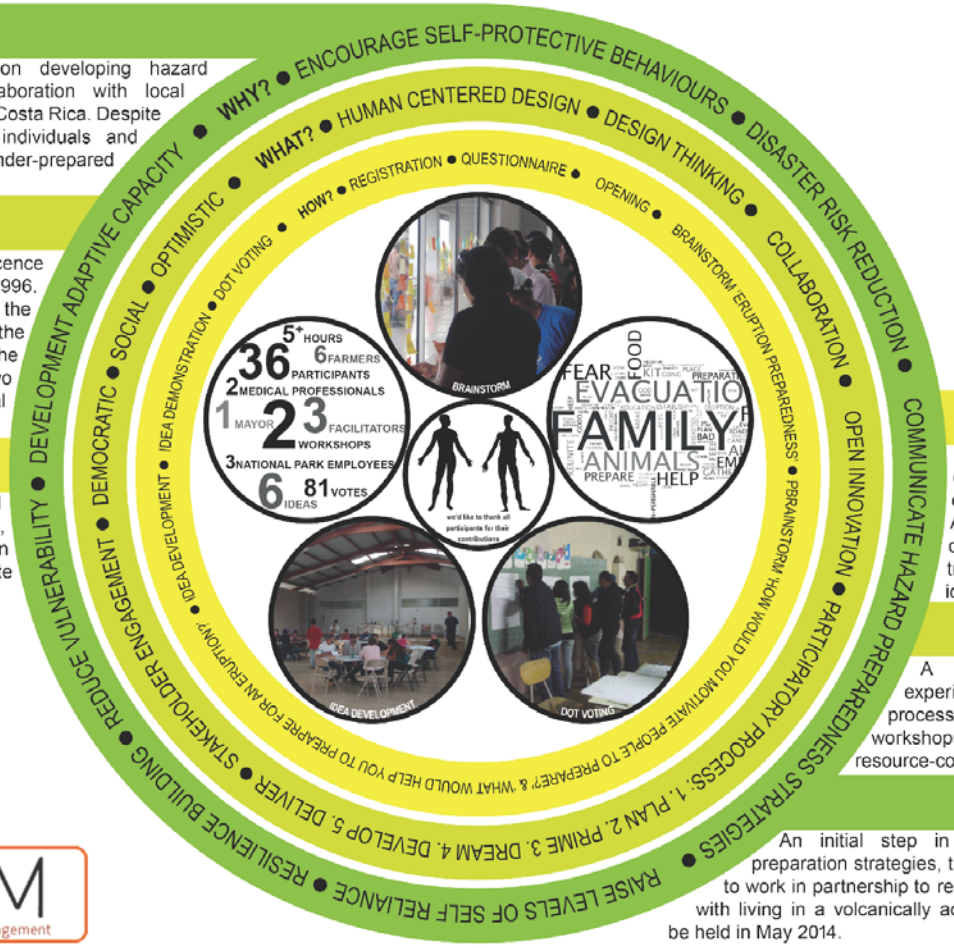
This action research focuses on developing hazard preparedness strategies in collaboration with local communities at Turrialba volcano, Costa Rica. Despite high levels of hazard salience individuals and communities in the area are not or under-prepared to deal with a volcanic eruption.

VOLCANO

After 100+ years of quiescence Turrialba resumed activity in 1996. This resulted in indefinite closure of the National Park that comprises the summit region of the volcano, the temporary evacuation of two villages, and devastation of local ecosystems.

METHODS

Participatory workshops were held in February 2014. Content analyses, critical reflection and discussion with facilitators are used to evaluate the data and process.



RESULTS

The workshops recorded key concerns, generated ideas and established design constraints. Additionally issues such as optimism bias, responsibility transfer and risk compensation were identified.

DISCUSSION

A number of challenges were experienced, mostly relating to the process of conducting participatory workshops in this specific socio-cultural and resource-constrained setting.

CONCLUSIONS

An initial step in the design process of hazard preparation strategies, this work allows those most affected to work in partnership to respond to the challenges associated with living in a volcanically active area. Additional workshops will be held in May 2014.

Researcher-led online Science

David Robinson and Manfusa Shams

eSTEeM, Faculty of Science, The Open University

The Open University

The research questions

We have been developing a project that attempts to answer the following questions:

1. Can we match for distance learners the short, researcher-led courses that often form part of the final year in other universities?

2. Can we provide a practical experience at Level 3 that forms the top end of a ladder of learning for undergraduates in practical science - and in an on-line world?

3. Could such a third level module component be provided by an individual researcher?

Background

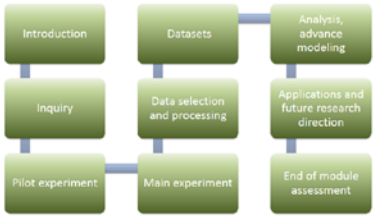
Academic staff in most universities generally offer a short course, often linked to practical work, to students in their final year. Such a course links a member of staff with a small group of students interested in their own research area. The course can often be presented using the most up-to-date research findings as the staff member is teaching in their research area. Despite the specialised nature of the subject area such courses teach generic skills. In the Open University, such direct links with staff engaged in research rarely – if ever – occur.

Although we present this in the context of our own teaching the problem of embedding practical science in distance-learning modules at all levels is one that has a widening significance as more institutions teach remote students.

Practical knowledge/'learning by doing' is an effective way of delivering scientific concepts, particularly if it is based on an enquiry-based learning approach. There is ample evidence that enquiry-based scientific pedagogy enhances students' scientific knowledge and understanding (for example, Liu et al., 2009).

What might a module look like?

- Individual researcher presents material in both production and tuition role
- All resources on-line
- All contact via synchronous conferencing and asynchronous forums
- All assessment fitted into a standard, pre-approved, package
- Practical component based on researcher's own experiments, data, subject specialism
- Pedagogic style selected by researcher



Theory to practice

The research questions have been explored in Faculty and eSTEeM workshops and presentations and we conclude that the practicality of researcher-lead modules can best be tested by running a fully evaluated pilot. **This is the next stage and we are looking for people interested in taking on this project.**

Towards a pilot module

The type of module component proposed is dependent upon the researcher running it taking complete control over content, pedagogic style and assessment. Pre-approved assessment plans can be provided and the tools needed for podcasts or deliver on-line tutorial sessions. A key component is a practical activity appropriate at an appropriate level. The choice of practical activity would dictate the learning outcomes of the accompanying material. Below is a worked out example

Assembling the resources

Our open distance learning modules are generally produced by a team of academics, editors and designers. These researcher-lead components depart from that model in that the onus is on the staff member running the module to provide the resources needed. We have devised this using just available resources in order to validate the idea. A draft study calendar is shown below together with examples of the resources that are available.

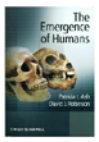
Literature

Images

Podcasts

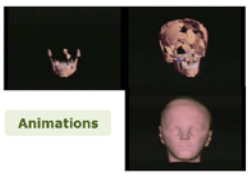
The emergence of humans

Week	Activity (generic)	Staff actions	Pilot – Human evolution
0	Website live		Set book purchase – no mailings
1	Introduction	Review article(s) and/or set book chapters and podcast	Podcast Set book (SB) chapters 1 to 4
2	Problem/discussion 1	Seed VLE forum discussion	Forum discussion Primate and anthropoid origins
3	First on-line tutorial	Publish reading list First lecture/tutorial	Review papers on 'Out of Africa' – SB Ch 5 to 8 Tutorial - Out of Africa versus multi-regional origin
4	Problem/discussion 2 Set-up practical task.	Seed forums on practical Podcast intro to practical	Task – How DNA sequencing of the Denisovans reveals relationships with modern humans
5	Forums and practical work		Literature searches and group work on forums
6	Second on-line tutorial	Tutorial on practical task	
7	Problem/discussion 3	Seed forums	Set book Chapters 8 to 10
8	Forums and practical work		Set book Chapters 11 and 12 and group work on forums.
9	Final on-line tutorial	Tutorial on practical work	
10	Work on EMA	Final podcast	Write up practical task and submit as End of Module Assessment (EMA)
11	Cut-off date for EMA	Start marking period	

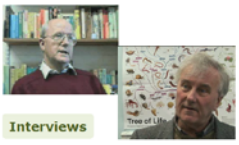


Set book

Data sets



Animations



Interviews

On-line investigations

A key component is investigative work. A suitable investigative activity might, for example, be based on the researcher's own data sets or sets available on-line. The investigations will use tools and facilities in the OpenScience laboratory. The challenge for a researcher is to devise a practical activity within their own subject area that is appropriate for Level 3 students in an on-line world.

Next steps

We are seeking one/two members of staff interested in both piloting this approach and taking the project forward. A pilot model will provide a stimulating and enjoyable virtual learning experience which can then be evaluated from both the staff and student points of view. Importantly, it would test the idea that direct contact with researchers in the subject area is attractive and valuable for students.

Contacts

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Associate Lecturer

eSTEeM

References

Liu, T-C., Peng, H., Wu, W.-H.,& Lin, M-S. (2009) 'The Effects of Mobile Natural-science Learning Based on the 5E Learning Cycle: A Case Study', Educational Technology & Society, vol.12, no.4, pp.344–358.

Robinson, D. J. (2011). Collaborative experiments on-line in a course presented globally. *Bioscience Education*. 18

Gathering student perception about online/distance practical science at level 1

Dr Victoria Nicholas

Project aim

To assess the change in student perception about online/distance practical science before and after studying particular level one modules.

Context

There is anecdotal evidence that students have a negative perception of the value of online science before starting their study. They appear to only do the module because it is a requirement of their pathway and are sceptical about how much "real science" they will be learning. Whereas after the presentation, students appear to be very positive about the experience and value of online tuition.

We aim to capture the student experience to demonstrate the value of this innovative method of delivering and developing practical science skills. We will use telephone interviews and questionnaires to gather this information, with the aim of improving our knowledge of student perception at the end of level one. This could impact on development of practical science skills in the Open University Science curriculum at all undergraduate levels.

If students feel more confident about their practical science skills, value the development of their skills and enjoy the online practical modules, they might wish to come back and do more science learning in an online practical environment.

The Open University is a world leader in delivering online practical science to a wide audience, notably through the OpenScience Laboratory. S155 Scientific Investigations and S141 Investigative and mathematical skills in science are both level one modules delivered solely online, S141 being the larger course which incorporates the online practical science element developed in S155. Student perceptions of the online module S155 Science investigations have been collected as part of the end of module surveys, but there has yet to be an evaluation of how students perceive the value of learning practical science in an on-line environment before and after the module. More importantly, how students' experiences on S155 and S141 change perceptions of how practical science skills are developed has not been examined.

Methodology

Short telephone interviews will be conducted with a small number of registered students prior to module start and one week after they submit their final assessment. The responses from these interviews will lead onto more detailed and more widespread questionnaires for subsequent presentations of the modules, both pre and post module.

Student data will be used to analyse the questionnaire responses with respect to age, gender, HE experience, employment sector etc.

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Outcomes

By December 2014, the data will be collected and analysed for write up in an internal publication and journal publication for July 2015. The results of such an exercise obviously would inform developments within the University, but for the wider HE sector the results would be of interest, as a contribution to the debate about how to give students an authentic practical experience in an online distance learning context.

Online and distance learning are 'hot topic's for the higher education sector in the UK and beyond at present. Being able to articulate the benefits (as demonstrated through student perception) of participating in S141 and S155 may contribute to the University's ongoing strategy to remain at the forefront of innovation in online distance learning

The use of smart phones to enhance teaching in environmental engineering and environmental science modules

Suresh T. Nesaratnam
Shahram Taherzadeh

- This Project revolves round the idea of using smart phones as measuring devices for environmental parameters related to noise, water and air.

With the demise of residential schools and home experiment kits at The Open University, the hands-on experience in measurement and monitoring has been lost in many environmental engineering and environmental science modules. The practical aspects of measurement and monitoring play an important part in developing environmental engineers and scientists for their role as protectors of the environment in which we and other forms of life live. Further, accreditation of our modules by professional institutions is often on condition that practical skills are taught.

- This use of smart phones can give distance-learning students experience in field measurement, thus enriching their learning of text-based material.

To report on progress, we have amassed information on the apps available for measurement of noise, and parameters related to air and water pollution, and purchased a smart phone. Most of the apps are free of cost, and the few that are sold, have a nominal charge. We have now got to select a Noise app for field trials to be undertaken at the TXR120 / T176 Engineering Residential School at Bath University, in the Summer. We have found a Water Testing app which works in conjunction with test strips (which we have purchased), and this will be tested out by students at a local school. Field trials will reveal any challenges to using the apps.

Developments currently underway and anticipated in the area of environmental apps, will also be ascertained.

Conclusion

This project will test the feasibility of using mobile smartphones as learning tools in teaching practical skills needed in Environmental Engineering and Science, and it is likely to be of interest in distance teaching worldwide.

Summary information will be sent to Science Education magazines (for rapid dissemination and application), before a full paper is presented at relevant Conferences, and published in peer-reviewed Journals.

Formative thresholded assessment: Is it working?

Lynda Cook, Janet Haresnape and Sally Jordan
with contributions from many other individuals and module teams

The Open University

A project to evaluate the impact of a Faculty-wide change in assessment practice.

Background – why the change?

- Formative thresholded assessment was introduced to save resource and to enable high-quality assignments to be developed and then re-used;
- The move away from summative continuous assessment also offers the potential to free students from anxiety over the minutiae of grading of TMAs and iCMAs, and to encourage them to concentrate on the feedback provided.

What do we mean by formative thresholded assessment?

- Students are required to demonstrate engagement by getting over a threshold of some sort in their continuous assessment;
- However, their final module grade is determined by the module's examinable component alone.

Two models of formative thresholded assessment are being trialled:

(a) Students are required to demonstrate engagement by reaching a threshold (usually 30%) in, say, 5 out of 7 assignments;

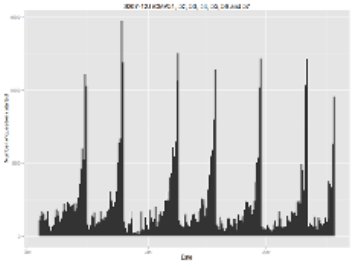
(b) TMAs and iCMAs are weighted and students are required to reach a threshold (usually 40%) overall.

Findings

- TMA and iCMA submission rates are slightly lower than with summative continuous assessment, but there appear to be no substantial changes as a result of the change in assessment practice;
- Students who submit all TMAs and iCMAs do better in the examinable component (unlikely to be a causal effect); however for some students, choosing to omit continuous assessment components in order to concentrate on revision appears to have been a sensible strategy;
- There were some problems when students were taking a module with summative OCAS and a module with formative OCAS concurrently, especially when TMAs were due on the same date;
- As an incidental side-effect of the project, we received some early warning signs of problems caused by the changing student population at level 1, and of overcommitted students at all levels.

iCMA engagement

Hard cut-off dates seem to be effective in maintaining engagement, even for a module where students only need to achieve 30% in 5 out of 7 iCMAs:

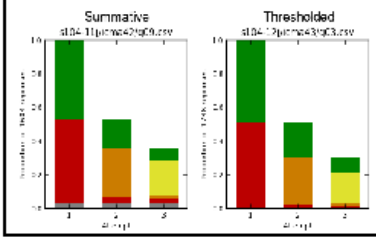


"The elephant in the room"

Many students and ALs have a poor understanding of our assessment strategies, including conventional summative continuous assessment. This is in line with a frequently found result that students have poor understanding of the nature and function of assessment (e.g. Carless. 2006: Orsmond & Merry. 2011).

Depth of iCMA engagement

So far there is no evidence that students engage less deeply with iCMAs in formative thresholded use than in summative use; there is substantially more variation between individual questions. Repeated colour = repeated response; green = correct; grey = blank; red, orange, yellow = incorrect.



Taking the work forward

- We are working towards greater consistency and transparency in Science Faculty assessment practice;
- We are emphasising the importance of personalised feedback on formative thresholded assignments;
- We are using 'assessment commentaries' to prevent full tutor notes being plagiarised when TMAs are re-used;
- We are retaining formative thresholded OCAS, but introducing a TMA (to assess e.g. writing up of practical work) into OES;
- Further evaluation is underway – see Allman et al. (2014) poster.

eSTEeM
exploring the frontiers of STEM education

References

Allman, S., Rostron, C., Budd, P., McIntyre, N., & Jordan, S. (2014) Associate lecturer and student views of Science Faculty feedback processes. Poster at eSTEeM Conference, May 2014.

Carless, D. (2006). Differing perceptions in the feedback process. *Studies in Higher Education, 31*(2), 219-33.

Orsmond, P. & Merry, S. (2011). Feedback alignment: Effective and ineffective links between tutors' and students' understanding of coursework feedback. Assessment & Evaluation in Higher Education, 36(2). 125-136.

Associate Lecturer and student views of Science Faculty feedback processes

Sarah Allman, Claire Rostron
Pam Budd, Nicola McIntyre, Sally Jordan

The Open University

A project with Scholarship of Assessment funding from the Study Experience Programme New Models of Assessment and Tuition Project.

The Problem
"All that effort but what's the effect?" (Price et al, 2010)
Like others we are concerned that our feedback practices may not be as effective as we would wish. We also suspect that students may not share our understanding of the nature and purpose of our feedback processes (Carless, 2006).

The Context
The Science Faculty hosted the Formative Assessment in Science Teaching (FAST) Project (http://www.open.ac.uk/fast/). More recently an MCT COLMSCT Project (Walker, 2009) found that students were unable to understand 27% of comments on TMAs. This project aims to investigate the current AL and student perspective.

We seek to identify student and AL views of our current feedback processes, in the light of changes in Science Faculty assessment practice. We will target students and ALs on carefully selected modules (SDK125, SDK228, S207 and S141), chosen because of the breadth of level, curriculum area, and marking and feedback style that they represent. SDK228 has summative OCAS whilst the other modules have formative thresholded assessment.
Project A will consider the student perspective and Project B will consider the AL perspective, using questionnaires and focus group discussions.
Planned outcomes:
(1) We will identify good practice, for circulation to module teams and to ALs via staff tutors, module teams and separately funded staff development meetings.
(2) We will make recommendations for advice to students (perhaps in the form of a podcast) on how to make use of TMA feedback.

Aspects of Science Faculty Assessment Practices that may be relevant:
1. Move to formative thresholded assessment (students need to get over a certain threshold in TMAs or OCAS overall) but their grade is determined by OES alone. One of the aims of formative thresholded assessment is to put greater emphasis on feedback.
2. The introduction of "Assessment commentaries" instead of full model answers for students who have given a weak answer or not attempted a question.
3. Learning outcomes grids.

Example of learning outcomes grid

Q3 (b) LO tested	Guideline requirement for a well demonstrated answer	Feedback
Ky1: Use mathematical skills	Clearly presented substitution of values and calculation, to give mass = 6.0×10^{-1} kg, in scientific notation to 2 significant figures	Learning outcome was well demonstrated
Kn2: knowledge and understanding of mathematical and statistical principles	Clear demonstration of how final units are obtained.	

Example of "Assessment commentary"
Advice for students who omitted Question 3(b) or gave an extremely weak answer:
You now need to substitute values into the equation you obtained in part (a), but first of all you should convert the value given in kW to W and the value given in minutes to seconds (s).
You need to express the final answer in scientific notation (*Maths for Science* Section 2.1), to an appropriate number of significant figures (*Maths for Science* Section 2.4) and with correct units (*Maths for Science* Section 3.4.4). To work out the correct units, you will find it helpful to remember that 1W = 1J/1s (*Maths*

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Carless, D. (2006). Differing perceptions in the feedback process. *Studies in Higher Education, 31*(2), 219-33.
Price, M., Handley, K., Millar, J. & O'Donovan, B. (2010). Feedback: All that effort, but what is the effect? *Assessment & Evaluation in Higher Education*, *35*(3), 277-289.
Walker, M (2009). An investigation into written comments on assignments: do students find them usable? *Assessment and Evaluation in Higher Education*, *34*(1), 67-78.

Flight of the Fritillary

Background

Open University (OU) scientists have been organising volunteers to count snakeshead fritillaries *Fritillaria meleagris* on North Meadow National Nature Reserve (Wilts) since 1999. Fritillaries are a rare species in Britain and are symbolic of a scarce floodplain meadow plant community found on less than 1500 ha in the UK. Our data show that on North Meadow fritillaries display a dynamic ecology, seemingly responding to changes in hydrology.

This member of the lily family relies on seeds for reproduction and its main pollinator is early season bumblebees. The reported decline of bumblebee populations may prove a problem for this rare plant. This project aims through volunteers, to better understand this relationship.

Objectives

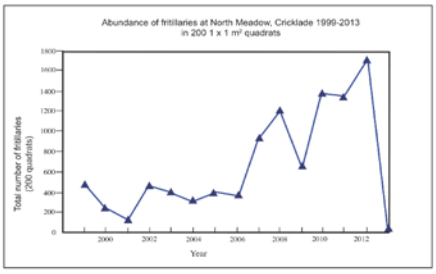
To determine trends in fritillary populations.
To explore the relationship between fritillaries and bumblebees.
To establish the value of volunteers in data collection.

Methods

1. Continue fritillary counts at North Meadow (200 1 x 1 m^2 quadrats).
2. Set up two new volunteer groups to count fritillaries; Clattinger Farm (Wiltshire) and Lugg Meadows (Herefordshire) with 100 1 x 1 m^2 quadrats at each site.
3. Establish volunteer bumblebee surveys at each site following the Bumblebee Conservation Trust's 'Bee Walk' method.
4. Observe bumblebee behaviour in April around fritillaries.
5. Run annual workshops to discuss findings with volunteers, gather feedback and shape the direction of the project.

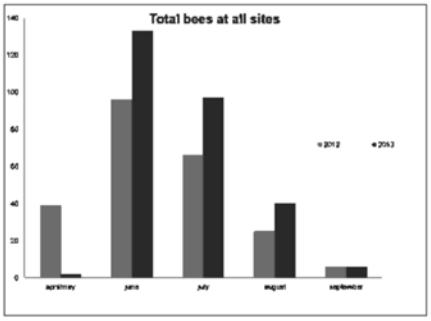
Results so far

Fritillaries



2012 saw the wettest year recorded in England since records began. North Meadow was under water for ten months. 1800 plants were counted in 2012 at North Meadow, but after this extreme flooding, only five plants were found. This generated a lot of national publicity as North Meadow holds 80 % of the UK's population of fritillaries and is a highly visited site. The count in 2014 will show us whether this species can remain dormant for a year and return undamaged.

In 2013, the counts at Clattinger Farm and Lugg Meadows were lower than in 2012, but not to the same extent as North Meadow and the number of flowering plants was actually higher at Clattinger Farm.

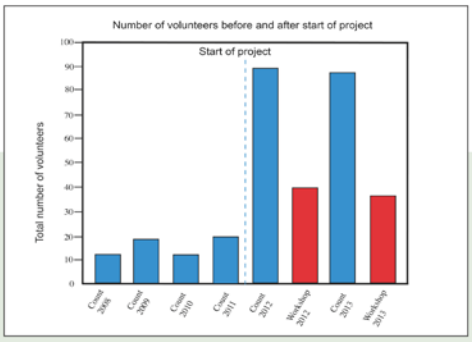


Bumblebees

The bumblebee surveys have become well established at two sites, but less regular at Clattinger Farm. All the common bee species have been recorded, plus one rarity at Lugg Meadow. The findings are shared with the Bumblebee Conservation Trust each year.

Volunteers

The volunteer counts have increased since we started the project, with heavy advertising in local press, wildlife trust magazines, websites and newsletters. However it is apparent that to sustain the numbers, regular re-advertising is required, otherwise numbers fall back to a small core of regular volunteers.



The workshops have been well recieved with good attendance at the Wiltshire workshop. More wide ranging advertising should be considered for the Lugg Meadows talk to encourage interest.

Next Steps

We want to continue the volunteer groups and possibly expand to a fourth site. We are looking to establish a webcam to observe pollinator behaviour in the field and we are encouraging groups of volunteers to observe fritillaries and pollinators for periods of time during April.

To volunteer as part of this project contact Floodplain-Meadows-Project@open.ac.uk

The OpenScience Laboratory
An initiative of The Open University and The Wolfson Foundation

3D Virtual Geology Field Trip

Tom Argles, Brian Richardson, Sarah-Jane Davies, Sara Hack, Shailey Minocha, Nick Braithwaite and Colin Chambers

Students experience Geology in 3D environment

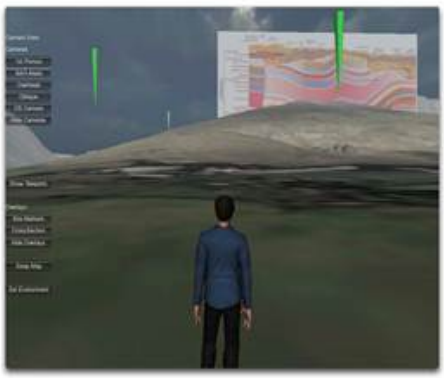
- authentic and interactive 3D simulations
- realism and high degree of fidelity
- virtual embodiment in the form of avatars
- visual and spatial experience not constrained by a 'flat' 2D user interface
- helps internalise the sense of exploration
- real-time interaction and collaboration

An immersive experience

- sense of space
- sense of presence, co-presence
- spatial perception of sounds
- feeling of 'flow' and sense of engagement
- collaborative and contextual learning

Opening up opportunities for students and educators

- practice for and reflect upon real life field trips
- learn by self-exploration and in teams
- seeing and doing what you can't in the real world
- cutaways into a mountainside to see the geology beneath
- flying across the landscape
- explore, observe and gather data within a context, e.g. using a virtual microscope



In partnership

The Open University

Skills articulation within a module: goal setting and reflection within assessment

Eleanor Crabb and Simon Collinson, LHCS, Science

This poster describes part of an eSTEeM project on "*Graduate skills in chemistry: online delivery, assessment and tracking*" which aims to embed the development of key 'graduate skills' in an incremental manner within an online chemistry curriculum. Skills will be embedded via assessment activities, with feedback.

As we are currently rewriting level 3 chemistry, it is timely to analyse how our students engage with a current reflective exercise on study skills as part of the assessment in *S347 Metals and Life*. In this exercise the students are required to initially score their current performance against the following key 'graduate skills' on a scale from 1 (= poor) up to 4 (= very good):

- *Time management*
- *Numerical skills*
- *IT skills*
- *Retrieving and handling information*
- *Written communication.*

Students then set themselves a *SMART* goal related to one particular area that they wish to develop further. They later reflect on their progress towards this goal as part of the final TMA.

Such assessment was summative but has now changed to be formative (with a threshold); initial evidence suggests that a reasonable number of students are still engaging with these activities.

Learning Outcomes

- To explore use of skills articulation, goal setting and reflection within a module.
- To discern, based on initial data, whether moving from summative to formative assessment effects the uptake of these types of activity.
- To reflect on students motivations for completing such activities.

Analysis of a typical tutor group

Note 2011 -12 used summative assessment whilst 2013 used formative.

Skill/ Number of students	*Time management*	*Numerical skills*	*IT skills*	*Retrieving & handling information*	*Written communication*	*Linking with prior knowledge*	*Did not engage*	*Average words per answer*
16 (2011)	10	2	1	2	1			258
14 (2012)	5		1	1	4	3		303
16 (2013)	11			3		1	1	232

Clearly OU students identify time management as a concern when balancing their study against other demands on their time.

It is also interesting that several students introduced a new topic '*Linking with prior knowledge*'.

Feedback relating to formative assessment

If we compare the mean scores for the final TMA between a year when it was summative against now when it is formative, we observe that there is only a slight fall upon switching to formative.

Additionally the mean score for the reflective question on setting a SMART goal is very similar.

Furthermore student feedback from a survey in the 12J presentation showed that 80% of students felt that the reflective and goal setting exercises were useful to them.

Our analysis shows that reflection and goal setting concerning key study skills is beneficial to students.

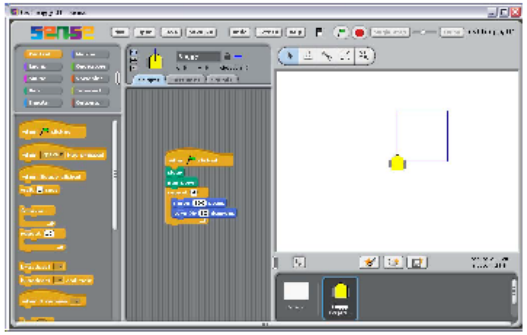
Engaging programming

Jon Rosewell, Computing and Communications, MCT

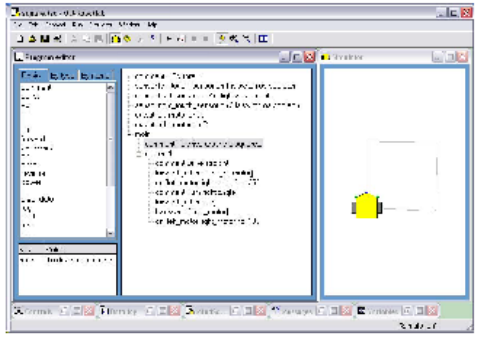
The Open University

TU100 and TM129 (and previously T184) are first-level courses that both include introductory programming. They have different programming environments: Sense for TU100 uses a full graphical metaphor whereas RobotLab for T184/TM129 has text-based drag-and-drop program construction. RobotLab offers a bridge to the syntactically more demanding conventional programming languages that students will encounter in higher-level modules.

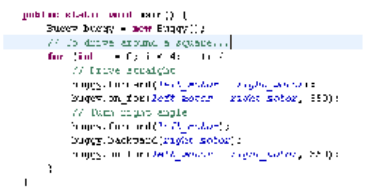
Programming is perceived as daunting and students may fail to engage with the programming aspects of an introductory course, which could lead to poor retention. Many students now study both TU100 and TM129; this provides an opportunity to probe how students engage with different styles of programming environment. Students can study the two courses with different permutations of start dates so they may encounter the two environments at different stages of their learning.



Sense for TU100: a graphical 'block' programming environment



RobotLab for T184/TM129: text-based drag-and-drop programming



Java: a conventional textual programming language

This project will take several approaches. Firstly, statistical analysis will probe pass rates, retention and TMA submission (eg patterns of late submission) and relate these to study patterns; that is students studying TU100 and TM129 consecutively, simultaneously or with overlapping calendars. Secondly, surveys and interviews will probe student attitudes to programming. Finally, feedback from tutors will be sought to highlight student problems.

This project should contribute to the debate about effective methods of introducing programming to Computing and IT students. By recommending the best sequence of experiences, the project may contribute to improved retention on the Computing and IT program. Students are now encountering programming in their first Computing and IT modules and it is critically important that we help them succeed and not fall at this early hurdle.

eSTEeM

exploring the frontiers of STEM education

NOTES

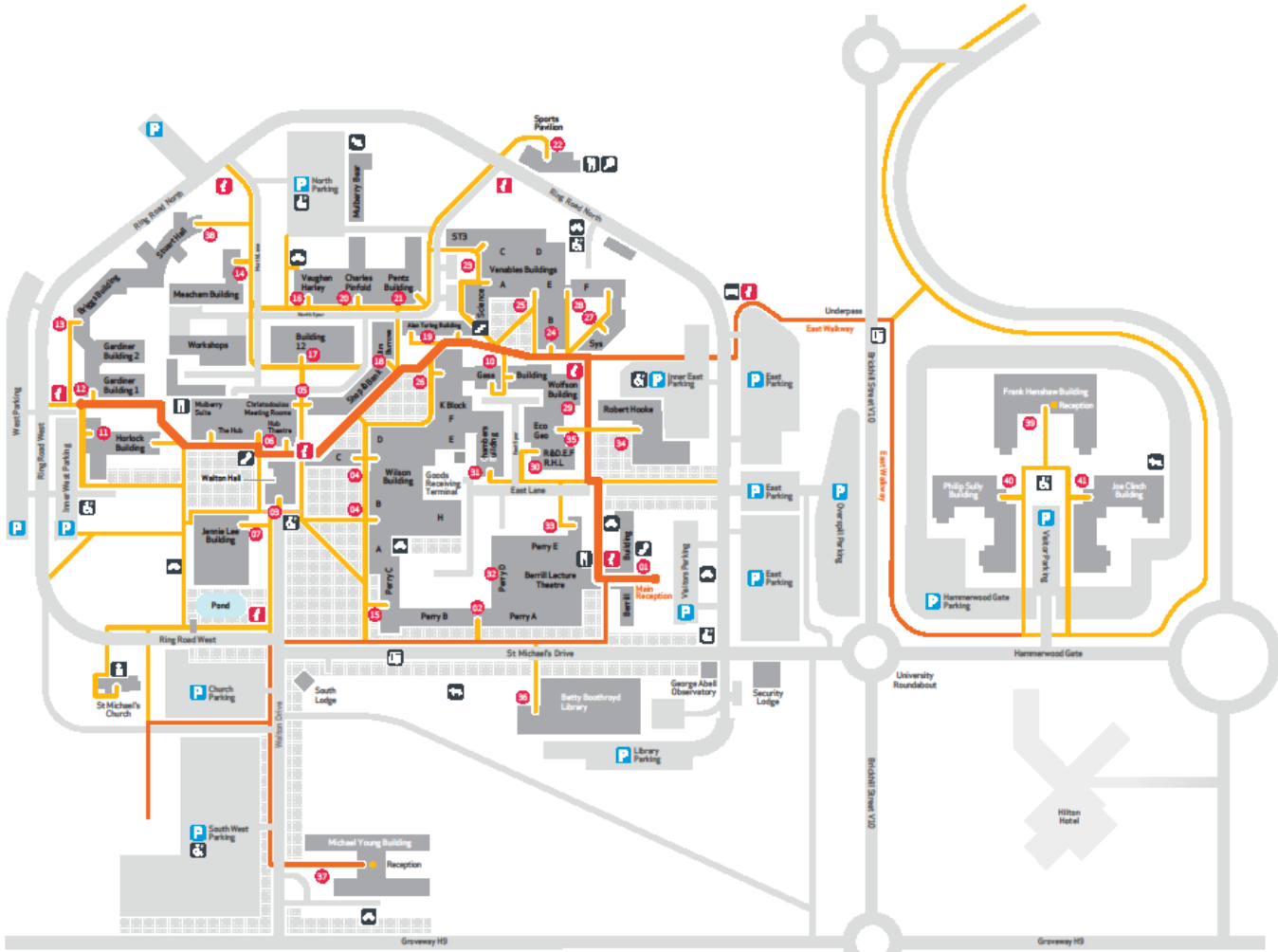
NOTES

OU CAMPUS MAP

Walton Hall
Campus Map

Key to Building Entrances

Alan Turing Building	19
Audio Recording Centre	39
Berrill Building	01
Berrill Lecture Theatre	01
Betty Boothroyd Library	36
Briggs Building	13
Building 12	17
Chambers Building	31
Charles Pinfold Building	20
Christodoulou Meeting Room	05
Ecosystems & Geobiology Labs.	35
Frank Henshaw Building	39
Gardiner Building 01 & 02	12
Gass Building	10
Horlock Building	11
Jennie Lee Building	07
Jim Burrows Building	18
Joe Clinch Building	41
K Block	26
Meacham Building	14
Michael Young Building	37
Pentz Building	21
Perry A	02
Perry B	02
Perry C	15
Perry D	32
Perry E	33
Philip Sully Building	40
R & D and Engineering Facility	35
Reinhold Hermann Labs.	30
Robert Hooke Building	34
Sports Pavilion	22
Stuart Hall Building	38
The Hub, Suites and Theatre	06
Vaughan Harley Building	16
Venables Entrance A & C	23
Venables Entrance B	24
Venables Entrance D	28
Venables Entrance E	25
Venables Entrance F & Systems	27
Walton Hall	03
Wilson Building	04
Wolfson Building	29



Key to Symbols

- Bus Stop
- Car Parking
- Car Parking for Disabled
- Bicycle Parking
- Childrens Centre
- Church
- Dog Run
- Gate
- Information Points
- Public Telephones
- Refectory
- Shop & Bank
- Sports Pavilion
- Stairs
- Building Entrance

Key to Walkways

- Footpath
- Central Walkway