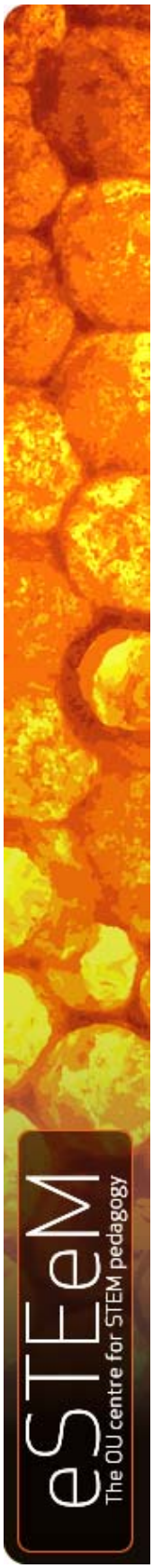

The Open University

The 7th eSTEeM Annual Conference 2018

STEM Futures: Delivering Excellence Through Scholarship

Conference Booklet

25-26 April 2018

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Open University Audio Visual, Events and Catering staff

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25 April 2018

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26 April 2018

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11.00 – 16.00	**Interactive Workshop: What can we do to make 'Digital by Design' work for us?**		**Hub Lecture Theatre**
16.00	**Close**		

WELCOME AND INTRODUCTION

Welcome to the 7th eSTEeM Annual Conference *STEM Futures: Delivering Excellence Through Scholarship*.

The aim of this conference is to highlight recent scholarship supported by eSTEeM and reflect on the future of STEM-specific teaching and learning in order to maximise the success of students in achieving their objectives and aspirations.

The conference programme for Day One is an exciting mix of short oral presentations, workshops and structured discussions showcasing work from colleagues in the STEM Faculty and wider university. Once again all conference delegates will be invited to vote for the best poster. New for this year will be our announcement of the winners of the eSTEeM Scholarship Projects Awards. Prizes will be awarded for projects in two categories;

- Innovation or innovative/original approach to teaching
- Enhancing the student experience.

The finalists and prize winners will be announced at the end of the day on the 25th April following the closing keynote session.

The success of our students lies at the heart of eSTEeM's scholarship activity; our portfolio of ongoing and new projects presented at this conference includes studies about the role of tutors, technologies for STEM learning, and online/onscreen STEM practice. The keynote lectures that open and close the day will address the wider STEM educational landscape. During the parallel sessions, the workshops, poster sessions and breaks for refreshment there will be plenty of opportunities for joining the STEM scholarship debate and we look forward to your contributions.

On our second day we will be running a specialist workshop which will focus on the theme of 'Digital by Design' and the challenges and opportunities we face as STEM educators in open and distance learning within this context. We anticipate that the workshop will surface a range of innovative and creative solutions to some of the issues faced by our learners, whilst reflecting on some of the opportunities that digital delivery may afford us in the future. We are delighted to be hosting a number of external and international colleagues for this innovative workshop.

We welcome you to our 7th eSTEeM conference and hope you have an informative, stimulating and enjoyable two days.

Clem Herman (left) and Diane Butler (right) eSTEeM Directors

OPENING KEYNOTE SPEAKER BIOGRAPHY

Tony Bates is currently a Distinguished Visiting Professor at the Chang School of Continuing Education, Ryerson University and a Distinguished Visiting Professor at the De Groote School of Business at McMaster University. He is also a Research Associate at Contact North|Contact Nord. He has almost 50 years' experience in using technology for teaching, starting in 1969, when he began researching the effectiveness of the BBC-Open University television and radio programs, as a founding staff member of the British Open University, where he became a full professor in educational media research.

In 1989, he emigrated to Canada, to take the position of Executive Director, Strategic Planning and Information Technology at the Open Learning Agency, Vancouver. In 1995 he moved to the University of British Columbia, to become Director of Distance Education and Technology. On retirement from UBC in 2003, he started his own consulting company, specializing in the planning and management of learning technologies in post-secondary education. He has worked as a consultant in over 40 countries. He has received honorary degrees from six universities for his research in distance education.

He is the author of twelve books on learning technology, online learning and distance education, including his latest online, open textbook for faculty and instructors, 'Teaching in a Digital Age'. The book, first published in April 2015, has been downloaded over 100,000 times and is being translated into ten languages.

In 2017 he led a team of independent Canadian researchers that conducted a national survey of online and distance education in Canadian universities and colleges.

Website: Online Learning and Distance Education Resources (www.tonybates.ca)
email: tony.bates@ubc.ca; tonybates@ryerson.ca

CLOSING KEYNOTE SPEAKER BIOGRAPHY

Dr. Rienties is Professor of Learning Analytics at the Institute of Educational Technology at the Open University UK. He is programme director Learning Analytics within IET and head of Data Wranglers, whereby he leads of group of learning analytics academics who conduct evidence-based research and sense making of Big Data at the OU.

As educational psychologist, he conducts multi-disciplinary research on work-based and collaborative learning environments and focuses on the role of social interaction in learning, which is published in leading academic journals and books. His primary research interests are focussed on Learning Analytics, Computer-Supported Collaborative Learning, and the role of motivation in learning. Furthermore, Bart is interested in broader internationalisation aspects of higher education. He has successfully led a range of institutional/national/European projects and received a range of awards for his educational innovation projects.

CONFERENCE INFORMATION

Registration
Conference registration will take place between 9.00 – 9.30 on Tuesday 25th and Wednesday 26th April in the Hub Reception. There is a map of the campus on the back cover of this booklet.

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 Hub Reception throughout the conference to help you with any queries that you may have.

Conference sessions and recordings
The opening and closing keynote presentations on day one will be webcast 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.

Poster Presentations
There will be a poster presentation session during lunch between 13.15 –14.30 in the Hub Lecture Theatre on the 25th April. Conference delegates are invited to vote for the best poster. The winning poster will be announced at the end of day on the 25th April after the closing keynote presentation. Posters will continue to be displayed throughout 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, mid-morning and afternoon tea, and a buffet lunch on both days.

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 Keynote Presentation

Digital Learning in an era of change: challenges and opportunities for STEM teaching and The OU

Tony Bates
Ryerson University, Toronto

There are major changes happening in teaching and learning in higher education. In Canada and the USA, online learning and distance education are ubiquitous. In particular, online learning is breaking down the distinction between distance and classroom teaching. Instructors are experimenting with low-cost, easy to use technologies for teaching, especially in the STEM subjects. The presentation will look at some of these developments and what they might mean for the Open University.

Parallel Session A: Short Oral Presentations – *Supporting Students*

Lessons in Retention and Success: Using video media to influence students – a story of effort, challenge and reward from S282

Helen Fraser, Jessica Bartlett, Mark Jones, Simon Green and Kate Bradshaw
STEM Faculty

S282 is a second level Module in "Astronomy". It is often the first 2nd level module students attempt, and although popular media might lead people to believe astronomy is pretty pictures and 'fluffy' ideas, it's actually a rather rigorous science with a strong background in Physics and Maths. S282 attracts not just OU students on a qualification pathway in Astronomy and Planetary Science (such students make up less than 25 % of our cohort), but a huge number of leisure learners, certificate students, and Open Degree students for whom this might be their first (and last) science module - and probably not quite the package they are expecting when they choose to, are encouraged to, or in desperation advised to, sign up. It is in this quagmire of student diversity that the S282 team have battled for many years with stubbornly low retention and pass rates as student numbers have fallen, and the challenge of keeping the exceptional and interested engaged. So, without compromising quality (given that the course, its books and content are well respected by the UK and international Astronomy communities), how do we take a part-time distance learning model and (a) improve pass rates and (b) retain as many students as possible, whilst ensuring that they successfully complete S282? And how can we kindle the 'love' of Astronomy that sparked students to come to the OU initially, whilst students are bogged down in the daily circle-squaring of simply studying the module and keeping up?

In 2017J we have built on the successful changes made to the assessment strategy and workload on S282 in earlier presentations. I'll briefly outline where we were at, by the end of 2016J, when, under Prof. S. Green's efforts, S282 moved to a module whose assessment strategy led to improved pass rates, provided students reached the exam. As incoming chair I was faced with the challenge – how to retain more of a decreasing number of students, and how to ensure that whilst they were retained, students passed and enjoyed the course.

In 2017J this has been our focus as a module team. With CM, ST, MTC and all the ALs and academic module team on board we have been putting 'students first' and trying a number of methods to engage and retain our students. From the S282 boot-camp (discussed elsewhere in the Esteem conference) to camel emails, MILLS interventions and tutor calls and emails, we have deployed all the usual weapons to try and keep students on track. But we have also tried two new innovations: (a) weekly chair's video messages (b) reflective practice on TMAs. These video tools have been produced by the module team without additional finance or resource, to try and help students, in a different and engaging way. In this presentation I'll demonstrate a few of the videos, talk about the student engagement and feedback, and discuss the impact of the media-led approach on student retention, engagement and success.

Evidence that 'Boot Camps' can help student retention and progress – the S282 story

Tom Wilks, Helen Fraser and Jessica Bartlett
STEM Faculty

S282 (Astronomy) is a Level 2, 30 credit, 'J' presentation. it has become evident that there is a significant proportion of students who are wholly unprepared for much of the content of this module, particularly applications of Maths and Physics. Furthermore, whilst there have been many attempts over the years by all staff concerned to reassure students as to the relatively light content of the Maths and Physics (roughly equal to GCSE study), there are few indications that the provision of extra study material, for example 'Are you ready for S282?', has been accessed by students.

Therefore, we decided to trial a 'Boot Camp' targeted to help all students engage at the very beginning of the 2017J presentation. I was tasked to adapt the existing resources and create new ones/adapting from other modules. This was carried out in frequent liaison with the new Chair of S282, Helen Fraser and, at the same time, Jessica Bartlett designed a dedicated platform for the resources of the Boot Camp (a dedicated asynchronous forum and a synchronous Adobe Connect (AC) room). The first CAMEL mailing was sent in early September 2017 to all registered students and the second CAMEL mailing was sent to 'late' registrants 3 days before the boot camp start.

The boot camp materials were delivered entirely on this web-page / forum online format. 28 AC recordings were made before the start of the boot camp and these were embedded within 6 specific forum posts, covering the key study skill areas the boot camp was designed to address. Hyperlinks within these posts took students direct to the appropriate module materials. During the course of the Boot Camp an extra 3 forum posts were created, one specifically for student feedback, and all of the material remains accessible throughout this presentation as reference material.

The statistics are impressive. 102 students watched 1 or more of the 28 recordings. This is 42% of those registered at the start of the S282 course. The 'Are you ready for S282?' recordings (12 in total) attracted 632 viewings, with an average of 10 viewings per student. The most popular background information was related to maths skills. An 'ad hoc' AC tutorial was also added during the boot camp week; 20 students attended this session and 54 students watched the recording.

As a consequence of the boot camp we can see that to date, no student who engaged with the boot camp has withdrawn from the course. TMA1 submission was significantly higher in this presentation (as a fraction of those remaining registered at TMA01 submission); 97% of students in 2017J compared with 91% in 2016J, and attendance at the first module wide tutorial forum was > 40 %. The boot camp website has also aided tutors with their feedback and student support.

In this presentation I'll discuss these approaches, focus on the student engagement and feedback directly as a result of this Boot Camp and beyond, and discuss potential future actions to further improve student retention.

The experience of running a Level 1 flexible start for Introducing Statistics (M140)

Carol Calvert
STEM Faculty

Our Open University students come with a wide range of personal, social, cultural, educational and employment backgrounds. In some cases, the combination of such circumstances means that a student decides to register several months in advance of the start of a module they wish to study. Frequently the University then does little to help that student, build on their enthusiasm and confidence and, in some senses, "reward" their commitment. Whilst initiatives such as our "Freshers' week" have been introduced we still rather neglect some students for several months and then ask them to begin the module, and increasingly at least one other module, at a fixed date in October.

It seems at least feasible that some students would like to take advantage of a facility to start their study on a much more flexible basis. Students have expressed views that it is "good" to get ahead with study if possible and this pilot has given students on M140 an opportunity to start their study on a rolling basis, at a time of their choosing and up to three months in advance of the usual module start. The approach is different to that of the several "revise and refresh" option running in STEM because it offers a tutor supported, flexible start, and uses the actual module materials.

Around 400 students were offered the opportunity of a flexible early start and just over two hundred students emailed that they would like to do. An over represented group within those that did take part were students who already had some OU credits. It might be argued that such students were already aware of the high October workload and they seemed to wish to minimise it- using their time over the summer. Responses were overwhelmingly positive with students attending online tutorials, using forums, loading and using module software and studying early Units with tutor support.

An important consideration was equality of access to the pilot. The pilot was designed to be open to all students registered before a certain date, regardless of the student's geographical location. We were aware that, by delivering access only electronically, it was not be possible for some groups of student to participate i.e. some disabled students, SiSI students etc. This limitation would need to be addressed for any further flexible start programme.

Improving retention amongst marginal students.

Elaine McPherson[1], Carlton Wood[1], Anactoria Clarke[2] and John Butcher[2]
STEM Faculty[1], LTI[2]

At last year's conference, the research team presented our scholarship concerning how studying the STEM Access module helps students prepare for their level 1 science studies, and we particularly found that greater confidence overall, more confidence in maths skills, and a knowledge of the tutor role all contribute to students feeling ready to study science at undergraduate level. This year we will present our further research and findings, in which we

have examined the effects of studying Access on students' TMA and iCMA scores, their retention, and their engagement throughout the level 1 science module. We will demonstrate the links between our qualitative findings from student and tutor interviews and the quantitative data of scores and submission percentages, and make recommendations for this institution and suggestions for the sector on how students without traditional entry requirements can be both encouraged and retained.

Parallel Session B: Short Oral Presentations – *Technologies for STEM Learning & Equality, Diversity and Inclusivity*

Haptic Prototype Assembly Tool for Non-Sighted, Visually Impaired and Fully Sighted Design Students, Studying at a Distance.

Lisa Bowers[1], Ryan Hayle[1], Nick Braithwaite[1] and Farshid Amirabdollahain[2]
STEM Faculty[1], Hertfordshire University[2]

Designers use a blend of analog and virtual processes to produce a design prototype solution. The rise of virtual and haptic prototyping tools indicate a potential for the use of haptics for creative human computer interaction (HCI). Thereby allowing designers to feel more 'hands-on' with the virtual modelling processes. This paper presents an investigation of an inclusive educational haptic tool and interface. Using a Geomagic Touch™, a haptic interface was designed to facilitate the initial design process for non-sighted - visually impaired (NS-VI) and fully sighted (FS) distant learners. The student participants involved in this study were all registered to design modules at The Open University (OU). This paper initially analyses the viability of the tool via a formative and qualitative testing with design academics. This was followed by a main study examining manual prototyping (MP) and virtual haptic prototyping (VHP) results. This paper analyses the results of 'time' taken to assemble a four block prototype, and the number of collisions (error) between block shapes during assembly. Time was recorded as time in both modes was taken as assembly time of the complete prototype. A between groups analysis was examined. Results showed that although the MP was completed at a faster time than VHP it was only approx. (+/-) 60secs difference. It was also shown that NS-VI participants produced similar average time in the VHP mode to their fully (FS) sighted peers, with only a slight difference in collision errors.

Implementation of sonifications on a live module

Karen Vines[1], Chris Hughes[1], Carol Calvert[1] and Chetz Colwell[2]
STEM Faculty[1] and LTI[2]

A sonification is a representation of a graph using (nonverbal) sound. A previous eSTEeM project explored the potential of sonifications to improve the accessibility of OU modules. That study showed that students were able to derive meaning from sonification. More importantly the study showed that the provision of alternatives for those with severe visual impairments requires a blended approach: sonifications, to provide the gist of a plot; tactile representations, to allow interrogation of plots; and figure descriptions, to provide detail (Vines et al 2016).

However what that study could not address was the impact of including sonifications on a live module, nor did it explore the feasibility of including sonifications via the VLE. So in this talk we will describe a follow-up eSTEeM study to examine just these issues. We will show how we managed to incorporate sonifications of plots in Unit 5 of M140 Introducing Statistics so that all students enrolled on the 17J presentation could access them (not just those with declared disabilities).

We will also discuss the student reaction to the sonifications. In particular the responses to a short questionnaire, placed on the M140-17J module website, that students were invited to complete. This questionnaire not only asked about the usage students had made of the sonifications during their study of Unit 5, but how useful they found them and whether they'd like to see more of them.

Addressing the disability attainment gap: Scaling up inclusion across the STEM disciplines

Trevor Collins[1], Anne-Marie Gallen[1], Kate Lister[2], Gareth Davies[1] and Kate Bradshaw[1]
STEM Faculty[1], LTI[2]

Analysis of the data collected nationally by the Higher Education Statistics Agency grouped by mode of study, age, sex, disability, ethnicity and socio-economic background, has identified a series of differences in degree outcomes affecting specific student groups. These differences have been referred to as 'attainment gaps or 'degree awarding gaps'. In response, a set of 17 projects are currently being funded through HEFCE's Catalyst programme to investigate and address the barriers to student success. In the 'Embedding and sustaining inclusive STEM practices' project, The Open University is working with The University of Leeds and Plymouth University to evaluate and promote inclusive approaches to STEM education as a means of addressing the degree awarding gap experienced by students with disabilities.

The project team have collated and reviewed policies and procedures, and undertaken a set of surveys with groups of staff and students involved in the design, delivery and completion of modules at each partner institution. At the OU, a series of meetings were held with the Head of School and Director of Teaching in the six STEM Schools to gather disciplinary perspectives on the inclusion of students with disabilities. From these findings, a set of fourteen potential case study topics were identified, eight of which have been selected for development during the second year of the project. The focus of the project is to work with colleagues across the sector to collate and disseminate examples of effective inclusive educational practices in these topic areas.

Specifically, we will explore accessibility and inclusion in the contexts of:

- online practical work (e.g. supported by the OpenSTEM labs),
- the specification of inclusivity in new modules,
- the language of disability and inclusion valued by staff and students,
- the development and implementation of accessibility policies,
- the procurement and deployment of online tuition platforms,
- methods for sharing knowledge of accessibility and inclusion within disciplines,

- approaches to inclusion within group work contexts, and
- examples of inclusive teaching and alternate learning experiences in degree accreditation.

This presentation, will provide an overview of the findings from the surveys and the interim outputs from the above case studies.

Student perceptions of the language of disability, deficit and empowerment

Anne-Marie Gallen[1], Elaine McPherson[1] and Kate Lister[2]
STEM Faculty[1], LTI[2]

This presentation reviews the results of an ongoing project which seeks to understand disabled students' language preferences, with an aim of better supporting disabled students throughout their studies. The aim of the project was to investigate the language that students feel comfortable using when talking about their disabilities and to identify gaps between the language students themselves use to describe their own disabilities and the social-model language currently used by Open University systems and staff. The project team posit that gaps between these language models create an unnatural and potentially uncomfortable environment for students disclosing disabilities and discussing needs.

The short oral report looks in particular, at the language **STEM** students use to speak about disability and study needs. Participants were invited to take part in focus groups, including a subset of STEM students, and were given specific tasks relating to the written communication the Open University has with disabled students and enquirers. Participants were asked to design (and write) these communications without being given a language model, meaning they generated their own language. The sessions were recorded and transcribed and the language was analysed using discourse analysis in order to a) identify what words and phrases were used and in what way, and b) create language models to inform the second stage of the project.

In the second stage, the different models of language identified in the focus groups were distributed to 8000 students who self-identify as 'disabled'. This stage built on the first stage, as a much larger number of students were reached, including a further subset of STEM students. Students were asked to self-declare their language model preferences in various scenarios in which they would discuss their disabilities and study needs with the Open University and negotiate Reasonable Adjustments. This is the first opportunity to share the outcomes of the research with respect to STEM and to offer a comparison with the outcomes across the University.

Parallel Session C: *Structured Discussion/Briefing – Employability*

Employability skills: Myth, Monster or Misunderstanding?

Frances Chetwynd, Fiona Aiken and Helen Jefferis
STEM Faculty

At a recent conference the question was asked "What is a university for?" (Marshall, 2017). The answer offered was that higher education needs to include not only core skills for each discipline but also wider graduate skills that employers require. However, does our current approach to employability skills development for STEM undergraduates work, given the poor employment rates for STEM UK graduates?

In this session we will start by considering what are the key employability skills for STEM graduates? Participants will be asked to develop a cross-disciplinary list, rating a top ten for STEM. This will then be compared to reported employers' requirements for example from the Edge Foundation (Lowden et al, 2014) and participants will discuss the differences and how these misunderstandings arise, drawing on the Wakeham Review (2016).

In the second section the discussion will focus on how we teach employability skills in the STEM Faculty at the OU. The conclusions from the Shadbolt review of computer sciences degree accreditation and graduate employability (2016) will be considered and participants will be asked if we are adopting the right approaches. Do we successfully engage students or do they fail to even recognise the skills being taught, preferring to merely behead the employability monster in TMAs?

Finally, we will ask if it is a myth that employability skills can be 'taught' at all in academia. Returning to the top ten list developed at the beginning, participants will consider which skills might be more effectively gained through work placements and internships, and whether we can help our students to more effectively identify the graduateness they will have developed by their graduation.

Delegates will leave the session with a clearer understanding of what employers in STEM consider crucial skills in their graduates, how we are teaching this within the STEM Faculty and where we can improve our practice. Academic teaching staff, support staff and students would all be warmly welcomed at this discussion session.

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Parallel Session D: *Structured Discussion/Briefing – Academic Professional Development*

Supporting scholarship in the STEM Schools

Arosha Bandara, Uwe Grimm, Arlëne Hunter, Sally Jordan, Robert Saunders and David Sharp
STEM Faculty

In this session, we invite colleagues to discuss how we can best support colleagues with their educational research and explore what can be done to promote scholarship activity more widely within STEM.

Parallel Session E: Short Oral Presentations – *Employability & Communities of Practice*

Cushions in the workplace? What vocational students need to succeed

Hilary MacQueen and Fiona Aiken
STEM Faculty

The OU has a history of teaching students in the workplace, for example in nursing qualifications, and in Foundation degrees. The support needed by such work-based students differs from the traditional model of academic support from Associate Lecturers, and these students require much more work-focussed and pastoral support, for example by a Mentor or a Practice Tutor. This has implications for module costings and staff workload.

In an attempt to identify factors contributing to student success on work-based modules we have undertaken a survey of graduates of the OU's Foundation degree in Paramedic Sciences. This qualification ran successfully for 10 years, but has now been withdrawn. The capstone module was a work-based module (S211 Developing your paramedic practice) during which students were required to achieve academic success, assessed by TMAs, iCMAs and a Project. The students also had to complete more than 150 work-based activities and to attend 4 weeks of placements at various healthcare locations in order to achieve competence in practical skills. The success rate of S211 was high (>80% overall) but students anecdotally found the module very difficult. Our survey asked them about the factors they found most influential for their success, about the workplace support they received, and for any advice they would give to other work-based students. Graduates of the qualification were asked to complete a survey that included categorical, semi-quantitative and open-ended questions.

Our results suggest that the most important factor for these students was time. The Ambulance

Trust employers did not allow dedicated study time, and since the students worked shifts and often had to undertake overtime they found it difficult to fit in time for effective study. Other important factors that emerged included the organization of placements, the role of the workplace Mentor, and the sense of belonging to a cohort of peers.

These results will be discussed in detail, and we will demonstrate that the emerging messages have implications for future Apprenticeships.

Skills progression in practical science within the Life Sciences; do students recognize the skills they have developed as employability skills?

Janet Haresnape
STEM Faculty

In the Level 2 module S295 (The Biology of Survival), students undertake a practical field project in which they follow a set protocol, and collect, analyze and interpret their results. In the Level 3 module S317 (Biological Sciences: from genes to species), students design and carry out a more challenging follow-up investigation, which gives opportunities to build on the skills acquired at Level 2.

Students who had passed both S295 and S317 were surveyed to identify practical and problem-solving skills they had developed in the S295 investigation, how these helped them successfully complete the more challenging S317 investigation, and whether they could articulate the skills acquired. This explored to what extent the method used to develop progression of practical skills from Level 2 to Level 3 in the Life Sciences degree pathway has been successful, and has contributed to development of students' employability skills.

Although not all successful students seemed aware that they were developing employability skills as they undertook the practical investigations, others articulated them well. Full analysis of the responses should help us to explore the effectiveness of the embedded skills progression within the Life Sciences pathway, and improve ways of emphasizing their relevance to employability.

Teaching of competencies or teaching for capability? Transforming pedagogy in a changing landscape of professional practice

Rupesh Shah[1], Jitse Van Amejide[2] and Martin Reynolds[2]
STEM Faculty[1], LTI[2]

Since 2014, the Applied Systems Thinking in Practice (ASTiP) group has been working on a series of eSTEeM projects to enhance pedagogy.

An initial eSTEeM project (2014-2016) reported on in Reynolds et al (2016) highlighted the challenges of enacting systems thinking in practice (STiP) in the workplace after qualifying with STiP core modules.
Within a changing landscape of professional practice, we have come to recognise that the work of

'teaching' competencies to individuals needs to be contextualised by a wider framework of building capabilities for systems thinking in practice. A second phase of work then ensued in which we sought to formalise an externally validated 'competency framework' for professional recognition of systems thinking in practice (Shah and Reynold (2017). We began to question our role, noticing that developing a framework that would be 'in competition with other frameworks' may not be the right approach. We stepped back from this and sought to act as convenor and facilitator of dialogue between different designers. Then, in the midst of negotiating this alternative role, the possibility of work on an apprenticeship standard for systems thinking in practice was mooted.

These other initiatives, then, have shifted us away from solely being 'teachers' of competency – a phenomena that might be located within the individual learner and hence which might be developed through a relationship between educator and learner. Instead we have begun to think about a framework for building 'capability for systems thinking in practice' – a phenomena which arises out of a complex set of relationships between learner/practitioner, co-learners, colleagues, line-manager and institutional settings. In that sense we have widened our role with respect to the landscape of professional practice within which our students may be embedded.

Most recently the STiP team has also begun to think about the renewal of the curriculum, due for 2020. One direction that is emerging is to recognise that our teaching can integrate this second-order perspective of 'developing the field', such that students are asked to engage directly with the questions about influencing the landscape of professional and institutional practice within which their competencies for systems thinking in practice would be expressed. As such, this represents the shift to 'teaching for capability'.

What aspects of a team make it a Community of Practice?

Sue Forsythe
STEM Faculty

A Community of Practice (CoP) is a learning community within a specific area of practice (Farnsworth, Kleanthous and Wenger, 2016). Individuals within the community negotiate their identity as members through demonstrating competence in the practice and through taking part in negotiating the meaning of what that practice entails (ibid).

In this presentation I will describe how the module team of tutors and academics on a specific OU module act as a Community of Practice. Using Wenger's (2011) summary of Community of Practice (CoP) which sets out the three main components of a CoP as Domain, Community and Practice I will show how the module team work effectively as social learners to develop their skills and manage changes in their work practices, in particular having to learn how to use a new online platform for student tutorials and how to facilitate increased student participation in the tutorials. Team members seek advice from and support each other in learning through the medium of online tutor meetings. On listening and transcribing the recordings of the tutor meetings these examples of social learning which happen in the CoP are evident. So too are the individual negotiations of identities as members of the group and the shared understanding of what it means to be a tutor on the team and negotiating the practices of the team's working

norms.

Schwen and Hara (2003) show how online platforms can be a good meeting place for the formation of a CoP and clearly this is most appropriate for OU tutors who live and work all over the UK. Although most of the team have met face to face on rare occasions they usually meet online and do so regularly. It is clear from the recordings of online tutor meetings that the members of the team share a good working relationship and they also share the important goals of supporting their students through their studies. In addition there were clearly other more tacit goals of forming the identity of the team, its agreed practices and members' individual places within it, an aspect of CoPs identified by Schwen and Hara (2003).

Finally the COP described here has happened naturally, which is to say that it has not been deliberately set up, nor has the concept of Community of Practice been sold to the group members in any way. Community of Practice as a way to learn through experience of negotiating meaning (ibid) seems to be a serendipitous finding in this case, but there may be lessons we can learn for facilitating CoPs in other contexts.

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Parallel Session F: Short Oral Presentations – *Online Delivery, Tuition & International Curriculum Delivery*

Synchronous online tuition: Differences between student and teacher expectations and experiences

Lynda Cook, Diane Butler, Vikki Haley-Mirnar, Catherine Halliwell and Louise MacBrayne
STEM Faculty

Online synchronous tuition in the distance learning context is thought to provide many benefits for the learner. These include opportunities to engage with peers as well as with teachers, while enhancing learning and skills development. Our recent research has suggested that some of these opportunities are rarely valued by students. We have further explored student perceptions of online tuition and systematically examined student learning behaviours in online classrooms. Our findings suggest that whilst students appreciate some of the benefits of this approach, such as the ability to view recordings of online tutorials after or instead of attending live events, many appear to have a set of expectations of successful online tuition which conflict with our view as teachers. In particular conflict are the teacher and student view of the merits of peer to peer learning. The aims of this session are to describe the differences found between student and teacher

expectations and experiences as applied to tuition in online settings and to discuss implications for this mode of delivery.

Understanding tutorial observation practice

Chris Douce
STEM Faculty

Tutorials and day schools, whether they are online or face to face are important; they can make a significant difference to the student experience. This presentation describes a project to capture and understand the practice of tutorial observations from two different perspectives: the perspective of the distance learning tutor (who is the subject of tuition observations), and the perspective of the line manager or staff tutor (who is often charged with carrying out an observation). The project aims to understand what happens during an observation; understand what good observation feedback is; understand what considerations need to be made regarding the observation of online tutorials; how to observe team teaching and offer feedback that is appropriate and useful for lecturers and how to best influence and develop teaching practice. The presentation begins with a description of a literature review study. This is followed by a summary of a series of focus groups that were designed to elicit opinions and perspectives about tuition observation practice. The discussions that took placed in the tutor focus groups can be summarised by a set of keywords: purpose, importance, dimensions, acknowledgment, dialogue, frequency, practicalities, negotiation, feedback, differences, opportunities and connections. The keywords that related to the themes that were exposed during the staff tutor focus group are: philosophy, relationships, dialogue, guidelines, feedback, online, experience, priority and opportunities. The focus groups also helped to identify a set of practice recommendations that were specific to STEM. The paper then concludes with a summary and pointers towards further research.

An International Comparative Study of Tuition Models in Open and Distance Learning Universities

Ann Walshe
STEM Faculty

I will report on the outcome of research carried out as a Visiting Scholar at the Institute of International Exchange, Shanghai Open University (SOU), during the Shanghai Open University International Staff Exchange Fellowship Program (International Visiting Scholar Program) from 13th to 24th November 2017. The visit was generously funded and supported by eSTEeM.

The purpose of this comparative study was to gain an insight into the similarities and differences between distance education in Shanghai Open University in China (SOU) and distance education in the Open University in the UK (OU), and how each institution sees tuition evolving in the future so as to provide the best possible learning experience for students. By comparing the OU tuition model with that of SOU and other parts of the world, it may be possible to develop a new adaptable model that can be adapted to our respective educational cultures.

There are many similarities between SOU and OU. Both use blended learning, are tending towards more online provision and are working towards a more personalised study experience.

SOU and many other Open and Distance Learning universities attach great importance to face-to-face provision, particularly for motivating open entry students and helping them develop their study skills.

The SOU provision for disabled students is specialist and successful, while the OU teaches all students inclusively. Can these two approaches complement each other? As teaching moves online does it become easier to integrate disabled students into mainstream groups? Does online teaching disadvantage some students?

Social media plays a significant role in SOU tuition. Students belong to a self-moderating WeChat group along with their teacher, who can share links, documents, photographs, messages etc. WeChat is a free, widely-used Chinese social media mobile messaging app similar to WhatsApp. Using WeChat makes the teaching resources easily accessible to students via their mobile phone.

With a shift to online classrooms, there is a need to improve expertise in the area of online teaching, particularly in having more interaction with the students and in providing a customised service to the students, that is, adapting to the different learning preferences of different students.

Unpacking STEM students' experiences and behaviours using internationalised academic content

Jenna Mittelmeier[1], Garron Hillaire[1], Bart Rienties[1], Dirk Tempelaar[2] and Denise Whitelock[1]
LTI[1], University of Maastricht, Netherlands[2]

There are increasing pressures and incentives for universities to internationalise their curriculums through the incorporation of international and intercultural elements, a subject of extensive scholarly discourse (see, for example: Harrison, 2015; Leask, 2009). One frequent focus of internationalisation is the diversification of content in classroom assignments (Dunne, 2011), such as by including materials from other cultures and countries. Indeed, research has suggested that such internationalised academic content may help build students' intercultural competencies over time (Caffrey, Neander, Markle, & Stewart, 2005; Tran & Pham, 2016). However, no known research has compared student behaviours and reflections between assignments with locally-based (i.e. host country) versus internationalised content, making it difficult to measure the actual added value of internationalisation. To address this gap, we conducted a randomised control trial study with 428 undergraduate students in an introductory statistics course to compare behaviours and experiences when working with local versus internationalised content during a small group task. After the activity ended, participants completed a 2-hour reflective post-activity on their own about their group work experiences. At eSTEeM 2018, we will highlight differences in student behaviours when using different types of diverse academic materials, along with a comparison of student reflections on their group work experiences.

Parallel Session G: Workshop/Demonstration – *Equality, Diversity and Inclusivity*

Getting in and getting on: gendered participation and achievement in STEM learning

Clem Herman and Carol Morris
STEM Faculty

This workshop draws on the experience and learning from two eSTEeM projects which are investigating gendered participation in engineering and Computing/IT degrees at the OU. We look at what we are able to do to support women STEM students in achieving in learning, but also in employability, and their transitions to employment and successful careers.

Data from across the sector shows women continue to enrol in lower numbers and the OU is no exception. Having identified some key issues through the work of Athena SWAN teams in E&I and C&C, two projects have been working in parallel to seek ways that we can support our women students more effectively. In this workshop we will explore the motivations that lead women to select engineering or IT/Computing and look at how we might increase and make a step change in the numbers of women enrolling on our courses. The lessons from these projects are of particular relevance now with the OU taking part in the new Institute of Coding which has a target of increasing numbers of women studying these subject areas.

Parallel Session H: Short Oral Presentations – *Supporting Students, Online/Onscreen STEM Practice and STEM Engagement*

Using a dedicated subject website in the continuing evolution of the mathematics and statistics community of learners

Rachel Hilliam and Gaynor Arrowsmith
STEM Faculty

The School of Mathematics and Statistics has a long tradition of engaging students outside of the 'classroom' environment. As universities looks at ways to engage students in curriculum delivery and development together with their student experience, the School of Mathematics and Statistics has been using an online website and forum to create what over the years has become an active and vibrant community of learners for this very purpose.

In the early years of the Open University annual meetings were held in each of the OU's numerous nationwide tutorial centres to help students choose their next course(s). These well-attended and lively meetings would give students the chance to talk to academics, support staff and, indeed, each other about the content of future modules and to discuss their options in different subject areas. During the 1990s, attendance at these events diminished not least as the use of the internet increased particularly in the context of distance learning. The School of Mathematics and Statistics embraced this opportunity by creating an online course choice forum for students to provide mutual support and advice in conjunction with expert input from

members of the School and subject-specialist educational advisors. The forum also gave students the opportunity to engage more fully in issues such as curriculum development and delivery of student support.

In time the forum was embedded into a website where the School published additional information relevant to study planning and course choice, but which is not generally easy to access from pan-university websites. This included lists of examination results and student satisfaction ratings on individual mathematics and statistics modules. These were built up over a number of years so that, at any one time, students could see trends, in order to help inform their decision-making.

This website has undergone several re-incarnations, but has always kept informed course choice as its core mission. It now acts as a one-stop shop for anyone studying a mathematics and statistics module, regardless of which qualification is their ultimate aim. It contains links with mathematics and statistics communities external to the OU, together with subject-related Facebook and Twitter feeds. Resources are available for students to self-assess their readiness to start their next module, along with targeted advice about areas which they might need to revise or alternative modules to consider. Further resources help students to refresh their knowledge in preparation for their next module, accompanied by synchronous and asynchronous support. Careers advice and guidance specific to mathematics and statistics are also provided. But the most important feature remains the forum to which students, academics and educational advisors all contribute. Students comment that this is the most useful forum that exists in the University, and discussions within it have ultimately led to improvements in the structure of qualifications, the content of new modules, assessment strategies, and ways of supporting students. It is thus a true community of learners where everyone, students, academics and advisors, all contribute, learn from each other and help shape the student experience.

Implementing additional maths support for Health Science students

Nicola McIntyre, Linda Thomson and Gerry Golding
STEM Faculty

This project investigates new ways of providing maths support on a level 1, Health Science module (SDK100). Previously on SDK100, maths tuition adopted a “one size fits all” approach and was not easily targeted to students’ specific needs. This was problematic because of the diverse maths backgrounds of the students on this module and it meant that a lot of students were receiving very general maths support.

In order to tackle this problem, we recorded a range of short, (5–10 minutes) maths screencasts, with each one focusing on a different mathematical concept. The screencasts were hosted on a YouTube channel and accessed via the module website. Students were encouraged to watch those screencasts which were most appropriate to their needs and were also encouraged to attempt the accompanying maths worksheets to allow them to assess their understanding. They were also offered a follow-up maths workshop (choice of two dates) where they received further support and opportunities to practice some of the concepts covered in the screencasts.

Feedback relating to these new maths resources and students' attitudes to tutorials in general was obtained via the polling pods within the Adobe Connect workshops and via a questionnaire sent out to a selection of students on the module. There are also plans to conduct interviews with a sample of students who have responded to the questionnaire.

This poster will provide further details about this approach to tuition and the main outcomes of our evaluations. This particular study focuses on maths support but the principles could also be applied to other aspects of tuition such as English writing skills.

Two mathematicians and a Ukulele (how the wrong answer can be the right in mathematics teaching)

Hayley Ryder and Toby O'Neil
STEM Faculty

We explain how a module team are using pre-recorded Adobe Connect sessions, containing plenty of wrong answers, to increase mathematical resilience (and hence retention) on a level three mathematics module. We also explain how the Ukulele fits in.

Mathematics is often seen as something that people either can or cannot do (1) - a subject with right (and wrong) answers. This impression is re-enforced by typical teaching that consists of the tutor demonstrating a calculation/ algorithm followed by a chance for students to repeatedly practise the technique. A correct answer demonstrates that the student is in the `can do mathematics' category whereas students who cannot reproduce the correct algorithm move into the `can't do mathematics' category (2). This accords with a fixed mindset approach to mathematical ability (3). Students with fixed mindset beliefs about mathematics often lack mathematical resilience (2) and can defer or drop out of modules because they equate feeling confused with being no longer able to do mathematics. This creates problems when understanding abstract concepts replaces memorising techniques, and when constructing proofs replaces the algorithmic approach. There is no longer a strategy that a student can usefully follow. Students can mistakenly see the subject as being about learning algorithms (whereas the process of `doing mathematics' has been described by mathematicians as being 'a blind man in a dark room looking for a black cat that isn't there'). Now they must think, try different approaches and recover from mistakes and wrong turnings. Feeling stuck or confused is unpleasant and a belief that mathematical ability is innate and that real mathematicians immediately know what to do causes the students to feel disheartened and drop out. In addition, correct answers in mathematics are often originally derived in reverse order but written out by authors and tutors in the correct order, creating a sense that the tutor or author has pulled a succession of rabbits out of hats. The student has no idea of the time taken to originally find these rabbits or of the order in which they naturally emerge.

On M303, as members of the module team, we have been pre-recording AC sessions in which we discuss the concepts and do questions `live', in real time, explaining our thoughts. This inevitably results in many trips down blind alleys and incorrect answers. We show how we recover from these, but we also demonstrate that this is a normal part of doing mathematics. Our sessions

show students how we produce the solutions, organically, and in real time. So far, the students appear to like the sessions, which have produced comments such as `there is hope for me yet'

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A secondary data analysis of SEAMs responses for programming and non-programming modules by gender

Joseph Osunde and Anton Dil
STEM Faculty

Gender disparity in computing higher education has been tackled in a number of ways to include structural adjustments to teaching support and teaching contents. Most recently, studies have focused on the use of virtual learning environment (VLE) to influence gender disparities in university-level computing courses. Open and distance learning (ODL) institutions provide printed and online materials mostly as VLEs in the place of lectures in conjunction with computer-based activities, forums, television and radio programmes and student support provision such as face to face tutor sessions, tutor centres etc. The empirical evidence suggests that learning environments that convey gender stereotypes significantly impact on the representation of women due to the influence on interest and anticipated success in computing courses.

The Open University delivers its courses online and through blended instruction to include videos, forums, face to face sessions with tutors and tutor centres. A review of related literature about online and blended instruction validated the usefulness and effectiveness of each learning delivery format in relation to learning outcomes and learner satisfaction. Enrolment statistics at The Open University show that more males than female are enrolled in the school of computing courses and fewer females would opt for programming modules in comparison to non-programming modules.

A secondary qualitative data analysis of The Open University student experience on a module survey (SEAMs) data between 2013 and 2016 of two programming (M256 & M250) and non-programming modules (T227 & T215) are investigated in this study. A multi-variant review of module content and teaching, assessment & learning responses were compared against module satisfaction responses by gender. The initial findings suggest that the module satisfaction rates are better for non-programing modules in comparison to programming modules for both genders. Furthermore, in most instances of the qualitative analysis, there was a correlation between all three multi-variant factors e.g. a positive linear relationship between module content and teaching, assessment & learning often indicated that the learners were more satisfied with the module. Finally, the initial analysis also indicated that male learners are more satisfied with the programming modules in comparison to the females. Future studies would further investigate

the differences in the module content and teaching, assessment & learning that could have resulted in the differences in the satisfaction rates by gender in modules.

Parallel Session I: Workshop/Demonstration – Online/Onscreen STEM Practice, Supporting Students and *Technologies for STEM Learning*

Engaging qualities: factors affecting learner attention in OpenStudio

Nicole Lotz, Georgy Holden and Derek Jones
STEM Faculty

This presentation reports on a study that investigated how the quality of learner-generated online content relates to learners' engagement through comments and conversations around this content. The study was part of the eSTEeM funded project: Are we making progress? The project investigated the progression of learners' in OpenStudio across a qualification. In this particular study, work uploaded to the OpenStudio by students across all core modules of the Design and Innovation Qualification (Q61), was rated by experts and analysed quantitatively using the Consensual Assessment Technique (CAT). Correlations of qualities to comments made on this content were considered and a qualitative analysis of the comments was carried out. It was observed that design students do not necessarily pay attention to the same qualities in learner-generated content that experts rate highly, except for a particular quality at the first level of study. The content that students do engage with also changes with increasing levels of study. These findings have implications for the learning design of online design courses and qualifications that use OpenStudio across different levels of study.

Visualising the code: student engagement with programming in a level 1 module

Soraya Kouadri Mostéfaoui, Elaine Thomas and Helen Jefferis
STEM Faculty

The aim of this project is to investigate the impact of using a visual or graphical programming environment on student engagement with programming in 'TU100 My digital life'.
The project addresses the fundamental question as to whether the visual programming environment actually engages novice programmers in a distance learning context. We hope to discover whether students are engaging more with the visual programming environment than with the text-based programming language used in the previous level 1 module.

In the quantitative analysis phase of the project, we collected copies of the End of Module Assignments (EMAs) for six presentations of TU100 (13J, 14B, 14J, 15B, 15J & 2016B) in order to identify the Sense programming questions in each assessment. Then we obtained the results for students who submitted their EMA for each of the six presentations. We used the SPSS Statistics Package V22 to analyse the grades of 6,159 students in the final assessment across the six presentations to identify student performance in the programming task, as distinct from their overall performance on the module. The aim was to explore whether there was any difference

between student engagements with the programming task in comparison with non-programming tasks.

Overall we found a strong ($r=-0.543$, $p<0.01$) correlation between the scores that students achieved in the programming and non-programming elements of the final assessment, i.e. students who did well in programming also tended to do well in the non-programming elements, and vice versa. Therefore, results from the statistical data analysis suggest that there is no significant difference in levels of engagement between these tasks, and it appears that success, or otherwise, in one type of task is a good predictor of engagement with the other task.
In this the qualitative phase we have obtained the SEaM survey results for the same students six presentations of TU100 (13J, 14B, 14J, 15B, 15J & 2016B) that were used for the quantitative analysis. NVivo was used to analyse the textual comments in order to identify comments using terms such as 'programming' and 'Sense' 'SenseBoard'. A total of 325 students left textual responses in the SEaM surveys with 79 students commenting on some aspect of programming. Of these, 73% were positive comments (60 students commenting about Sense; 11 about programming) and 27% were negative (19 students commenting about Sense; 7 about programming.)

Automated marking of free-text responses for concept inventories in physics

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STEM Faculty[1], University of Hull[2], University of Edinburgh[3]

The Force Concept Inventory (FCI) [1] was the first concept inventory. The FCI was constructed in response to a lack of conceptual understanding of Newtonian mechanics among students across physics institutions worldwide. Today, the FCI is the most well-known instrument in Physics Education Research.

In order to probe for conceptual understanding, the FCI uses a multiple-choice format. Within the possible responses there is one correct answer and the rest of the options are incorrect answers based off common misconceptions that students have of the topic. This format is not ideal, because it is impossible to come up with suitable distractors for each possible student thought process, as well as concerns that the distractors themselves are not effective enough [2]. Additionally, students may guess the correct answer, or use the given options to guide their answer.

In order to better understand the thought processes and conceptual understanding of students taking the FCI, it would be appropriate to give students the opportunity to construct their own responses to the questions. This would replace the multiple-choice questions of old with new free-text questions. Previously, this would have been unfeasible, because it would have required a human to manually mark thousands of responses. However, we can now collect and mark a large number of free-text responses automatically.

The presentation demonstrates and explains work that has been done to re-cast the classic multiple-choice FCI into a new online format, using different question types including

automatically marked short-answer free-text questions. It also presents some of our findings relating to student engagement and reaction to the new format and looks at the future of the project, in particular, the development of a similar assessment to test understanding of General Relativity concepts.

References:

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[2] Rebello, N. S., Zollman, D. A. (2004) 'The effect of distracters on student performance on the force concept inventory', American Journal of Physics, vol. 72, pp. 116-125.

Expanding Conceptual Understanding in Physics (ECUIP)

Ulrich Kolb, Mark Parker and Sally Jordan
STEM Faculty

The Institute of Physics instigated a UK & Ireland-wide project to evaluate the conceptual understanding students at participating HEIs achieve in physics. The aim of the project is to identify teaching and learning methods that are particularly effective in delivering this understanding, so as to improve physics teaching across the sector. In the first phase of the project 20 HEIs took part, including The Open University, by conducting validated diagnostic tests of their students' grasps of concepts in mechanics and in electromagnetism, before and after instruction. While the emerging data set is the largest homogenous sample of its kind in the UK, its interpretation proves to be a formidable task. This needs to take into account contextual data collected alongside the pre- and post-instruction test scores, and rely on a meaningful classification of teaching methods. We present an overview of the current status of the project, demonstrate the implementation for OU students, present preliminary results pertaining to the OU cohort, and discuss some of the challenges in translating test scores into actual recommendations for improving the effectiveness of physics teaching.

Parallel Session J: Workshop/Demonstration – Online/Onscreen STEM Practice

Between module engagement and extension activities

Nick Braithwaite
STEM Faculty

The OpenSTEM Labs is going announce a short competition to be completed by mid-April. The basis of the completion is the generation of new, scaffolded activities using existing OpenSTEM Lab resources targeted between module activities. We propose to feature a number of the submissions in a demonstration workshop within the eSTEeM conference, this will be used to select a few for further vigorous evaluation and deployment. A secondary selection criterion will

be based on compatibility with external engagement opportunities. A third but optional criterion will be an overt link to employability skills.
The competition will be open to postgraduates, research assistants, academics including associate lecturers and other curriculum support staff. The rules will encourage multi-disciplinary, multi-skilled teams. The presentation will be expected to address pedagogic aspects in addition to functionality. We might hope there may be up to one dozen entries. We will produce a generic poster and invite submitters to also contribute a summary poster.

Closing Keynote Presentation

Critical discussion of Student Evaluation scores and academic performance at the OU

Bart Rienties
LTI

Satisfaction surveys have increasingly been used as a proxy for student learning in higher education, for example in the UK's teaching excellence framework. However, in this keynote I will critically discuss this practice using OU data on 111,256 students on 151 different modules. Significantly higher student satisfaction was found in modules in which students received large amounts of learning materials and worked through them individually, than in courses where students had to collaborate and work together. However, the best predictor for whether students actually passed the module was whether there were collaborative learning activities, such as discussion forums and online tuition sessions. In fact, no relations were found between student satisfaction scores and academic performance in those modules. Therefore, during the keynote I will discuss whether or not we should actually listen to students' feedback, and if yes which students' voices we should adhere to.

Parallel Session K: Short Oral Presentations – Supporting Students and Technologies for STEM Learning

Using Student Analytics with ALs to increase retention

Katie Chicot, Gerry Golding, Sally Crighton and Carol Calvert
STEM Faculty

The project seeks to find a good way of using student analytics with ALs to improve student retention.

We have recruited a group of volunteer tutors.
Firstly - the project has targeted students who were identified of having a 40 – 60% chance of completing the module. Students in this bracket who are in the tutor group of participating tutors received specific bespoke interventions delivered by their own tutors.

Secondly - throughout the duration of the presentation the tutors received updates on the students VLE usage in the form of a flag when students VLE usage has dropped. This has been shown to be a good early indicator of potentially dropping out of the course.

These students were telephoned. The phone call covered their mathematical life history, explored their attitude to learning and mathematics. The tutors were trained in the theory of 'growth mindset' in mathematics and learning. These themes are then linked to a discussion of how much time the student plans to spend practicing mathematics and strategies to use when students get stuck.

These students will receive a pre and post attitude to maths survey. We hope to see an improvement in their attitude to maths and to see a better outcome in retention for this group of students.

The project has been running for three months and we are already seeing some impact on student retention.

Analytics for tracking student engagement

Christine Gardner, Allan Jones and David Chapman
STEM Faculty

Although there has been much research in the area of data analytics in recent years, there are questions regarding which analytic methodologies can be most effective in informing higher education teaching and learning practices. The university is currently proposing an increased use of analytics to support students. For example, OU Redesign proposes that students "learn in state-of-the-art digital environments, using data analytics to understand and drive their learning. Through using digital tools, learners will have the opportunity to develop digital competencies, aligned with our commitment to digital inclusion…"

This study will explore the use of computer aided learning (CAL) resources on module TM355, "Communications Technology", using a data analysis tool developed by the Open University, Analytics for Action (A4A). A4A can provide detail of how students are engaging with specific online materials, with the aim to highlight the kind of interventions that module teams can make to support students. However, currently it does not identify activity at an individual student level. Using the analytics tool's quantitative data in conjunction with qualitative data from student interviews could help provide a clearer insight into how students engage with a particular module.

The prompt for this particular study was students' poor performance on a particular exam question in the 2016J presentation of TM355. Using A4A it could be seen that the associated computer aided learning (CAL) tool had not been extensively used, either during the module or for revision. Much time and resource had been invested in producing the CAL packages, so there is a question on why they are not being used more extensively.

The research questions cover two key areas; the effectiveness of the analytics tools and students' perception of the CAL resources.

Analytics:

- What motivates OU students to engage with CAL tools?
- Do students understand topic more deeply as a result of using CAL packages?
- Are students deterred if the packages are too complicated/time consuming?

Student feedback via interview:

- What motivates OU students to engage with CAL tools?
- Do students understand topic more deeply as a result of using CAL packages?
- Are students deterred if the packages are too complicated/time consuming?

The project is at an early stage, but a start has been made on the quantitative data analytics review. Interviews with students are scheduled for late Spring 2018. By evaluating a specific Level 3 module in the School of Computing and Communications it is hoped that analytics can used to best effect to inform module teams and thus help students achieve their maximum potential. The findings should be of interest to those involved in other Level 3 modules in the IT and Computing degree programme i.e. TM351, TM352, TM353, TM354 and TM356.

STEM Learning Analytics Evaluation

Steve Walker, Moira Dunworth, Tom Olney, Maria Kantirou and Carlton Wood
STEM Faculty

Evidence of the effect of predictive learning analytics on student performance is mixed (e.g. Ferguson & Clow, 2017; Gašević et al, 2016). Anecdotal feedback from the initial OU Analyse pilots echoed these mixed views. In particular, we are interested in how the 'insights' generated by OU Analyse, are translated into interventions, primarily by ALs (since the OUA Dashboard is designed primarily for ALs to use in identifying individual students at risk of not completing) but also potentially SSTs, module teams and others. The empirical work is underway at the time of

writing, so this presentation will focus on the approach we are taking to the evaluation, though we would hope to be able to present some initial results in April.

The evaluation design draws primarily on two related traditions. Firstly, we think of technology in the social informatics tradition (broadly, the design and use of ICTs in their social, organisational and cultural settings). This conceives of technologies as inherently part of networks of people, things, practices and so on. As with the vast majority of technologies, the OUA dashboard isn't being implemented on a green field site, but into a set of pre-existing situations and practices. Hence, an early question for us is to have a clearer understanding of what ALs are already doing, independently of OUA, to identify and intervene to support students they deem at risk. It is perhaps surprising that we didn't have a clear picture of this before introducing technologies aimed at supporting this process.

The second tradition is that of realist evaluation (Pawson & Tilley, 1997). Realist evaluation conceives of projects and programmes as interventions into complex and diverse social contexts, which will generally also be changing. These interventions will not generally have the same effects in these differing contexts. The overarching question is 'what works for whom, in what contexts' and perhaps more ambitiously 'in what respects, and why'. Project interventions represent 'theories' of how making a particular intervention will lead to a particular set of outcomes; the evaluation aims to identify and these logics and their effects.
The STEM OUA evaluation is in two broad parts. Primarily evaluation treats seven 'focus' modules as case studies of how analytics is being used in different academic contexts. It is comprised of initial meetings with the module chair and other module team members to develop an understanding of the particular context of each module, and a 'logic model' mapping their 'theory' to identify intended outcomes and the steps towards achieving them. We are interviewing ALs from each focus module and examining other documentary and quantitative data. At the time of writing, the focus module evaluations are just beginning.

We preceded the work on the focus modules with interviews of ALs with the aim of understanding how they currently identify potentially failing students and how/when they intervene to support them. We will present the results of this pre-study.

Evaluation of a software tool for Java program specification checking

Anton Dil, Sue Truby and Joseph Osunde
STEM Faculty

Although a number of tools for evaluating Java code style and functionality exist, little work has been done on software to evaluate a Java program with respect to a structural specification, that is, one that specifies requirements for the creation of particular classes, fields, methods and constructors in a program. This project developed and evaluated the use of a tool to perform an automated check of code against such a structural specification. Tutors were surveyed on the usefulness of the tool to them when marking students' code, and on its potential usefulness for students to use when working on their assignments. Tutors were asked to compare the usefulness of structural specification testing as compared to other kinds of tool support, including compilation error assistance, style checking and functionality testing. Subsequently several tutors

were interviewed to get more detailed feedback. Initial results suggest that most tutors using the specification checking tool found it to be useful, and some reported that it increased their accuracy in marking. Reasons for not using the tool included lack of time, and the simplicity of the assignment it was trialled on. There was general support for tool usage, with some reservations expressed about reliance on such support and time required to engage with tools. The tools discussed have further potential for use in online assessment and feedback via the coderunner question type in Moodle iCMAs, allowing students to perform some checks on their code before submitting it for marking.

Parallel Session L: Short Oral Presentations – Online/Onscreen STEM Practice

Best practice in teaching with the Virtual Microscope: a comparative study of blended and online learning

Christothea Herodotou[1], Maria Aristeidou[1], Eileen Scanlon[1] and Simon Kelley[2]
LTI[1], University of Edinburgh[2]

Amongst the latest developments in virtual learning environments is the design and use of Virtual Microscopes (VMs) that allow for viewing and manipulation of online images by multiple students. Previous studies have found that students are generally satisfied with the use of VMs, but it is not yet known what teaching and learning conditions better support their use and lead to enhanced learning outcomes. This study evaluated the integration of the VM in both blended and online only learning conditions and concluded on the factors that should be considered in teaching and learning using VMs. Data collected from a survey with 139 students and 11 semi-structured interviews revealed that blended learning better caters for students' engagement and satisfaction due to the systematic use of the VM in course design, its complementary use with a physical microscope, and the ongoing provision of tutors' support and guidance. Equally good perceived learning gains were reported by both blended and online only students. These outcomes suggest that the online experience of using a VM could be enhanced in certain ways; these will be discussed in the course of this presentation.

Notetaking and on-screen learning

John Baxter
STEM Faculty

Research implies that undergraduate students in lectures who take handwritten notes learn more effectively than those who type into an electronic device, and that both in turn learn more effectively than those who do not take any notes.

There is much less evidence related to either book-based or onscreen teaching materials.
This presentation will outline initial evidence that where students regularly use a notetaking tool in an on-screen module, there is a strong correlation between intensity of usage and achievement in the end of module assessment.

S201 Science and Society is an interdisciplinary level II module which integrates development of students' scientific understanding with a clear focus on skills development. One of the major aims of the module was to develop the students' skills in collating and analysing complex scientific and social information from a wide range of study materials. The idea is, in part, to give them some early preparation for a level III project.

This presentation will describe how the S201 module team integrated an on-screen notetaking tool in the design of the teaching and assessment materials; student take-up of the tool; the evidence of a correlation between assessment outcome and intensity of notetaking; its impact on student satisfaction levels; and directions for further qualitative research.

Online Team Investigations in Science (OTIS) – Work in progress

Mark Jones, Susanne Schwenzer, Ulrich Kolb, Judith Croston and Sheona Urquhart
STEM Faculty

The effect of cooperative learning approaches in a face-to-face context has long been recognised as providing benefits to students studying STEM subjects (e.g. Springer, Stanne & Donovan, 1999). There have been attempts to translate cooperative learning activities into online settings (see e.g. Robinson, 2013, Minocha & Thomas, 2007) but there remain questions about the factors that determine how effective these activities are.

In this presentation we will describe the early phase of a study into cooperative team projects at advanced undergraduate and taught postgraduate levels in astronomy and planetary science at the OU. These student projects are based on rather open-ended scientific investigations using data from research archives, a robotic telescope or a Mars rover simulator. Our experience of teaching on these modules suggests that they are successful in the sense that student teams are able to fulfil the goals of the respective projects. We have also observed that students seem to be highly engaged with their task and with their team when working on these projects. Prompted by these observations, we are now investigating the factors that may be important in such online cooperative team activities. These factors include; pedagogic design, facilitation of team working, modes of online communication and assessment.

We will describe how we intend to use forum and wiki data to analyse how teams behaved as a whole. Such data cannot give a complete picture, and student perceptions that are not usually expressed online will be explored through analysis of structured conversations that will be conducted after the teamwork has been completed. We will describe the areas that we have identified for further exploration of the student experience in these team projects.

The aims of this presentation are to describe the scope and methodology of our study and to foster discussion about the pedagogy of online cooperative team work.

References:

Springer L., Stanne M.E., Donovan, S.S. (1999) Effects of Small-Group Learning in Undergraduates in

Science, Mathematics, Engineering and Technology: A Meta-Analysis. Review of Educational Research, 69, 21-51.

Robinson, K. (2013) The interrelationship of emotion and cognition when students undertake collaborative group work online: An interdisciplinary approach, Computers and Education 62, 298-307.

Minocha S., Thomas, P.G. (2007) Collaborative Learning in a Wiki Environment: Experiences from a software engineering course, New Review of Hypermedia and Multimedia, 13:2, 187-209.

Live field broadcasts: Moving from optional additions to required assessment

Trevor Collins, Julia Cooke, Philip Wheeler, Kadmiel Maseyk and Julie Robson
STEM Faculty

Historically, the OU have developed the use of broadcast media to demonstrate and engage students in STEM practical work. Recently this involved the development of interactive web broadcasts, which display a live video in a web page alongside interactive widgets that collate and display students' responses to questions set by the presenter. Developed during the 2014 presentation of the second level Practical Science module (S288-14B) the approach taken has been for the presenter(s) to prepare a set of decision points in their presentation, where they can adapt their presentation based on the students' responses.

The resulting system developed in KMi is called Stadium Live. The administrator interface supports the creation of events, the selection and authoring of questions from a menu of widget types, and the presentation of student activity data (such as the number of students and their interactions). With capital support from HEFCE, a teaching lab has been set up at the OU and fitted with the audio-video equipment needed to support live broadcasting. This is used across a range of STEM undergraduate modules to introduce students to practical work, relating it to the concepts and processes covered in their module.

In the context of fieldwork specifically, second level Environmental Science (S206) students have participated in a one-week field investigation each May undertaken by three lecturers at an ecology field site on the OU campus. This involves two field broadcasts and one lab broadcast on three weekday evenings lasting around 30 minutes each. During the 'fieldcasts' students use the widgets to identify potential things to investigate; select the form of investigation, hypothesis, sampling method and analysis method; and decide the interpretation of the results. The aims of the fieldcast activity are to model the scientific method applied in the context of field investigations, to introduce students (and widen access) to practical fieldwork, and demonstrate the practical application of environmental science.

Through an eSTEeM project, student feedback has been gathered from the fieldcast events, module forums, OU student surveys, and student interviews. The majority of students participating in these events found the fieldcasts stimulating and informative, valuing the opportunities to work with their lecturers and peers. However, the synchronous nature of live events seems to be a challenge for many distance learning students. Across the two presentations, around 10 - 15% of the cohort attended the live fieldcasts with a similar number watching the event recordings.

To date, these events have been optional additions in existing modules. However, reviewing the findings from the eSTEeM project, the S206 module team have revised the assessment strategy for 2018, so that students must either participate in the fieldcasts or watch the recordings in order to complete one of the module assignments. In this presentation we will explore how the move from an optional addition to integral assessed work is affecting the production process and the anticipated student experience, from the robustness and accessibility of the technology used to the development of contingency plans and wet weather alternatives.

Parallel Session M: Structured Discussion/Briefing – Technologies for STEM Learning

Accessing the hive mind: Creating a repository of interactive activities for use in Adobe Connect

Susan Pawley
STEM Faculty

Question: What do you do when the virtual classroom previously used for creating and delivering engaging and interactive online activities changes and the ones you have developed can no longer used?
Answer: Attend a structured discussion session on Interactive activities for Adobe Connect and help to build a brand new repository of activities that can be viewed and used by all staff.

Research (McBrien et Al, 2009 and Freeman et al, 2014) shows the provision of online tutorials help to mitigate the effect of transactional distance and that the performance of STEM students can be improved with active learning. However, the discipline specific requirements of STEM subjects can make producing interactive activities in the online environment an exciting challenge.
Previously, maths and stats tutors had built up a repository of online tutorial material that was both interactive and engaging. However, due to the different format of Adobe connect, many of the interactive elements of the tutorial material can no longer be used. During the summer of 2017, a group of maths and stats Associate Lecturers investigated how to make mathematics tutorials in Adobe Connect interactive, producing some activities relevant to all levels of maths tutorials. This work was presented during a series of online training sessions in October and January.

The project then took on a new direction and at the Regional Associate Lecturer staff development events we have been running cross faculty workshops where tutors explore ways to produce interactive activities relevant to all STEM disciplines and a repository of activities is being built that will be accessible by everyone.

During the session we investigate the repository and look at some of the amazing ideas that Associate Lecturers have suggested, discussing how they can be used in our respective disciplines. Working in groups, we will then produce in-depth plans for activities which will be added to the repository. The session will explore potential challenges that arise in online tuition and methods that can be used to overcome them, using peer support to gain a deeper knowledge of Adobe Connect and the techniques that can be employed.

Interactive Workshop – What can we do to make 'Digital by Design' work for us?

Facilitated by Sarah Grange and Ben Monks
Improbable

Delivering higher education digitally/online is a huge issue across the sector as a whole. Is the OU to become merely a digital content provider or are we building an exciting new tool for universal education? What are your hopes and fears about the changes and challenges facing the OU? What are the opportunities or pitfalls?

We welcome your expertise from within the STEM Faculty and beyond. Using a format where you set the agenda and nothing is censored, this workshop is an opportunity for you to ask questions and plan action around what matters to you. We would love to see you there.

POSTER PRESENTATIONS

Automated marking of free-text responses for concept inventories in physics

Mark Parker[1], Sally Jordan[1], Holly Hedgeland[1], Nick Braithwaite[1], Christine Leach[1], David Sands[2] and Ross Galloway[3]
STEM Faculty[1], University of Hull[2], University of Edinburgh[3]

Same abstract as Parallel Session I: Short Oral Presentations on page 37.

See page 60 for poster.

The Cross-Faculty Accessibility Working Group - working for institutional change

Victoria Pearson[1], Sally-Anne Imeme[1], Kate Lister[2], Rachel Slater[1], Libby Meade[1]
STEM Faculty[1], LTI[2]

The Cross-Faculty Accessibility Working Group (CFAWG) was established in 2013 by accessibility practitioners in MCT and Science, predominantly those appointed as Accessibility Coordinators under the Securing Greater Accessibility (SeGA) umbrella. The success of this small group in addressing common challenges in accessibility and inclusion led to being expanded to include practitioners from all faculties and other units across the University. Since then, it has had an impact on students and staff from module to university level, because of its grounding in a community, practice-led approach.

The group's overall objective is to be proactive in developing a collaborative and consistent approach to embedding accessibility into module production and presentation, and to drive tangible change across the University. Examples of this are:

- Enhancing the online accessibility information given to enquirers and students before they register at a qualification and university level
- Development of module Accessibility Guide templates
- Creation, implementation and training support for the Module Team Accessibility Coordinator role
- Developing module 'Accessibility Statement' templates available to undergraduate students on the online study prospectus (new for 18J registration).
- Improving the guidance available to staff when completing the Equality, Diversity and Inclusion template on the module specification document (new January 2018)

In addition to these practical outputs, CFAWG is also consultative, and provides input to institutional changes. For example:

- The OU Accessibility Policy (launched September 2017)
- A new process for recording Reasonable Adjustment requests
- An improved process for producing and submitting module accessibility blueprints

- Addressing the challenges of offline digital learning

In this poster, we will present the impact that CFAWG has had on teaching and learning across the University and our objectives for future change.

See page 61 for poster

Student experiences of assessment banking

Linda Robson
STEM Faculty

Evaluation of assessment banking has so far focused on student return rates and measured success in terms of module completion. This project will be talking to students to gain a deeper understanding of student experiences of assessment banking and whether they found it to be a useful option in managing their studies.

Taking a decision to assessment bank and defer studies is often a difficult decision and often taken at a point in time when students are dealing with some form of personal crisis. This project will be asking students to reflect on their experience of assessment banking and consider if, in hindsight, they feel it was a good decision for them to take in their particular situation. It will also explore the factors which encouraged or discouraged return to study and seek to find recommendations for improving the assessment banking experience.

See page 62 for poster.

Examining Interaction in STEM Web Broadcasts

Venetia Brown, Trevor Collins and Nick Braithwaite
STEM Faculty

This project is investigating the impact of web-broadcasts on learning. Web-broadcasts stream live content alongside interactive tools (widgets) to support the learning process and promote interaction between the presenters and viewers.

Interaction is crucial to maximise student learning. Empirical data suggest that synchronous methods add value to student learning through real-time discussion, instantaneous feedback and connectedness with others (Martin, Parker & Deale, 2012; Giesbers, Rienties, Tempelaar & Gijselaers, 2014), and can assist in the overall social aspect of learning (Witton, 2017). However, others (Hrastinski, 2008), point to the potential lack of reflection that synchronicity has on complex concepts. Nevertheless, an agreed consensus in the field is that collaborative learning activities and participation maximise learning opportunities and are more likely linked to student success. Therefore, this project hypothesizes that participation with synchronous technologies increases engagement and therefore enhances learning.

This project will investigate (i) the ways in which collaboration happens between students and presenters, (ii) the impact of synchronicity on learning tasks and (iii) the perceptions of stakeholders (i.e. students, lecturers, and production teams). Research design will include observations on teaching practice and technological logistics; surveys to measure attitudes; interaction data to analyse the target, frequency, and types of interaction; and trialing interventions to test procedures of instructional strategies.

The project contributes to the field of STEM distance education. Systematic evaluation will assess the effectiveness and lead to recommendations for improving web-broadcasts. The outcomes will: inform students on meaningful practice and future learning opportunities, help lecturers understand which instructional methods are more effective and provide insights for lecturers planning new modules and those producing/directing the broadcasts.

References:

Giesbers, B., Rienties, B., Tempelaar, D., Gijselaers, W. (2014). A dynamic analysis of the interplay between asynchronous and synchronous communication in online learning: The impact of motivation. Journal of Computer Assisted Learning, 30, 30-50.

Hrastinski, S. (2008). The potential of synchronous communication to enhance participation in online discussions: A case study of two e-learning courses. Information & Management 45, 499-506

Martin, F., Parker, M.A., Deale, D.F. (2012). Examining interactivity in synchronous virtual classrooms. The International Review of Research in Open and Distance Learning. 13(3) 227 - 261

Witton, G. (2017). The value of capture. Taking an alternative approach to using lecture capture technologies for increased impact on student learning and engagement. British Journal of Educational Technology. 48(4), 1010-1019.

See page 63 for poster.

Flexible early start on a level 1 module

Carol Calvert
STEM Faculty

M140 has around 1000 students on a J presentation and 600 on a B presentation. It seems at least feasible that some students would like to take advantage of a facility to start their study on a much more flexible basis. Students have expressed views that it is “good” to get ahead with study if possible and this pilot has given students on M140 an opportunity to start their study on a rolling basis, at a time of their choosing and up to three months in advance of the usual module start. The approach is different to that of the several “revise and refresh” option running in STEM because it offers a tutor supported, flexible start, and uses the actual module materials.
Around 400 students were offered the opportunity of a flexible early start and just over two hundred students emailed that they would like to do. An over represented group within those that did take part were students who already had some OU credits. It might be argued that such students were already aware of the high October workload and they seemed to wish to minimise

it- using their time over the summer. Responses were overwhelmingly positive with students attending online tutorials, using forums, loading and using module software and studying early Units with tutor support.

See page 64 for poster

An International Comparative Study of Tuition Models in Open and Distance Learning Universities

Ann Walshe
STEM Faculty

I will present the outcome of a comparative study carried out as Visiting Scholar at Shanghai Open University (SOU) in November 2017.

Both SOU and the OU use blended learning, are tending towards more online provision and are working towards a more personalised study experience.

SOU and many other Open and Distance Learning universities attach great importance to face-to-face provision, particularly for motivating open entry students and helping them develop their study skills.

The SOU provision for disabled students is specialist and successful, while the OU teaches all students inclusively.
Social media plays a more significant role in SOU tuition than in the OU.

With a shift to online classrooms, there is a need to improve expertise in the area of online teaching, particularly in having more interaction with the students and in providing a customised service to the students, that is, adapting to the different learning preferences of different students.

I will compare the perceived importance of face-to-face tuition, provision for disabled students, use of social media, and the need to improve online teaching expertise.

This poster is to accompany a short oral presentation of the same title.

See page 65 for poster.

Reflections on the OpenStudio online Student Conference for S350 Evaluating Contemporary Science

Rachel McMullan and Simon Collinson
STEM Faculty

In its first presentation in 2016-2017 (16J) S350 employed OpenStudio to run an innovative online conference and peer learning experience. This novel approach aimed to enhance the student learning experience and target valuable employability skills around communication, critical evaluation and presentation of complex data to a target audience.

Students produced electronic presentations (e-posters, key image, keywords and recorded audio pitch) as part of formal assessment on this module. To produce their presentation students selected a research area from within several interdisciplinary topics and identified, evaluated, compared and contrasted two recent primary scientific papers. The audio pitch was prepared using the OU audio recording tool (ART) to enable students to reflect on and improve their presentation, as well as to reduce the stress associated with giving an oral presentation often in a student's second language. The use of keywords facilitated students searching their fellow student's posters.

During the conference students gave feedback on at least two other posters to encourage peer learning. A feedback form was provided and the students taught to fit their feedback with the CORBS tool used by many teachers, lecturers and tutors for giving effective feedback. CORBS stands for Clear, Owned, Regular, Balanced and Specific (Hawkins, P. and Shohet, R. (2012)). The poster, audio and feedback all form part of the student's assessment. The assessment was designed so that the poster feedback also helped preparation of the end of module assignment. 264 students uploaded poster presentations to the Conference OpenStudio site and 92% of students registered at 25% visited the Conference OpenStudio site during the two week conference (SASanalytics). Several student quotes were similar to the following: 'My favourite block was the virtual conference. It was very interactive and represented a life-like situation a scientist would encounter.' We also discuss recent modifications to the S350 conference.

Reference:

Hawkins, P. and Shohet, R. (2012) Supervision in the Helping Professions, 4th edn [Online], McGraw-Hill Education. Available at http://open.eblib.com.libezproxy.open.ac.uk/patron/FullRecord.aspx?p=990490 (Accessed 11 July 2016.

See page 66 for poster.

An investigation into how STEM students use learning resources in different formats, and how this use develops over time – progress so far

Laura Alexander and Alexis Lansbury
STEM Faculty

Within the STEM Faculty at the OU, the learning resources provided for students vary in format from school to school. In Science, learning resources tend to be online and digital. In contrast, in Mathematics and Statistics, books written by OU academics specifically for the module are supplied as well as digital media. In Computing and Communications, a mixture of different types of resource is used; including off the shelf books by external authors and online digital media. Depending on their degree pathway, students may follow modules from at least two of the STEM schools and thus presumably need to change their learning strategies. This investigation focuses on two central research questions: What is the impact of students being required to develop different learning strategies part way through their studies due to meeting modules which rely on different media for learning resources? Does this affect student progression and retention and could there be ways to mitigate this impact?

Data is being gathered from 3 samples of students who are studying level 2 modules; one sample from each of Science (S217), Mathematics (MST224) and Computing (M269). Students coming into these modules may have come from entirely online level 1 study resources (e.g. S111 and S112), a mix of online and book based study resources (e.g. S111, MST124, S141) or mostly book based study resources (e.g. MU123, MST124, MST125, M140). Students were asked to reflect on the type of learning strategies they developed during their level 1 studies, and, if and how these have evolved and changed during their level 2 studies. An overview of progress so far is provided, together with preliminary results from the initial questionnaire.

See page 67 for poster.

Women in Engineering at the Open University: motivations and aspirations

Carol Morris and Sally Organ
STEM Faculty

Women students represent 10% of the engineering cohort at the Open University, which is less than the HE sector average of 14-15%. Anecdotal evidence suggests that these women are aspiring to change career, rather than enhance an existing career choice, which may place them at a disadvantage if teaching materials make assumptions about prior knowledge. Results from the first presentations of the reconfigured engineering curriculum show that women are less likely to complete the first module of the qualification, T192, and are less likely to progress immediately to the next module, T193. In order to help these women succeed we need to understand their motivations and aspirations and any barriers to study which they encounter. We will report the results of a recent survey of current engineering students, aimed at discovering the motivations and aspirations of both male and female students. This survey will inform the direction of future focus groups and individual interviews.

See page 68 for poster.

Active student engagement in research-led teaching maximises learning success: Translating best practice from the traditional classroom to the virtual classroom

Philip Staddon
STEM Faculty

Here research-led teaching is defined as where there is critical engagement with research on the part of the students and where students are actively engaged in performing research. By definition these activities involve active learning and are student-led. Using a comparative analysis of a traditional classroom teaching module and a virtual environment module, the areas where substantial improvement in the digital delivery is required to facilitate the inclusion of research led-teaching for student-led learning are identified.

Key areas requiring further attention are (1) how to facilitate discussions between students in a virtual environment, (2) how to broaden study topic choice in large classes to maximise engagement, and (3) how to install the co-creation of knowledge as a normal teaching approach.

Proposed actions for improvements include (1) devising challenging and engaging active learning tasks incorporating group work and suitable for a virtual environment, (2) maximise the diversity of these active-learning tasks to stimulate interests in all students, and (3) incorporate research-led active learning exercises wherever possible.

This approach, if successful, will result in greater engagement amongst the students, a higher retention rate, and improved learning outcomes.

See page 69 for poster.

Utilising the Teaching Tricky Topics Process to Identify and Address Student Misunderstandings across Three OU Modules

Elizabeth Fitzgerald[1], Jo Iacovides[1], Lesley Boyd[1], Elaine Moore[2], June Barrow-Green[2] and Rob Janes[2]
LTI[1], STEM Faculty[2]

This project developed a practice based understanding of conceptual problems experienced by students on three modules (MST124 (large population level 1), S215 (small population online module) and H880/800 (module in production). Our approach was framed within current teaching practice which has shifted from misconceptions and threshold concepts (Meyer and Land, 2003) to Tricky Topics in teaching (http://tricky-topics-guide.ac.uk).

We report the current outcomes of this project for one of the modules, S215. The involvement of ALs in this process has been key. Our tutors are ideally placed to help module teams identify areas where students struggle (Tricky Topics).

An initial learning network forum was established, which aims to support active and collaborative participation. Tutors responded enthusiastically and suggested some initial topics which were expanded upon in online workshops. This enabled tutors to continue the discussion of problem areas and drill down further to identify the tricky topics which are obstacles to progress. Based on the output of these sessions, four topics were selected – two basic topics which should have been covered at level 1, one appropriate to material at the beginning of the module and one that was essential to material covered midway through the module. A novel intervention was proposed by the tutors – videos in which two tutors discussed the problems their students had with the topic. The S215 module team utilised AL resource to create such videos (using in-house facilities of the Open Science Laboratory). These were offered to the students as resources for the 17J presentation, and are located on the module website.

Future work will include interrogation of analytics to obtain student usage, gathering of feedback from tutors, module team and students and analysis of student performance on the chosen topics in assessment. If this approach is deemed successful, it will be applied to further topics.

See page 70 for poster.

Evaluating and improving the S112 prep site

Chris Hutton
STEM Faculty

A VLE prep site was established to help students prepare for S112; the site aimed to improve retention and success by enabling students to sustain / build skills, knowledge, motivation and confidence before module start. The site comprised a self-assessment quiz, a collection of study resources, and forums run by two experienced level 1 tutors. Evaluation using a student feedback questionnaire (n = 24) showed satisfaction was high among respondents, though engagement with forums was poor. Students indicated they would have liked the periodic release of new study materials, and some synchronous tuition.

Following evaluation through student feedback and peer review from the forum moderators, revisions to the site are planned for 18J; these aim to increase engagement with forums and establish an academic community. Presented using Kolb's Experiential Learning Cycle, this poster will share findings and progress so far, and invite further feedback from colleagues to help direct on-going improvements.

See page 71 for poster.

Using tools to study the acquisition and development of research and employability skills as students' progress through a qualification

Steven Self, Mark Slaymaker, Lucia Rapanotti, Jon Hall and David King
STEM Faculty

The aim of this eSTEeM project is to extend and refine the tools and processes developed in a previous project [1] which focused on the evaluation of a new pedagogical approach implemented in three post-graduate computing modules (M811, M813 and M816) for the MSc in Computing (F66), where the students' own professional context of practice, rather than fictitious case studies, is used to assess their understanding of and ability to apply what is taught in those modules, as well as to develop a wide range of research and employability skills.

Our approach is a novel application of natural language processing techniques in combination with more traditional analysis of key performance indicators, to study the acquisition and development of research and employability skills as students' progress through the MSc in Computing qualification.

We report the preliminary findings from the analyses of the TMAs, EMAs and forum postings of students who have studied these post-graduate computing modules using SOLO (Structure of Observed Learning Outcomes)[2] and LDA (Learning Design Activities)[3] classifiers.

References:

[1] Rapanotti, L., Hall, J.G., Self, S., Slaymaker, M., King, D. (2017) "Measuring qualification effects of a new pedagogy which embeds learning and assessment activities within each student's rich professional context of practice".

[2] Brabrand, C., Dahl, B. (2009) "Using the SOLO taxonomy to analyze competence progression of university science curricula", Higher Education 58(4) pp 531-549, Springer.

[3] Rienties, B., Toetenel, L. (2016) "The impact of learning design on student behaviour, satisfaction and performance: A cross-institutional comparison across 151 modules", Computers in Human Behavior 60 (2016) 333-341, Elsevier.

See page 72 for poster.

Supporting Degree Apprenticeship students: Tutors' and Students' perspectives

Christine Gardner and Soraya Kouadri Mostéfaoui
STEM Faculty

The OU is currently devising an academic model for degree apprenticeships and the area of greatest relevance for this project is "Accessible provision and a seamless apprenticeship experience". This project seeks to address the fundamental question as to whether Degree Apprenticeship (DA) students need a different support strategy by identifying current issues that they may face during their DA journey.

Given that the first DA cohort at the OU started in May 2017, the project is timely as any 'gaps' or 'good practices' in the students' support should be identified as early as possible in the lifecycle in order to inform further DA modules' development.

The research questions include:

- DA students tuition support
  - Support from subject-specific tutors; what are the specific issues that DA students face?
  - Support from practice tutors; how can practice tutors best integrate support from the university and employers to ensure a seamless apprenticeship experience?
- DA students employer support
  - How the OU can/should work alongside employers to improve support?
- DA students assessment
  - How can we integrate work-based assessment (relevant to the students' work place) into the degree apprenticeship programme?
  - How can we make the OU offering stand out?

Both the students' and the tutors' perspectives will be considered and contrasted.

It is worth noting that the project is currently at a very early stage, with interviews due to take place in late spring 2018.

See page 73 for poster.

Using Adobe Connect Tools to Evaluate Tutorials

Linda Thomson, Nicola McIntyre and Gerry Golding
STEM Faculty

As part of an eSTEeM Project to investigate different ways of supporting maths students on SDK100, two module-wide maths workshops were delivered via Adobe Connect. These workshops supplemented a series of maths screencasts which students were recommended to view prior to the workshop.

At the start of the workshops, the Adobe Connect poll pods were used to check whether students had engaged with the maths screencasts prior to the workshop and to gain information about students' current maths abilities. The content of the workshops was therefore tailored to the needs of students who were in attendance.

During the workshop, polls were used to check students understanding in the same way that would have been done using our previous platform, OU Live.

At the end of the workshop, the session was evaluated via further use of the poll pod. Both multiple choice and free-text questions were used. Gathering feedback in this way enables instant responses from all students attending and an immediate evaluation of the workshop. The

advantage of Adobe Connect over OU Live is the ability to group answers for each student, thus enabling more sophisticated post-workshop evaluation.

This poster demonstrates how the tools available in Adobe Connect can be used to run a detailed evaluation of tutorials and other projects. This could be useful for ALs to gain further insight into their students' understanding of tutorial concepts.

See page 74 for poster.

Implementing maths support for Health Science students

Nicola McIntyre, Linda Thomson and Gerry Golding
STEM Faculty

This project investigates new ways of providing maths support on a level 1, Health Science module (SDK100). Previously on SDK100, maths tuition adopted a "one size fits all" approach and was not easily targeted to students' specific needs. This was problematic because of the diverse maths backgrounds of the students on this module and it meant that a lot of students were receiving very general maths support.

In order to tackle this problem, we recorded a range of short, (5–10 minutes) maths screencasts, with each one focusing on a different mathematical concept. The screencasts were hosted on a YouTube channel and accessed via the module website. Students were encouraged to watch those screencasts which were most appropriate to their needs and were also encouraged to attempt the accompanying maths worksheets to allow them to assess their understanding. They were also offered a follow-up maths workshop (choice of two dates) where they received further support and opportunities to practice some of the concepts covered in the screencasts.

Feedback relating to these new maths resources and students' attitudes to tutorials in general was obtained via the polling pods within the Adobe Connect workshops and via a questionnaire sent out to a selection of students on the module. There are also plans to conduct interviews with a sample of students who have responded to the questionnaire.

This poster will provide further details about this approach to tuition and the main outcomes of our evaluations. This particular study focuses on maths support but the principles could also be applied to other aspects of tuition such as English writing skills.

See page 75 for poster.

Using social media to support mathematics educations students through facilitating engagement with the wider mathematics education community

Charlotte Webb
STEM Faculty

The OU mathematics education modules (ME62X) are primarily aimed at students whom are either working in educational settings, such as teachers, tutors, teaching assistants or parents of school-aged children, or are working towards becoming teachers of mathematics. The modules are based on mathematics pedagogy: understanding and teaching mathematics, but are not directly linked to current national curriculums.

Teachers, and prospective teachers, need to keep up to date with current issues in education and consider different viewpoints by connecting with educators with diverse perspectives. Twitter is an efficient, accessible and cheap way to facilitate interactions between education communities. Following leading educators on Twitter facilitates exposure to a rich, interconnected network of other like-minded educators and a wide variety of relevant educational material (Holmes, K. et al., 2013). It encourages personalised, self-directed, and voluntary learning while rejecting isolated learning experiences (Veletsianos, G., and Kimmons, R., 2016).

Project
A Twitter page was set up for 'Developing Thinking in Geometry' (ME627) for the 16J presentation. Weekly tweets included module specific information and posts related to teaching geometry. Students on the module were invited to follow the page via messages on the module website.

In 17D the page moved from being module specific to a mathematics education page, incorporating all four modules. To avoid excluding students without access to Twitter, the feed was embedded into the module sites, enabling all students to see what was posted. Finally, Hootsuite was used to introduce semi-automated tweeting. Analytics from Twitter provided information about the impact of particular posts. This information has newer posts.

What next?
Structured use of automated tweeting for 18D presentations, including plan to host a live Twitter discussion using nationally recognised hashtag #MathsCPDchat. Evaluation of the impact of this structured use of Twitter will be carried out through student questionnaires and using Twitter analytics.

See page 76 for poster.

Establishing Physics Concept Inventories Using Free-Text Questions

M. A. J. Parker[1], C. A. Leach[1], D. Sands[2], R. Galloway[3],

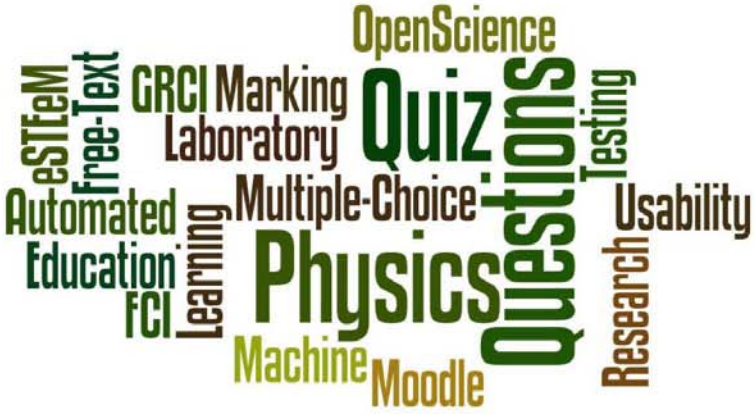
N. St. J. Braithwaite[1],H. Hedgeland[1], S. E. Jordan[1]

[1]The Open University, [2]The University of Hull, [3]The University of Edinburgh

1. Our aim is to develop quizzes that make use of free-text questions. We started by adapting the Force Concept Inventory [1].

2. The quiz questions were authored using the Moodle quiz engine. The OpenScience Laboratory hosts the quiz.

3. Developmental testing was carried out informally by getting OU staff and PhD students to try the quiz. Formal testing was carried out in the OU's usability laboratory.



4. The automated marking rules are built by using student responses as training data. It is also possible to employ a semi-autonomous approach by making use of the AMATI feature of the Moodle quiz engine [2].

5. Quantitatively, we need to make sure that the quiz behaves in the expected way, and also need to check that the marking rules are accurate.

6. We are using the same principles to develop a quiz for General Relativity, and this is still in the early development stage.

References

[1] Hestenes, D., Wells, M., Swackhamer, G. (1992) 'Force concept inventory', *The Physics Teacher*, vol. 30, pp. 141-158.

[2] Willis, A. (2010) *Inductive Logic Programming to Support Automatic Marking of Student Answers in Free Text*, Final Report, The Open University, Milton Keynes, United Kingdom.

The Cross-Faculty Accessibility Working Group: working for institutional change

Vic Pearson, Sally-Anne Imeme, Libby Meade, Rachel Slater and Kate Lister

Securing Greater Accessibility (SeGA)

'A whole-institution and whole-product and service life-cycle approach to accessibility'

Aim To support The Open University to ensure that its curriculum is accessible to disabled students.

Approach: To work collaboratively with faculties and units across the OU to embed accessibility in learning resources and ensure compliance with equality legislation.

Objectives:

- embed accessibility for disabled students/learners in the curriculum
- ensure accessibility is inherent within the systems, tools and websites that deliver the curriculum, including Learning Design and the Stage-gate process
- ensure that sufficient information about accessibility is provided to disabled students and/or their advisors
- influence senior management to include consideration of the impact on disabled students of strategic decisions

Cross-Faculty Accessibility Working Group (CFAWG)

Objective: To be proactive in developing a collaborative and consistent approach to embedding accessibility into module production and presentation, and to drive tangible change across the University.

CFAWG was established in 2013 by accessibility practitioners in MCT and Science, predominantly those appointed as Accessibility Coordinators under the SeGA umbrella.

The success of this small group in addressing common challenges in accessibility and inclusion led to its expansion to include practitioners from all faculties and other units across the University with the aim of achieving a consistent approach.

Since then, it has had a continual impact on students and staff from module to University level, because of its grounding in a community, practice-led approach.

CFAWG impact to date

- Enhancement of online accessibility information given to enquirers and students before they register, at a qualification and university level
- Development of module Accessibility Guide templates
- Creation, implementation and training support for the Module Team Accessibility Coordinator role
- Development of module 'Accessibility Statement' templates available to undergraduate students on the online study prospectus (new for 18J registration).
- Improvement in the guidance available to staff when completing the Equality, Diversity and Inclusion template on the module specification document (new January 2018)

CFAWG as influencers

- Contributors to OU Accessibility Policy (launched Sept 2017)
- New process for recording Reasonable Adjustments
- Improving process for producing and submitting module accessibility blueprints
- Addressing the challenges of offline digital learning

Future objectives

- Create EDI guidance for critical readers and external assessors
- Improve new staff induction and refreshers for existing staff
- Develop appropriate information for staff in SRSCs
- Investigate effective study planners

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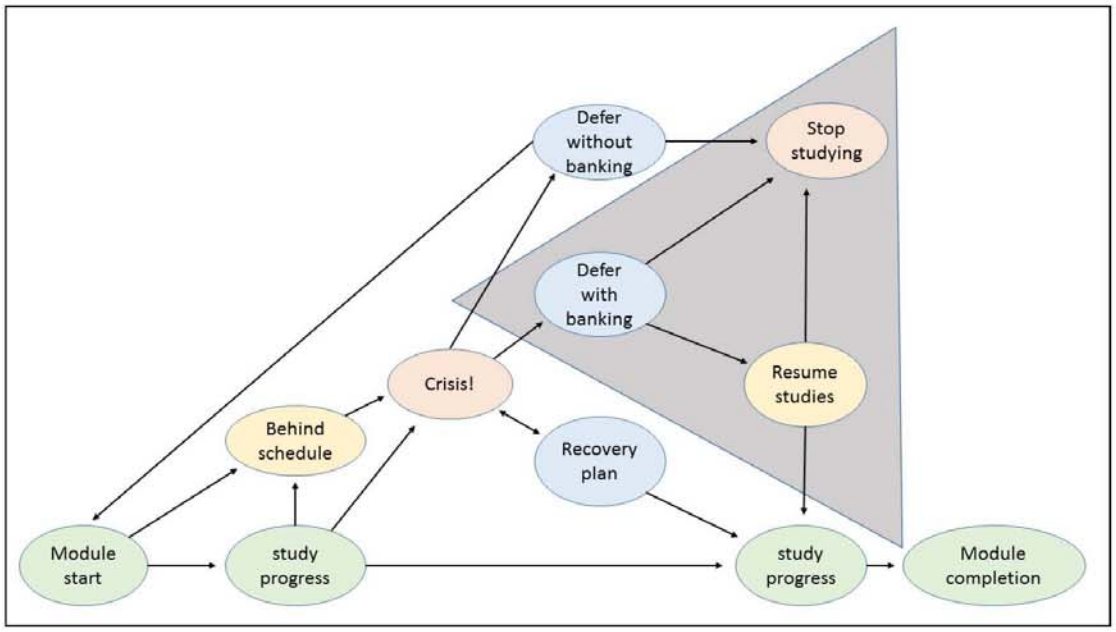
Student experiences of assessment banking

Linda Robson

The Open University

This project seeks to explore assessment banking and develop an understanding of what happens to our students who decide to take a break from their module. At a point of study crisis, some students devise a catch-up plan and continue studying, whilst others take a break through deferral or assessment banking.
Each year, around 6000 students across the university take a break from study using the option of assessment banking. 40% of assessment banked students do not return. Of those that do return, 45% achieve credit on the module (Taylor, 2017).

Looking at a selection of modules within the School of Engineering and Innovation, this project will analyse the recorded data available on assessment banking to identify any patterns in behaviour that can be observed. Through one to one interviews with students who have assessment banked, case studies will be developed to deepen our understanding of the student experience, and be used as a resource to improve our policy, advice and guidance relating to assessment banking. It is hoped that interviews will include both students who have and who have not returned to study.



Student journey through a module, grey triangle indicates area of study.

Achievement of credit is only one measure of success and does not give any indication of the student experience of assessment banking. It could be assumed that a student returning and achieving credit is a success, however the student may feel it was a poor decision which impacted on the time taken and possibly the grades achieved in their module. Equally students who do not return in the following presentation may not view it as a negative experience. Whilst some studies suggest that "stop-out" of study is simply deferral of "drop-out" (Tinto, 1993), deferral of a withdrawal decision may improve the student experience and improve the likelihood of return at a later date. To date there has not been any analysis of the triggers for students deciding to assessment bank or the impact of the timing of their study break. Better understanding of assessment banking situations and their outcomes may enable us to review policy and offer better advice, to improve the experience of future students.

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References

Taylor, P. (2017) Assessment banking: interventions to improve student success rates. Paper for Strategy and policy committee.
Tinto, V. (1993) Leaving College: Rethinking the causes and cures of Student Attrition. 2nd Ed. Chicago, The University of Chicago Press

Examining Interactions in STEM Web Broadcasts

Venetia Brown, Trevor Collins, Nick Braithwaite

The Open University

Aim

To investigate the impact of embedded interactive tools (widgets) in live web-broadcasts on learning.

Context

Inquiry and experiential learning are key pedagogical methods in STEM curricula. As part of the OU's supported opening learning approach, lab-based broadcasts provide online and distance students an opportunity to observe and engage in practical science demonstrations through synchronous (real-time) methods.

Interaction is crucial to maximise student learning. Empirical data (Martin, Parker & Deale, 2012; Kim, Kim & Han, 2013) suggest that synchronous media:

- Add value to learning through real time discussions
- Provide instantaneous feedback
- Enhance student connectedness, interest and engagement

There remains a gap in the type of pedagogical strategies that promote interactivity in synchronous environments.

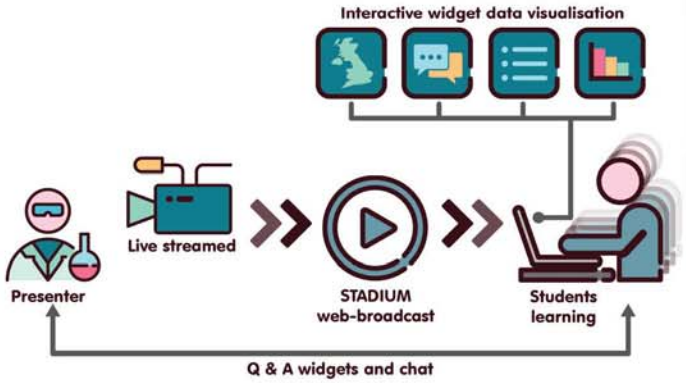

Figure 1. Schemata of live-stream web-broadcast

Areas of Investigation

- Social Presence
- Student Motivation
- Interactivity
- Effectiveness

Lab-based Broadcasts vs. Online Tutorials

	Stadium Live Lab-Based Broadcasts	Adobe Connect Online Tutorials
Number of Students	~ 10 - > 100	~ 5 - 25
Focus	lab-bench experiment field	whiteboard shared screen
Interactive Techniques	pre-prepared Q&A widgets, chat box	on-screen activities, polling, raise hand, applaud, chat box, microphone
Instructional Strategy	situated presentation	dialogue
Motivational Factors	curiosity excitement companionship	support isolation learning
Technology	multiple HDI cameras, video mixing desk	restricted camera on device
Logistics	production team, presenter and assistant	tutor and assistant

Approach

Observations	Surveys	Tests
• Teaching practice • Video content analysis	• Stakeholders attitudes & perceptions	• Instructional strategies • Pre test/post test

Draft Research Questions

The study will address the following areas:

i) Ways collaboration happens between students and presenters.

ii) Adaptations to encourage equality of knowledge development.

iii) Perceptions of stakeholders (i.e. students, lecturers and production teams) on live web-broadcasts.

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Martin, F., Parker, M.A., Deale, D.F. (2012). Examining interactivity in synchronous virtual classrooms. *The International Review of Research in Open and Distance Learning*. 13(3) 227 – 261
Kim, S., Kim, H., & Han, S. (2013) A development of learning widget on m-learning and e-learning environments. *Behaviour & Information Technology*, 32 (2) 190-202

Flexible/ early start on M140: Introducing Statistics

Carol Calvert

The Open University

The Problem

- Students registering early are more likely to drop out than students registering later. Around 14% , or 140 students, drop out before mid October

The Plan

- Enable students to start when they want from June onwards.
- Provide tutors, tutorials, forums, the units and quiz's and screencasts
- Allocate, as far as possible, to these same tutors at module start

Doing the plan

- 400 students were offered the opportunity of an early start and over 200 took up the offer- around ten-fold more than expected!
- Some students got very into the module and we added two more Units to the three originally installed on the web pages
- Students surveyed to shape the programme

Checking the solution

- Students initial very keen and six months after the main model started definitely happy with programme
- In terms of students we retained 4% more students

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An International Comparative Study of Tuition Models in Open and Distance Learning Universities

Ann Walshe

Outcome of research carried out as a Visiting Scholar at the Institute of International Exchange, Shanghai Open University 13th to 24th November 2017. My visit was generously funded and supported by eSTEeM.

The Open University

Blended learning, balance shifting towards online.
Online student induction.
Working towards a more personalised study experience.
Distinction between teaching and tuition.
Tutor refers student to support team if they need additional support.
Remote access to OPEN STEM labs.
Disabled students are integrated in tutor groups.
Little use of social media for teaching.

Shanghai Open University

Blended learning, balance shifting towards online.
41 branch schools across Shanghai.
Face-to-face teaching by full-time and part-time tutors.
F2F induction to motivate students and develop study skills.
Minimum face-to-face attendance required.
Student supervisor in the classroom to motivate students and refer them to the teacher if they need additional support.
Digital Lab and Technology Enhanced Learning.
Disabled students taught in a specialised branch school. Deaf students taught by specialist teachers using sign language.
Social media (WeChat) plays a significant role.

National Open University of Nigeria, NOUN

- Study centres across Nigeria
- Where students have the opportunity to attend tutorials.
- 24/7 call centres for student queries

Chongqing Radio and TV University

- Distance education network of 45 branches covering 38 districts.
- A combination of on-campus and off-campus education.
- Aims to integrate educational resources in a massive teaching database system.

Cavendish University Zambia

- materials provided on a tablet
- Students use the tablet to study online or offline
- periodical f2f classes
- Access to online forums and chat
- Some modules cannot be studied online

Netaji Subhas Open University of India

- 120 study centres "to reach the unreached"
- Students attend weekly Personal Contact Programme sessions
- Aim of f2f is to motivate, interact, clear doubts, exchange thoughts and encourage further reading
- Faculty members available online in scheduled Chat sessions

Jose Rizal University, Philippines

- Half the time face-to-face lectures and discussions.
- Half the time interactive computer aided instruction and computer resource programs.
- Independent learning in student's own time and space.
- Focus on ensuring teachers are trained with the right competencies.

University of South Africa, UNISA

- Teaching materials either printed or downloadable.
- Regional centres distributed over the entire country.
- Walk-in access to computers, video conferences and other technology, f2f tutorials.
- Online discussion forums.

Distance education can enhance but not replace the interpersonal nature of traditional face-to-face education.
Motivating students is particularly important in the case of open entry.
Distinction between teaching and academic support needs to be made clearer with the move to more online teaching
Further research is needed around the competencies of online teachers and tutors.

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Reflections on the OpenStudio online conference for S350

Rachel McMullan, Simon Collinson

The Open University

1 About S350 Evaluating Contemporary Science

- Q64 Natural Science pathway level 3 module
- Aims to give students the skills to explore areas of contemporary science and examine the 'science behind the news'
- Taught online to students on a range of science and health pathways or the Open degree

2 Conference aims

- Enhance student learning experience
- Target employability skills in
  - Communication
  - Critical evaluation
  - Data presentation
- Encourage student peer learning by giving feedback in their own discipline and one other.

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3 Conference format

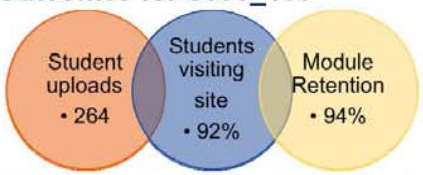
- Run in OpenStudio for 2 weeks:

Before	• Select from 4 interdisciplinary topics
Before	• Identify, evaluate and compare 2 primary papers
Before	• Prepare and e-poster, key image and recorded audio pitch
Before	• Upload to OpenStudio
During	• Give feedback on 2 posters
After	• Use poster presentation and feedback to prepare TMA

4 Supporting material

- Activities earlier in the module prepared students for using OpenStudio
- Module material/activities introduced students to scientific conferences, poster presentations and giving balanced feedback
- Students were provided with;
  - An example poster presentation
  - Detailed instructions on how to prepare and upload their poster presentation
  - A poster feedback form

5 Outcomes for S350_16J



"My favourite block ... It was very interactive and represented a life-like situation a scientist would encounter." *S350 16J student*

"I thoroughly enjoyed preparing the poster..... it was immensely interesting to read those created by other students too. The Student Conference was a wonderful, innovative idea and it brought a really interactive feel to an online module. The OU continues to come up with these ground-breaking ideas, it really is the leader in online learning." *S350 16J forum post*

6 Lessons for the future

"…student conference where I feel further organisation and work could …. improve this experience. I suggest having clearer software to track the students that did or did not receive feedback as well as dealing with software issues involving the uploading and arrangement of slots in this activity, as this did cause delays of the production of productive work"

- S350_17J students have more preparation time.
- Students provide a transcript to aid the tutor's marking.

How do STEM students use learning resources? How does this use evolve over time?

Laura Alexander and Alexis Lansbury

Investigation into how use of learning resources changes

The OU offers students a wide spectrum of learning resources, including textbooks, books of exercises, online content, online quizzes, forums, screencasts and applets. The blend of resources provided varies widely from module to module. This study investigates whether students need to change their study methods as the resources provided vary, and whether such changes are perceived to cause difficulties.

599 students from M269, MST224 and S217 were invited to take part in an online survey.

S217	entirely online and digital
M269	blend of digital resources, texts in the public domain and module texts
MST224	purpose-written text-books with some digital resources

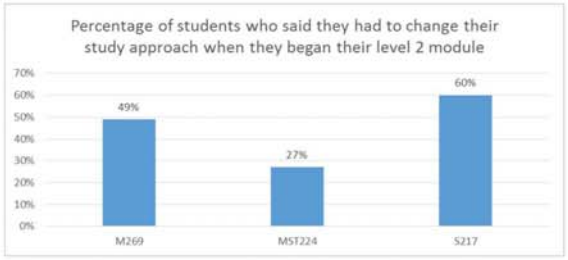
Students coming into these modules may have come from modules with entirely digital level 1 study resources, a mix of online and book-based resources, or mostly book-based resources.

What did we ask?

We questioned students about their level 1 OU modules, the format of the learning resources and how they used these resources to study.

Module	Number of respondents	Textbooks in 1st level 1 module	Online-only 1st level 1 module	No level 1 module
M269	35	31	4	0
MST224	33	29	0	4
S217	45	32	6	7
Total	113	92 (82%)	14 (12%)	7 (6%)

We then asked students to consider their current level 2 module, and tell us whether they had needed to change the way they used module materials for this module.



The entirely digital module, S217, appears to require the biggest change in approach.
Statistical analysis shows the link between the level 2 module studied and the need to change how they studied is real.

We asked students both how they changed their approach, and if changing their approach caused any particular issues. The results are still being analysed, but of those who changed, 66% felt having to change their approach had caused them problems.

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Quantitative data from online survey – initial analysis

We collected detailed data on the methods students used to study, and how much they used each of them. Most students used a blend of digital and non digital study

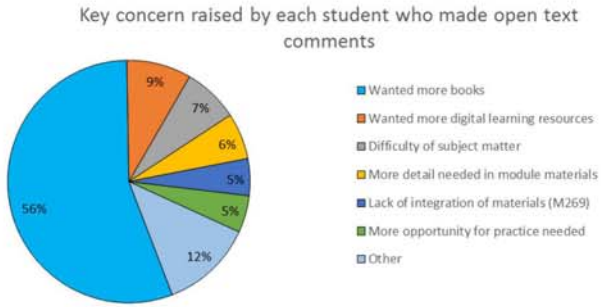
Online quizzes and iCMAs and *Doing module exercises and activities on paper* were the two most popular ways of studying for both initial level 1 and current level 2 modules.

Considering all the possible methods of studying, overall there was a fairly even split between using digital and non-digital resources at level 1, and we did not see this change significantly as they moved to level 2.

Method of Study	First Level-1 Module	Current Level-2 Module
Digital	52%	51%
Non-digital	48%	49%

Open text comments from online survey – initial analysis

We gave students the opportunity to give open text comments on why and how they had changed their study approach over time, and what else would have helped them. 82 students did this.



Next steps

51 of the students agreed to take part in further one to one interviews.

There appears to be a conflict between what students do, and what they perceive they do.

We will be investigating this further in the one to one interviews

Women in Engineering at the Open University
Motivations and aspirations

Carol Morris & Sally Organ

The Open University

Background

There have been many initiatives over the past 30 years to increase the number of girls choosing to study engineering at university. Despite these initiatives the numbers of professional female engineers has remained low at around 9%.

Women account for ~ 10% of undergraduate engineering students at the OU. We have investigated their backgrounds, motivations and aspirations through a recent survey, which has revealed some interesting differences between male and female students.

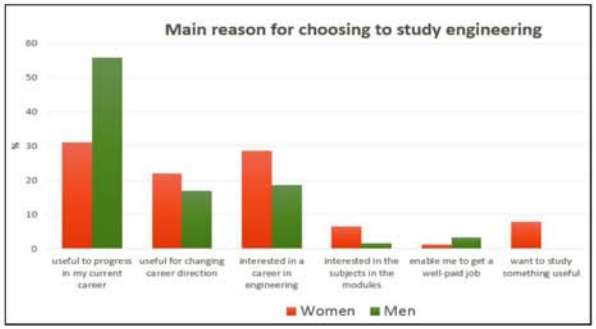
Work experience

Women
71% work full-time, 10% part-time
19% work in engineering, 23% in STEM
44% have never worked in engineering but want to.

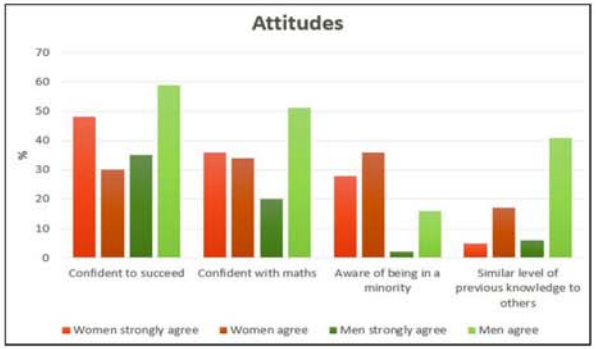
Men
84% work full-time, 4% part-time
58% work in engineering, 12% in STEM
17% have never worked in engineering but want to.

Can you guess which set of disciplines most interest women and which most interest men? The relative sizes of the words represent the popularity of the discipline.

Reasons for studying engineering



Attitudes to study



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Active student engagement in research-led teaching maximises learning success: translating best practice from the traditional classroom to the virtual classroom.

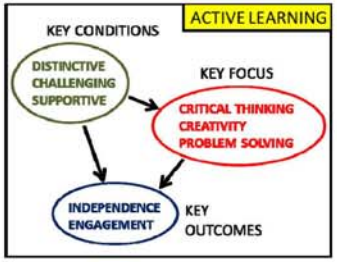
Dr Philip L Staddon

The Open University

Impetus. The retention rate amongst OU student is poor. Increasing engagement and motivation of students is key to decreasing drop out, but also to achieving the desired learning success. A proven way to achieve this in the traditional classroom is by increasing research-led teaching and the active student learning. Can this be translated into the online environment?

Active learning. Here research-led teaching is defined as where there is critical engagement with research on the part of the students and where students are actively engaged in performing research. By definition these activities involve active learning and are student-led.

University of Minnesota 2010



ACTIVE LEARNING
Q&A sessions
Discussion

RESEARCH-LED
Problem solving
Dealing with complexity

***How activities benefit learning*:**
- Co-creation of knowledge
- Sense of ownership

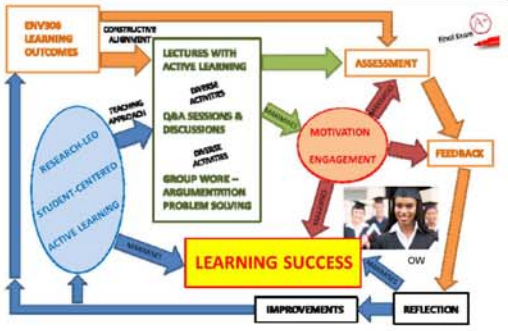
***Results*:**
- Improves engagement
- Improves independence
- Improves critical thinking

Methods. Using a comparative analysis of a traditional classroom teaching module and a virtual environment module, the areas where substantial improvement in the digital delivery is required to facilitate the inclusion of research led-teaching for student-led learning are identified.

Key issues:
1. how to facilitate discussions between students in a virtual environment,
2. how to broaden study topic choice in large classes to maximise engagement,
3. how to install the co-creation of knowledge as a normal teaching approach.

Proposed actions:
1. devising active learning tasks with (live) interactive group work for a VLE,
2. maximise the diversity of these active-learning tasks to stimulate all interests,
3. incorporate research-led active learning exercises wherever possible.

Active student engagement in research-led teaching maximises learning success (traditional classroom example)



Learning environment

Creating an environment where students feel comfortable is crucial for successful interactive online discussions and active group learning

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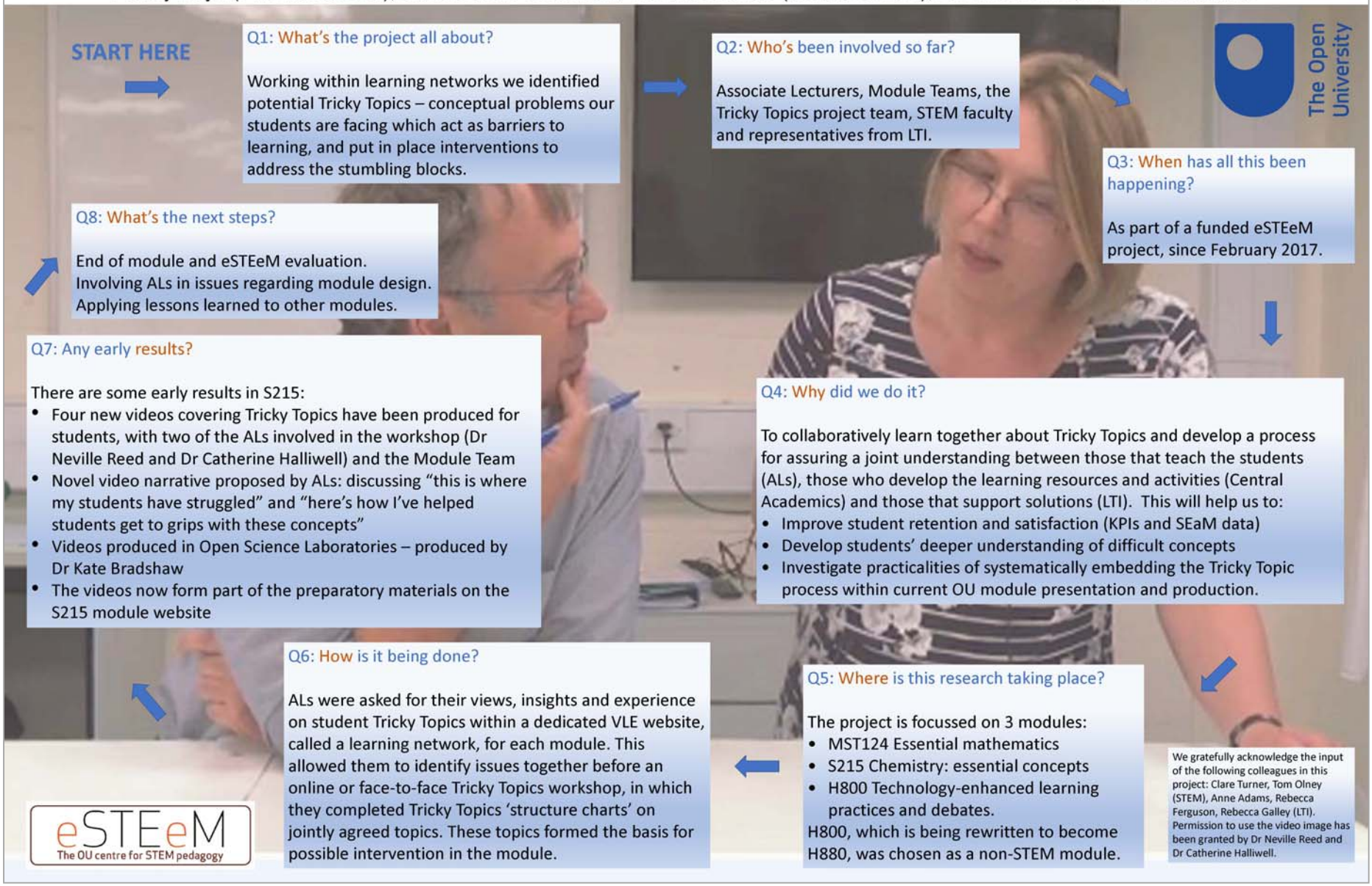
Conclusion. This approach, if successful, will result in greater engagement amongst VLE students, higher retention rates, enhanced soft employability skills (team work and leadership), and improved learning outcomes.

OW: Our Weekly: EVM: Express Virtual Meetings

Utilising the Teaching Tricky Topic Process to Identify and Address Student Misunderstandings Across Three OU Modules

Project Team: Elizabeth FitzGerald, Jo Iacovides, Rob Janes, Elaine Moore (Project Leaders & Module Chairs), Anne Pike (Tricky Topic specialist), Lesley Boyd (PhD researcher), June Barrow-Green and Thea Herodotou (Module Chairs), ALs from S215, MST124 and H800



START HERE

Q1: What's the project all about?

Working within learning networks we identified potential Tricky Topics – conceptual problems our students are facing which act as barriers to learning, and put in place interventions to address the stumbling blocks.

Q2: Who's been involved so far?

Associate Lecturers, Module Teams, the Tricky Topics project team, STEM faculty and representatives from LTI.

The Open University

Q3: When has all this been happening?

As part of a funded eSTEeM project, since February 2017.

Q4: Why did we do it?

To collaboratively learn together about Tricky Topics and develop a process for assuring a joint understanding between those that teach the students (ALs), those who develop the learning resources and activities (Central Academics) and those that support solutions (LTI). This will help us to:

- Improve student retention and satisfaction (KPIs and SEaM data)
- Develop students' deeper understanding of difficult concepts
- Investigate practicalities of systematically embedding the Tricky Topic process within current OU module presentation and production.

Q5: Where is this research taking place?

The project is focussed on 3 modules:

- MST124 Essential mathematics
- S215 Chemistry: essential concepts
- H800 Technology-enhanced learning practices and debates.

H800, which is being rewritten to become H880, was chosen as a non-STEM module.

Q6: How is it being done?

ALs were asked for their views, insights and experience on student Tricky Topics within a dedicated VLE website, called a learning network, for each module. This allowed them to identify issues together before an online or face-to-face Tricky Topics workshop, in which they completed Tricky Topics 'structure charts' on jointly agreed topics. These topics formed the basis for possible intervention in the module.

Q7: Any early results?

There are some early results in S215:

- Four new videos covering Tricky Topics have been produced for students, with two of the ALs involved in the workshop (Dr Neville Reed and Dr Catherine Halliwell) and the Module Team
- Novel video narrative proposed by ALs: discussing "this is where my students have struggled" and "here's how I've helped students get to grips with these concepts"
- Videos produced in Open Science Laboratories – produced by Dr Kate Bradshaw
- The videos now form part of the preparatory materials on the S215 module website

Q8: What's the next steps?

End of module and eSTEeM evaluation.
Involving ALs in issues regarding module design.
Applying lessons learned to other modules.

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We gratefully acknowledge the input of the following colleagues in this project: Clare Turner, Tom Olney (STEM), Anne Adams, Rebecca Ferguson, Rebecca Galley (LTI). Permission to use the video image has been granted by Dr Neville Reed and Dr Catherine Halliwell.

EVALUATING AND IMPROVING THE S112 PREP SITE

Chris Hutton

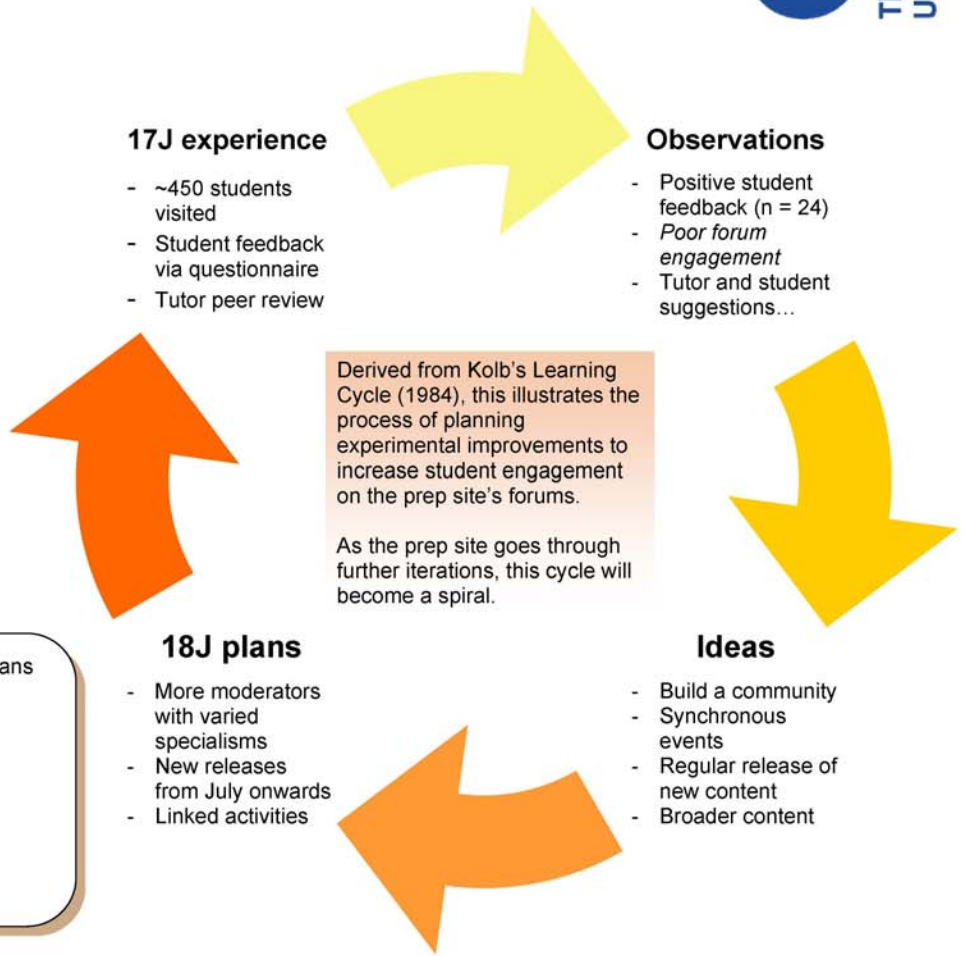
The Open University

S112 is a high population module (~1,200 students in 17J), with students drawn from various feeders, including S111, SDK100 and U116. Prior to the first presentation in 17J, a prep site was written with the following content:

1. Welcome message and key module info
2. *Are You Ready For S112?* self-assessment quiz
3. Range of short study options for students to choose from
4. Forum-based tutor support

The site was designed for time-poor students to be able to prioritise their preparation and achieve progress within a few hours.

In order to evaluate the success of the prep site, students were invited to complete a short questionnaire, and the forum moderators were asked to provide peer-review comments. Following this evaluation (Hutton, 2018), the reflective planning of improvements for 18J has begun – the particular focus being on improving student engagement.



Please feel free to leave thoughts / suggestions for 18J plans on Post-Its in this box. Thank you …

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Hutton, C. (2018) *Preparing Students for Science Distance Learning*. Presented to: HEA STEM Conference 2018, Newcastle, UK. 31 Jan 2018.

Kolb, D.A. (1984) Experiential Learning. Prentice-Hall Inc., USA.

Using tools to study the acquisition of research and employability skills as students' progress through a qualification.

Steven Self, Mark Slaymaker, Lucia Rapanotti. Jon Hall, David King

The tools

We have been developing tools to allow us extract and analyse student texts, such as TMA and EMA submissions, and forum posts. Our original tools looked specifically for significant features, such as the use of external references, principally through rule-based regular expressions. We have now extended the tools to exploit two Natural Language Processing (NLP) techniques: *tokenization* (identifying individual words) and *stemming* (reducing a word to its stem). We apply these techniques to students' writings and map the output against keywords from classification schemes, such as Bloom's Cognitive Taxonomy[1], SOLO (Structure of the Observed Learning Outcome) [2] and LDA (Learning Design Activities)[3] which allow us to automatically analyse the students' writings in seconds rather than manually analyse them over several days.

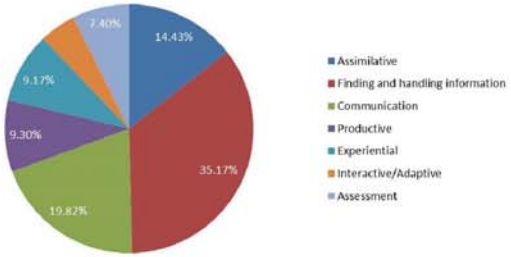
[1] Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain. New York: David McKay Company.

[2] Brabrand, C., Dahl, B. (2009) "Using the SOLO taxonomy to analyze competence progression of university science curricula", Higher Education 58(4) pp 531-549, Springer

[3] Rienties, B., Toetenel, L. (2016) "The impact of learning design on student behaviour, satisfaction and performance: A cross-institutional comparison across 151 modules", Computers in Human Behavior 60 (2016) 333-341.

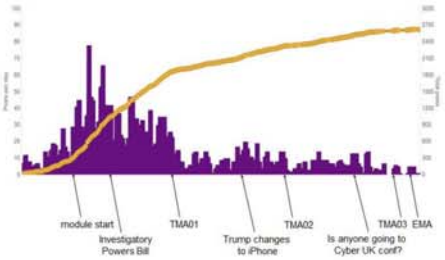
Learning Design

Adapting our NLP based tools we can also gain an insight into the design of module materials. This work is at an early stage, but indicative results are shown below.



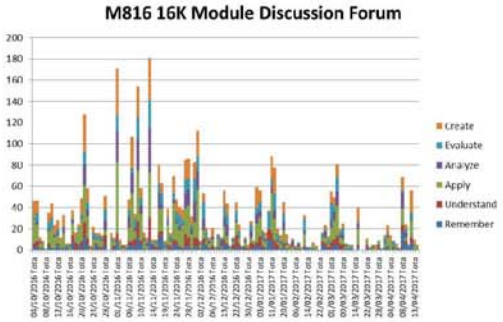
Tracking student engagement

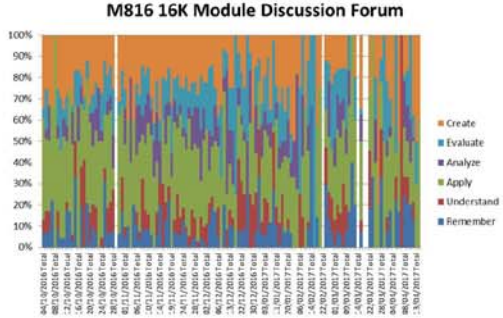
The graph below shows student engagement through forum posts on M811, a module on information security. There are 20 - 30 posts per day from the 100 students, so we can immediately see good engagement from about 1/5 to 1/3 of cohort per day. We can also see that not all is module directed, but that there is *real world* engagement too.



Tracking student progress

Taking the output from our tools and making use of Excel to group, summarise and visualise the data we can produce charts like those below to help us analyse the results of a pedagogical intervention made in a module. We are looking to see the balance across cognitive modes.
Initially, we have tracked this sort of behaviour in forum posts within a module, and we are now extending the tools to examine TMAs and EMAs, and to follow behaviour across a qualification path.





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Supporting Degree Apprenticeship Students

Tutors' and Students' perspectives

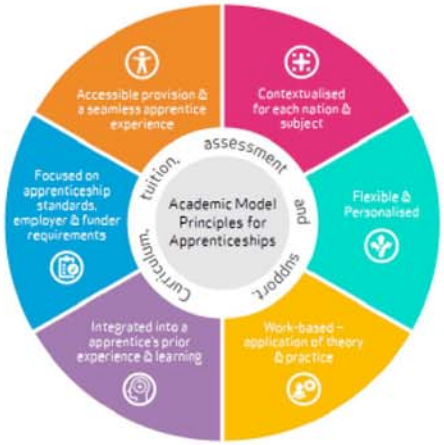
Soraya Kouadri Mostéfaoui and Christine Gardner

Focus of Research

Investigate the support of Degree Apprenticeship (DA) students during Year 1 studies

- *TMX130: Computing Technologies*
- *TXY122: Career Development and Employability*

The OU Academic Model for DA



Area of relevance: accessible provision and a seamless apprenticeship experience

Research Questions

- Support available to DA students
- Relevance of assessment (theory-based and work-based)
- Key benefits of studying via the OU DA programme

Tuition support

- Subject-specific tutors
- Work-based learning tutors
- Practice tutors

Employer support

- How can the OU work alongside employers to improve support?

Assessment

- How can we best integrate work-based assessment into the DA programme?
- New assessment methods?

How can we make the OU offering stand out?

- Flexible study times
- Choice of specialisms

DA students tuition support issues

- How do students determine where to go for support on the DA programme?

Research Methodology

- Literature review relating to work-based learning and DA programmes
- Students' surveys and interviews
- Tutors' surveys and focus groups
- Module debriefings (for tutors)

Project outputs

- Identify 'gaps' or 'good practices' to inform further DA development.
- Inform School committees, School/BDU review of the DA programme.

Contact: Soraya Kouadri (Soraya.kouadri@open.ac.uk) and Christine Gardner (c.f.gardner@open.ac.uk)

Using Adobe Connect Tools to Evaluate Tutorials

L. A. Thomson and N. McIntyre

Introduction

The online synchronous tuition tool used by the university has recently changed from OULive to Adobe Connect. As part of an eSTEeM Project, two module-wide interactive maths workshops/tutorials were delivered via Adobe Connect. In doing this project, we found that the Adobe Connect poll pods allow for more detailed post-workshop analysis of the data than was possible via OULive.

Use of Adobe Connect Tools

Multiple choice and short answer questions have been used in tutorials for years to tailor content to students needs and to check their understanding in tutorials. This continues in the new platform, Adobe Connect, where poll pods have been used to:

1. Determine students' current maths confidence (Figure 1) and change in confidence after the workshop and the reasons for this (Figure 2);
2. Check students understanding of concepts;
3. Determine students' engagement with and evaluation of tutorial resources.

Results of polling are saved so they can also be analysed post-tutorial.

Figure 1: An example poll pod to determine confidence.

Figure 2: Screenshot of a poll pod showing students' reasons for their change in confidence after a tutorial.

Analysing the Data Post-Tutorial

From the "manage meeting information" link on Adobe Connect, detailed workshop information can be collected, including summaries (Figure 3) and individual student responses for every question. Table 1 shows some anonymised and collated student information.

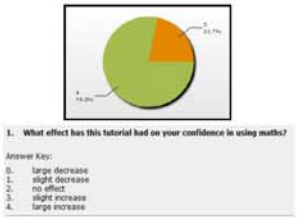


Figure 3: Screenshot of the summary for one question, as provided on the Adobe Connect meeting information.

Comparing the confidence levels at the start (Figure 1) and end of the session (Figure 3), shows the effectiveness of a tutorial. This can be supported with reasons given in a short-answer style question (Figure 2).

Table 1: Student answers to some subject-based questions from the workshop, using data taken from the "manage meeting information" link on Adobe Connect. The highlighted answers are incorrect.

	Concept 1		Concept 2		Concept 3	
Example	A	B	A	B	A	B
Student 1	C	B	C	C	0.02, 0.002	1.7
Student 2						
Student 3	B	B	B	C		
Student 4	C	B	C	C	2	

Table 1 shows the level of detailed information that can be gained about the students' understanding:

- Student 1 – all answers correct
- Student 2 – no engagement
- Student 3 – errors in example A for concepts 1 and 2, but both follow-up examples were correct; no answers for concept 3.
- Student 4 – concepts 1 and 2 correct; concept 3 error in example A and student did not attempt example B.

This collated detail gives a greater insight into students' understanding of tutorial concepts and then allows more focussed and tailored student support to be offered.

Conclusion

Adobe Connect allows greater post-tutorial evaluation than the previous platform. This poster demonstrates how poll pod tools can be used to provide greater insight into the students' understanding of tutorial content and can also be used to evaluate tutorials and other projects.

Implementing Additional Maths Support for Heath Science Students

N. McIntyre, G. Golding and L. A. Thomson

The Open University

Background

On the level 1 Health Science module, SDK100, students have very diverse maths backgrounds and often very low confidence in their maths skills.

In 17J, a new approach to maths tuition was introduced, targeting the early maths required for the module. This poster provides details about this approach to tuition and the main outcomes of our evaluations to date.

Changes to Tuition

In 17J, maths support was removed from the first dayschool and replaced with:

- 18 short videos (3-12 min) hosted on YouTube, each focused on a mathematical concept (numbers, fractions, decimals, percentages, brackets, significant figures, powers, BEDMAS and scientific notation)
- Practice worksheets (with answers) for each mathematical concept.
- Follow-up interactive workshops (run twice), which were tailored to the needs of the students in attendance.

Evaluation of Videos

Students were encouraged to watch those videos which were most appropriate to their needs in advance of attending the workshop and also attempt practice questions.

Students rated the usefulness of the videos (Figure 1) and the academic level of the videos (Figure 2).

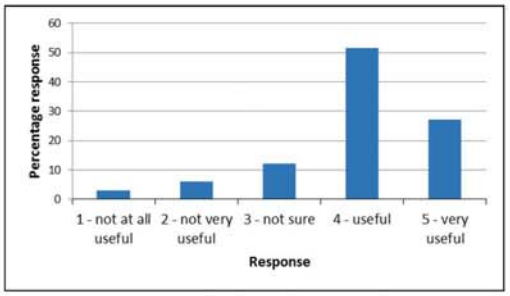


Figure 1: Responses from 33 students to polls on "How would you rate the maths videos?" at the workshops; excludes students who had not watched the videos (39) and no answers (30).

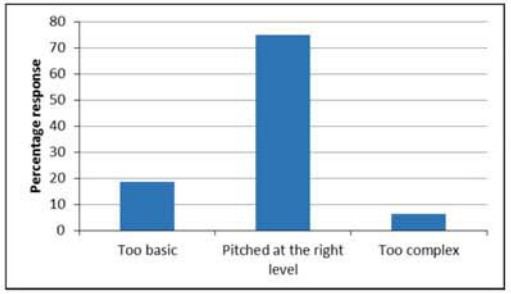


Figure 2: Responses to "How would you rate the level of the maths videos?" in the post-workshop questionnaire (16 respondents).

Students valued being able to choose the most appropriate resources for their needs with 81% agreeing/strongly agreeing that they liked having the option to choose which maths videos best fitted their needs.

Students could check their understanding after the videos through the use of practice questions.

Evaluation of Follow-Up Workshop

Students were offered a follow-up maths workshop and 100 students attended across two sessions. 67% of students in the questionnaire thought that the provision of the workshop alongside the resources was important.

> "Very clearly explained and very helpful - better than just learning from a book or webpage"

Students were asked at the start of the workshop to rate their maths confidence levels and at the end of the workshop to rate the effect of the tutorial on their confidence levels (Figure 3). Of the 62 responses, 57 showed an increase in confidence.

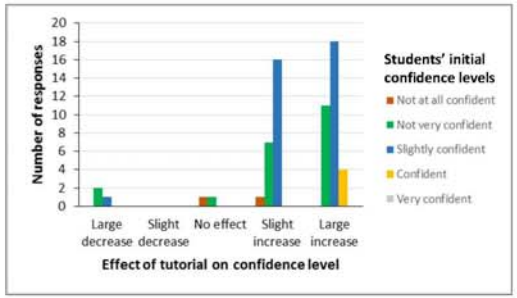


Figure 3: Graph of number of responses vs effect of tutorial on confidence level, mapped against students' initial confidence levels from the start of the tutorial.

Conclusion

This new approach uses videos, questions and workshops to enable students to tailor the support to their needs. It has been used effectively, with many students reporting an increase in confidence.

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The OU centre for STEM pedagogy

Using Twitter to support students through facilitating engagement with the wider mathematics education community

Charlotte Webb

The Open University

Background

Our mathematics education modules are primarily aimed at students whom are either working in educational settings, such as teachers, tutors, teaching assistants or parents of school-aged children, or are working towards becoming teachers of mathematics.

The modules are based on mathematics pedagogy: understanding and teaching mathematics, but are not directly linked to current national curriculums.

Aims

- To encourage students to engage with the mathematics education community.
- To enable students studying at a distance to "get to know" tutors and central staff.
- To share relevant information with students, including about events, resources, current research and government policy.

Photos of and "facts" about the tutors and central team help students to "get to know" staff.

Rationale

Using Twitter encourages personalised, self-directed, and voluntary learning while rejecting isolated learning experiences as students are can interact with other like-minded educators through online discussions (Veletsianos, G., and Kimmons, R., 2016).

Teachers, and prospective teachers, need to keep up to date with current issues in education and consider different viewpoints by connecting with educators with diverse perspectives. Twitter is an efficient, accessible and cheap way to facilitate interactions between education communities (Clinton, K., Jenkins, H., and McWillians, J., 2013).

Following leading educators on Twitter facilitates exposure to a rich, interconnected network of teachers, researchers and policy makers, as well as a variety of educational material (Holmes, K. et al., 2013). This will not only support students in their study of mathematics education on these modules, but will also help them in their future careers within education.

Tweets are a quick way to remind students of module events and information, which can be accessed through mobile phones and tablets.

Project so far

- 'Developing Thinking in Geometry' Twitter page created for 16J presentation.
- Weekly tweets about module specific information and posts related to teaching geometry.
- Students on the module invited to follow the page via forum posts.
- 17D page moved from single module to mathematics education "OUMathsEd".
- Twitter feed embedded onto module sites to ensure accessibility to all students, regardless of Twitter use.
- Semi-automated tweeting introduced using Hootsuite.

What next?

- Structured use of automated tweeting for 18D presentations.
- Host live Twitter discussion using nationally recognised hashtag #MathsCPDchat.
- Evaluation of the impact of structured use of Twitter, through student questionnaires and using Twitter analytics.

Issues

- It is difficult to tell whether followers are students or not, due to usernames.
- Not all students have access to (or want to use) Twitter so information posted must be additional material.
- Analytics give information about the impact of tweets but not specifically about our students.

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