The 5th eSTEeM Annual Conference 2016

STEM Futures: Lifelong Learning in the Digital Age

Conference Booklet

14-15 April 2016

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ACKNOWLEDGEMENTS

We gratefully acknowledge the support of the following people who helped with various aspects of this conference:

Mahruk Bailey, Research and Business Office Manager, Faculty of Mathematics, Computing and Technology

Helen Beetham, Consultant in Higher Education

Nick Braithwaite, Co-Director eSTEeM, Faculty of Science

Diane Ford, eSTEeM Manager, Faculty of Science

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Patrick McAndrew, Director, Institute of Educational Technology

Rachel Redford, eSTEeM and RBS Assistant, Faculty of Science

Andrew Smith, Senior Lecturer in Networking, Faculty of Mathematics, Computing and Technology

Open University and external colleagues who have contributed to the conference

Open University Audio Visual, Events and Catering staff

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14 April 2016

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PROGRAMME – DAY 2

15 April 2016

Time	Session	Venue
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11.00-11.15	**Coffee Break**	**Medlar and Juniper**
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12.15-12.35	**Devices / Soft Haptics** Iestyn Jowers, Mark Gaved and Gary Elliott-Cirigottis *Design and materiality: collaborative learning at a distance*	**Hub Lecture Theatre**

	Trevor Collins *Soft haptics: Tactile multimedia for immersive learning experiences*	
12.40-12.55	**Tactile/Vision Impaired** Vic Pearson, Karen Vines and Andrew Whitehead *Alternative versions of graphs for visually impaired students*	**Hub Lecture Theatre**
13.00-14.00	**Lunch**	**Medlar and Juniper**
14.00-16.00	**Roundtable discussions** The aim of this session will be to address specific questions relating to haptics in education e.g. what are the potential benefits of additional sensory feedback i.e. texture, resilience, defamation? How far are we from routine use of tactile clues, in addition to the important niche area of visual impairment?	**Hub Lecture Theatre**
16.00	**Close**	

WELCOME AND INTRODUCTION

The 5th eSTEeM Annual Conference is titled *STEM Futures: Lifelong Learning in the Digital Age*. While the Open University has for over 40 years been in the forefront of providing lifelong learning at a distance, digital technologies have brought about profound changes in how our students learn as well as how we facilitate this learning.

The aim of this conference is to highlight recent research supported by eSTEeM and reflect on the future of STEM-specific teaching and learning in the light of new possibilities and challenges presented by the digital age.

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. This year conference delegates will be invited to vote for the best poster and the winning poster will be announced at the end of the day on the 14th April during the closing keynote session.

The effective use of learning technologies at scale is at the centre of much of eSTEeM's scholarship activity; our portfolio of ongoing and new projects presented at this conference includes work on supporting students, technologies for STEM learning, innovative e-assessment and online/onscreen STEM practice. The keynote lectures that open and close the day will address working with the tide of social media and the support of lifelong learners. 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.

Our second day is a workshop focused specifically on exploring innovation in the use of haptic technologies for STEM teaching and learning. We are pleased to be hosting a few external colleagues for this innovative workshop.

We welcome you to our 5th eSTEeM conference and hope you have an informative, stimulating and enjoyable two days.

Nick Braithwaite and Clem Herman, eSTEeM Co-Directors

OPENING ADDRESS SPEAKER BIOGRAPHY

Patrick McAndrew is Professor of Open Education and Director of the Institute of Educational Technology (IET) in The Open University.

IET is a strategic academic unit carrying out research, supporting the University and offering post-graduate qualifications in online and distance education. IET research considers new forms of pedagogy afforded by technological developments and how these can be deployed to support learning. IET's strategic programmes include developing learning analytics and learning design to drive quality enhancement processes in the University. IET has a major role to play in accessibility for disabled students, ensuring that their learning experience remains rich and varied, and enables them to achieve their learning goals.

In his own research Patrick has taken a leading part in the development of approaches to open and free learning. Recent projects in this area include OpenLearn, OLnet, Bridge to Success and the OER Research Hub. These projects combine practice and research on the impact of openness. He has had an active role in over 40 funded-projects across technology enhanced learning.

Patrick has a degree in Mathematics from University of Oxford and a PhD in Computer Vision from Heriot-Watt University.

OPENING KEYNOTE SPEAKER BIOGRAPHY

Andrew Smith is focused on the development of simulated learning resources in the delivery of networking technology, investigating the differences in the learning experiences of 'simulation' and 'remote' students vs those having an 'in class' and 'hands on' experience. In addition, Andrew is a member of the adaptive security research group and also has an interest in the use of social media as a pedagogical resource.

Tweets @teraknor. Blog http://teraknorblogs.blogspot.co.uk/

CLOSING KEYNOTE SPEAKER BIOGRAPHY

Helen Beetham is a writer, researcher and adviser on e-learning issues. She has worked extensively in UK Higher Education and is a regular keynote speaker in Europe and Australasia. She has written key national reports on e-portfolios, e-learning and pedagogy, digital literacy, open educational practice and developing digitally capable organisations. A long-standing consultant to the Jisc e-learning programme, Helen recently completed a year-long study on the expectations and experiences of today's 'digital students'. She works for a range of professional bodies and provides independent consultancy to universities and colleges, including recently as part of the Changing the Learning Landscapes programme. Her co-authored volumes *Rethinking Pedagogy for a Digital Age* and *Rethinking Learning for a Digital Age* (both Routledge) are standard texts on PGCert and Masters courses in Education.

Tweets @helenbeetham. Blogs digitalstudent/jiscinvolve.org and digitalcapability.jiscinvolve.org.

HAPTICS FOR EDUCATION WORKSHOP
KEYNOTE SPEAKERS BIOGRAPHIES

Astrid M.L. Kappers studied experimental physics at Utrecht University, the Netherlands. She received the PhD degree from Eindhoven University of Technology. From 1989 till September 2012, she was with the Department of Physics and Astronomy, Utrecht University. From 2008-2012 Astrid was head of the Human Perception group of the Helmholtz Institute. In September 2012 she moved with her whole group to the MOVE Research Institute, Department of Human Movement Sciences, Vrije Universiteit Amsterdam, The Netherlands. She was promoted to full professor in 2005. More than 25 students received their PhD under her guidance. Her research interests include haptic and visual perception. In 2003, she won the prestigious Vici grant. She is/was member of the editorial boards of Acta Psychologica (2006-present) and Current Psychology Letters (2000-2011) and associate editor of the IEEE Transactions on Haptics (2007-2011).

Professor William Harwin is Director of Research for the School of Systems Engineering at the University of Reading, where his research interests encompass cybernetics and the interfaces between humans and smart machines as typified by haptic devices, and medical and rehabilitation robots.

CONFERENCE INFORMATION

Registration
Conference registration will take place between 9.00 – 9.30 on Thursday 14th April and 9.30 – 9.45 on Friday 15th April in the Bay Reception. There is a map of the campus on the back cover of this booklet; the conference venues can be located at numbers 05 and 06.

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

Helpdesk
A helpdesk will be manned by eSTEeM conference staff in the Bay Reception throughout the 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 12.45 – 14.00 in the Hub Lecture Theatre. This year conference delegates are invited to vote for the best poster. The winning poster will be announced at the end of the day on the 14th April during the closing keynote session. 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, morning and afternoon tea, and lunch.

GENERAL INFORMATION

Parking and transport

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

Security

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

Disabled access and elevators

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

No Smoking Policy

The Open University operates a non-smoking policy. We ask you to respect this policy whilst on campus. All premises are designated smoke-free. Smoking is not allowed in any part of, or entrances to, any building, including bars and eating areas. Smoking whilst on site is only allowed outdoors in designated green areas.

Other queries

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

Feedback

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

BOOK OF ABSTRACTS

Opening Keynote Presentation

Our classroom has escaped!

Andrew Smith
Faculty of Mathematics, Computing and Technology

Social media is here to stay with many platforms having been with us for over ten years - it is embedded into the daily lives of around 3 billion souls. As academics we have to face facts; our classrooms virtual or face to face have long ago escaped into the ether via social media.

The Cisco Networking team at the Open University have explored how social media can help extend the 'classroom'. Finding ways of using Twitter, LinkedIn, Facebook and Periscope amongst other sites to engage students and enhance the way the subject is being taught.

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

Student experience of university email communication

Linda Robson[1], Lynda Cook[2] and Nicolette Habgood[2]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2]

Since email access has become almost universal, universities have increasingly used email as a key communication channel. This project investigated the number and origin of email communications to students on three Open University first year undergraduate STEM (Science, Technology, Engineering and Mathematics) modules. The modules were: *Topics in Science* (S142), *Introducing Health Sciences* (SDK125) and *Environment: Journeys through a changing World* (U116). S142 and SDK125 are 30 credit modules amounting to about 8 hours study a week and U116 is 60 credits amounting to around 16 hours study per week and all three modules are run over 31 weeks. The number of students who started studying the modules in February 2015 was; S142 838, SDK125, 824 and U116, 494 which ran from February to October presentation in 2015.

Quantitative analysis of the number and type of emails sent to students on these modules revealed an average and maximum number of email communications per student on each module was S142: average 38, maximum 59, SDK125: average 67, maximum 82, U116: average 45, maximum 83. These figures are for students studying a single module over 31 weeks.

Qualitative analysis from interviews undertaken with 40 students from each module determined how they felt about the number and type of communications they were receiving. The outcome of this analysis revealed that students appreciated email as the main form of communication from the university, although they underestimated quite significantly the number of emails they had received.

Sharing good practice and creating community spirit online - an AL Staff Development initiative in Science

Janet Haresnape and Nicola McIntyre
Faculty of Science

Staff Development for Associate Lecturers (ALs) should be primarily about developing and sharing good teaching practice, to enable ALs to better support their students; however with so many changes within the OU, Staff Development events in recent years have focused more on ‘imparting information’ to help ALs keep abreast of changes. This programme of regular

OU Live sessions, delivered by ALs for ALs, was introduced as a Staff Development initiative which would give Science ALs the opportunity to share good practice and suggest ways of improving the way they support their students. All Level 3 and many Level 2 modules are now all online, so neither tutors nor students meet face-to-face, so the programme also aims to help nurture a sense of community among Science ALs, providing an opportunity for them to get to know each other, and share their concerns.

Any Science AL can submit a proposal for a suggested contribution to the programme; proposals are reviewed by the Science AL Staff Development working group, and a programme of monthly sessions is put together and published on the SST website. ALs sign up on a wiki if they plan to attend so that the facilitator gets an idea how many participants to expect. Participants are asked to give feedback by email after the session, and the feedback is collated and passed back to the presenter. Facilitators are paid 1 DL (Day Lecturer) day for preparing and delivering their session, with the money coming from the ALSD fund.

The programme has now been running for over a year, and has included sessions on TMA marking tips, supporting international and geographically dispersed student groups, managing student expectations, and applying for HEA recognition, as well as some more informal Q&A sessions.

Attendance at the sessions is recorded on the AL's Staff Development record, so will appear on his/her ALAR (AL Activities Review). The running of the programme has recently been handed over to the AL members of the Science ALSD working group.

We will outline how we have developed and organised the programme, and present data on who has participated in the sessions in it, and summarise the feedback received. We will also invite questions and suggestions on how to widen the scope of the programme, especially now that we are part of a larger STEM Faculty, without jeopardising the feeling of community spirit which is beginning to develop among the participating ALs.

Associate Lecturer perspectives on supporting students through tuition in groups

Ann Walshe[1], Anne-Marie Gallen[1], Anne Campbell[2] and Mark Jones[3]
Faculty of Mathematics, Computing and Technology[1], The OU in Scotland[2], Faculty of Science[3]

As part of our eSTEeM project: *Perceptions, Expectations and Experience of Group Tuition: towards a shared understanding amongst stakeholders*, we have gathered evidence from a group of Science and MCT Associate Lecturers

(ALs) of their perceptions of group tuition and what ALs think students expect from it.

ALs have come to their current understanding through a wealth of experience and therefore we can learn much from this group of practitioners about the effective provision of group tuition, particularly as we move towards the implementation of the new Group Tuition policy.

A number of themes are emerging from the evidence:

The need for social interaction, sharing, collaboration and group work. ALs said "...we are human and we need to communicate with each other..." and "...it is important for students not to feel they are in this alone, so I think that meeting their tutor and meeting other students is one of the important functions [of group tuition]…"

Meeting your own tutor. Related to the above, ALs also think that one of the purposes of a group tutorial is for students to meet their own tutor and for tutors to meet their own students. One AL said "...more will come if they know their own tutor will be there".

The changing nature of our student population over time. One AL observed "... the student population has changed and become significantly younger, and I think in many ways more demanding…". Technology has also moved on, so students and their expectations have changed a lot as well. ALs think that students often expect group tuition to be didactic rather than participative. "[They] ....expect a lecture, it is a bit of a shock that you are actually asking them to do things".

A fall in group tutorial attendance, both face-to-face and online. Evidence suggests that only one or two students at a tutorial is not unusual and "....getting students to come along is a real problem". However, there is no shared understanding of why attendance has fallen off so much over the years. There is also a perception that the students who would and could benefit most from group tuition never attend. In the words of one AL, "The problem of course is that the wrong students come." There appears to be a shared nostalgia for a time when attendance at face-to-face group tuition was higher.

We will present our findings and ask how we should take forward what we can learn from our ALs in order to best implement group tuition. Our presentation will also pose the question of how the new Group Tuition policy might affect AL practice and student engagement.

Parallel Session B: Short Oral Presentations – *Technologies for STEM Learning & STEM engagement*

The impact of technology on the teaching and assessment of 'systems diagrams'

Andy Lane
Faculty of Mathematics, Computing and Technology

Diagramming is a creative process where the context and tools used to create the diagram may hinder or help students in learning both how to create diagrams that represent a situation and how to learn about diagramming and the situation. These tools equally provide opportunities and challenges to tutors in teaching about and assessing these diagrams and providing feedback, particularly for students studying at a distance.

There is a long history of teaching systems diagramming as a 'thinking and doing' technique at the Open University. A recent manifestation has been in two mainly online undergraduate modules, T219 *Environmental management 1* and T319 *Environmental management 2*, where students share diagrams with other students throughout the duration of the module, have to work collaboratively on diagrams in small groups for one part of the module and include diagrams in all assignments.

The study focused on students' experiences of using diagrams before, during and outside their study of both modules to better understand the main factors that influence their educational value. It looked at student postings in online forums; samples of assignments with specific questions about diagramming as a practice; an online survey of students who studied one or both of the modules; and telephone interviews with a small sample of students and tutors.

It was found that few students seriously used diagrams before their study of the modules; that they were either enthusiastic or sceptical about their value although most said they would use them in future; that the number of diagrams and the technologies used to create and share them were often burdensome in the two modules investigated; and that the group work could provide a better experience for using diagrams but that this too could be blighted by timing and technical issues.

Establishing the force-concept inventory using free-text questions: Can we do it? Why would we do it? Is it the same?

Sally Jordan and Christine Leach
Faculty of Science

There are several concept inventories in physics, with the most well-known being the force concept inventory (Hestenes et al, 1992), an instrument that is widely used around the world as a measure of student understanding of Newtonian mechanics. However, most of these concept inventories rely on the use of selected response questions (e.g. multiple-choice questions) which may falsely represent student understanding (Rebello & Zollman, 2004). We will describe recent work, with colleagues at the University of Hull and the University of Edinburgh, which implies that the frequently observed gender gap in attainment on the force concept inventory (Madsen et al., 2013) may be reversed if the questions are framed as free text questions (James et al., 2015).

We will also discuss early stage work (using the Moodle Pattern Match question type; Butcher & Jordan, 2010) to develop automatic answer matching for free-text responses received for a version of the force concept inventory; this will enable testing across the world, though there is a philosophical question as to whether the resultant inventory is the same as the FCI or different. We will encourage discussion of all aspects of this work, from the practical to the philosophical.

Breaking the coding barrier: Transition from Level 1 to Level 2 programming

Frances Chetwynd[1], Helen Jefferis[1] and Fiona Aiken[2]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2]

In the era in which retention and completion rates are more transparent to potential students, improving our ability to support students in their transition from First to Second Year studies is an important goal. For the MCT Faculty in particular, the move from broad-based modules at Level 1 (covering a very wide Computing and IT curriculum) to more tightly and technically focussed programming modules at Level 2 is a critical area of interest. However, whilst the bare numbers will tell us something about the success or otherwise of a particular cohort in making this leap, understanding why some students subsequently fail to progress at Level 2 is more difficult. In addition, there has been little recent research into engagement or success with programming among students on either TU100 or TM129.

The project we are reporting on here aims to explore the effectiveness of the teaching of programming on the above Level 1 modules in preparing

Computing and IT students for higher level study of programming – specifically on M250 and M269. This broad aim comprises three objectives:

1. to gather data on levels of student engagement with the programming at Level 1 and to correlate this with success in programming in Level 2 modules;

2. to explore the influence of Level 1 programming teaching on students' choice of modules at Level 2;

3. to gain insight into how well Level 2 programming students on M250 and M269 believed they had been prepared for programming work by TU100 and TM129.

Aim (1) will be investigated by analysis of individual programming TMA question scores. Aims (2) and (3) will be explored via survey questions.

In the proposed presentation we will discuss the initial analysis of a subset of the data on engagement with programming at Level 1 and the results of a survey of M269 and M250 students on the 2014J presentations. Additionally, we will explore the difficulties of working with whole cohort datasets at the Open University. In any subsequent discussion, we would welcome ideas on the analysis of such datasets, and whether more insight into the students' transitional journey can be gained from the perspective of L2 students looking back, or from the actual performance of L1 students at L2.

Parallel Session C: Short Oral Presentations – *Online / onscreen STEM practice & Technologies for STEM learning*

Perceptions of online group work

Victoria Nicholas, Nick Braithwaite, Sarah Chyriwsky, Dave Edwards and Mark Hirst
Faculty of Science

The Open University is a world leader in delivering online practical science to a diverse student audience. One of the key factors at risk in taking practical activities from a residential, hands-on, environment into the online world is that of collaborative learning and the development of team working skills that are highly valued by employers. It is therefore important to evaluate the strategies that have been adopted in our online practical activities.

This inquiry aims to investigate the perceptions of team work in students on the "S288: *Practical science''* suite of modules. This is a 30 credit Level 2 module, was a compulsory module in BSc Natural Sciences (Q64) pathway and

optional in other Science qualifications. Students from five discipline areas came together to form an inter-disciplinary team to propose investigations in a particular scenario (such as a manned mission to mars). Students are asked to reflect on their group work experience as part of their final assessment. Initially a subset of the student reflections was examined by two tutors associated with the module and key themes from the reflections were collated. This initial data showed that students often cite negative perceptions such as "poor participation" "missed deadlines" "unequal participation" as reasons why their group work experience was not successful. Based upon this initial survey, text themes were further explored in a larger cohort of scripts.

This presentation will focus on the results of the analysis and the subsequent changes to the way group work is carried out on the daughter module, SXHL288. It will also provide an insight for other modules considering online group work aimed at developing team working skills as part of their practical science delivery.

Inspiring and enabling academic authors so they can better support students learning online

Angela Coe[1], Pallavi Anand[1], Tom Argles[1], Nigel Harris[1], Victoria Nicholas[1], David Rothery[1], Philip Sexton[1], Clare Warren[1] and Graham Healing[2]
Faculty of Science[1], Institute of Educational Technology[2]

A major challenge in distance education is providing direct and engaging connectivity between the student and educator. The learning environment needs to be responsive to student needs, tailored to the academic content, efficient and above all inspirational for both the students and educators.

Online technology now presents many opportunities to overcome the separation in distance education and bring the student and educator closer together. The S309* academic team have been using new technology to: (i) develop an entirely new approach to course production including directly authoring into a web environment (open edX); (ii) examine new ways of engaging students and (iii) develop ways of communicating difficult scientific concepts. We are testing out our approach with current students through a series of 5 'taster' pilots, each of which have a different cohort of 20 students. Full evaluations of our presentation methods and new approach have been conducted through online surveys. The pilots are funded and supported by eSTEeM together with small contributions from the Department of Environment, Earth and Ecosystems and the Faculty of Science.

Initial student feedback includes:

'I found the contents of the course interesting, challenging and enjoyable. I learnt a lot'

'...an excellent learning platform and have studied at a faster rate than what was recommended. I have enjoyed it so much I just wanted to keep going!'

'Well done, the enthusiasm of the team is tangible and contagious! Looking forward to ….S309 in October 2016'

'The ability to make changes during the pilot demonstrates that the module, when presented, would be bang up to date'

This presentation will showcase some of the highlights of our approach and present the student response so far to these major changes. Our S309 work has helped to initiate and is influencing two major new projects within the Open University these are: a project on direct authoring and project Minerva that is examining agile module production.

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*S309 is a stage 3, 60 credit Earth Science module which will be presented for the first time in October 2016. The module covers: events in Earth history, mountains, oceans, volcanoes and remote observation, sediments and sea-level and Earth science in society. The students will also undertake a short project. More details can be found at:
http://www.open.ac.uk/courses/modules/s309

The trials and tribulations of S217: putting a second-year physics module online

Tara Hawes[1], Chris Hough[1], Will Rawes[1], Peter Twomey[1] and Andrew Norton[2]
Learning and Teaching Solutions[1], Faculty of Science[2]

They said it couldn't be done, but S217 *Physics: from classical to quantum* is a second-year OU Science module now offered 100% online. Taking a hefty print-based course and adapting it for online use posed several challenges for production that required innovative solutions. Firstly, it was authored in TeX and became the first Science module to use TeX and then be published on the OU's Virtual Learning Environment (VLE). Secondly, already having a number of complex textbooks was a mixed blessing as they needed to be re-written and edited for studying online within a relatively short timeframe. Thirdly, given the nature of the content, we wanted to make the module as interactive for students as possible, which posed additional challenges given the large number of interactive assets required. A more flexible production process therefore needed to be followed. Finally, when the time came to make ePubs of the units, a new process had to be created by the module's Interactive Media Developer (IMD) to ensure all of the assets could be pulled through into the final product.

The result? Early student feedback suggests it does work, so it looks like there is definite potential for other similarly complex modules to be taught in this way. The onscreen but offline zip file format the IMD developed is also an ideal means of delivering the material to offender learners (students in prison).

Parallel Session D: Short Oral Presentations – *Supporting students*

Improving retention: using a voluntary diagnostic quiz

Carol Calvert and Rachel Hilliam
Faculty of Mathematics, Computing and Technology

This case study demonstrates the issues and advantages in encouraging students to take responsibility for their learning and to be better prepared both in terms of knowledge and expectations for their study. The study outlines the improvement in retention achieved when students were encouraged to use a voluntary diagnostic quiz on a Level 1 mathematics module – MST124. Initially the power of the diagnostic quiz, in predicting future success on the module, was identified using predictive analytics. Information on students who had registered on MST124 was linked to diagnostic quiz results. With this information the module team were able to ensure that students most at risk of struggling with the module content were contacted. Students were contacted by Learner Support Staff in the Student Support Team or by Associate Lecturers. Telephone discussions took place with students who had done poorly on the quiz and those who had not done the quiz, were encouraged to do so prior to module start, by email or phone contact. The aim was to use the quiz results to steer the student to start on the "right" module.

Students were pleased to be contacted by the University about their forthcoming study but they generally expressed confidence about their mathematical ability and were reluctant to heed professional advice that the quiz results pointed to an inappropriate module choice. The diagnostic quiz total score was made available to the student's tutor prior to module start to enable further tailoring of support to the individual needs of students.

The University has a range of interventions designed to help support and retain students. These interventions were essentially the same for the October 2014 and October 2015 students apart from the intervention of this project. This consistence, until December 2015 when an additional source of support to aid retention was implemented, enables us to draw some direct comparisons between the 2014 and 2015 presentations.

Early results indicate a substantial improvement in retention at the early stage of the MST124 module. Retention at the end of two months into the module was 88% for the October 2015 presentation compared to 81% for the same presentation in 2014 which represents an increased retention of just under 200 students.

Provision of online drop-in centres for students requiring additional support in mathematics

Susan Pawley and Chris Hughes
Faculty of Mathematics, Computing and Technology

Many UK Higher Education Institutions offer, in addition to their standard tuition, some form of Mathematics Centre in which students are invited to drop-in for any additional support they require in relation to their studies. At The Open University this facility is covered by our Associate Lecturers on a day-to-day basis, but we note that there is a time-critical period, just before each assessment deadline, when students require additional and immediate support. Given the geographical diversity of our students at the Open University, hosting a face-to-face learning centre in the run up to an assignment deadline would be impractical, as we would not be able to serve all our students with equal effectiveness; the idea of a drop-in facility, however, remains relevant.

For the 15J presentation of MST124 *Essential mathematics 1,* we are running a pilot scheme of on-line drop-in centres for students in Wales ahead of each TMA deadline. We have the full backing of the Module Chair; Assistant Director of Student Services, Academic Services and Student Support; Program Director and Assistant Director for Teaching and Learning in Wales; and the Mathematics SST lead.

Currently, we are 4 months through our pilot and have run drop-in sessions for two Assignment deadlines. There are two further assignments to be submitted before the end of our pilot.

For the first TMA, we hosted a dedicated OU Live room open from 9am-9pm, a week before the deadline. For the second TMA, we hosted an OU Live room open for two hours each evening of the week preceding the deadline.

During our short presentation, we would like to discuss the rational for mathematics drop-in centres and how we can adapt the standard face-to-face model to fulfil the needs of our diverse student body. We will look in detail at the two models piloted so far, discussing their advantages and disadvantages and the demographics of the students that attended. Looking forward to the next two assignment deadlines, we consider how we can adapt our model to

be accessible to even more students, welcoming comments and discussions from those in the audience.

Bitesize virtual mathematics support

Gerry Golding, Martina Gibbons and Anthony Brown
Faculty of Mathematics, Computing and Technology

Bitesize virtual mathematics support is one of a number of initiatives within a wider virtual mathematics support project that seeks to support students who are struggling with the mathematical content in their undergraduate studies. It draws on the premise that we don't all learn mathematics in the same way.

The diverse nature of OU students necessitates diverse approaches to mathematical support. A traditional, often long winded, explanation can prove frustrating and sometimes over bearing for students with short attention spans. Some students don't always have the time to commit to the traditional tutorial type support whether online or face to face. By using a bitesize approach based on short screencasts, audio clips, self-assessment tests and guidance on how to learn maths, students are presented with a series of concept images of mathematical topics with pre-determined goals and allowed to choose their own learning style in a low threat/ high challenge environment. We identified a basic skillset that underpins all mathematical learning with a clear emphasis on repetition and practice to develop this skillset through a number of key mathematical topics. The students can use this resource as either a revision tool before commencing their OU studies or as a support tool during their studies.

The origins of our research draws on the area of neuroscience which seeks to explain how we form connections in the brain and supports our claim that all students don't learn in the same way. Students who are "left side" (of the brain) dominant tend to prefer a more logical structured approach to learning, whereas those who are more "right side" dominant tend to prefer a "whole picture" approach that is much less structured. Traditional mathematics support is often more suitable to "left side" dominant students.

This is very much a prototype of how mathematics support can be presented in an alternative manner. It challenges the perception that presenting mathematics in a step by step approach is the best way to learn. It is not the complete solution to the retention problem but we believe it will help some students. We are very aware that this is mathematical support and is not meant to replace the traditional learning model so we place a big emphasis on encouraging students to engage with module material while using this resource to support their learning.

Parallel Session E: Short Oral Presentations – *Employability, Innovative assessment & Supporting Students*

Enabling Staff Tutors to achieve their potential and equipping them with the correct support in STEM

Rachel Hilliam[1], Rosaria Gracia[1], Carol Calvert[1] and Victoria Pearson[2]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2]

Feedback from Athena SWAN departmental submissions in STEM have identified staff tutors as a group of staff who are of concern with regards to progression and career development. This study looks at staff tutors across the whole of STEM and explores issues such as how the new promotions criteria and changes of working conditions due to the closure of locations may affect this.

A questionnaire was distributed to the 74 staff tutors in STEM on 16th November 2015 which provided a response rate of 63% of which 70% were fully completed. The response rate alone gives an indication of the depth of feeling amongst staff tutors at this time. Issues highlighted in the questionnaire were followed up in two focus groups containing in total 13 staff tutors across the different departments. The results have been analysed using a combination of statistical methods and content analysis.

Staff tutors are the main link between faculty, ALs and students. This group of staff provide line management of ALs, support to students within their region and subject specialism, whilst also contributing to central faculty work. Identifying career development is key to retaining good staff in these posts. Staff tutors directly impact on ALs' performance through the line management structure and delivery of staff development, which in turn impacts on the performance of students. Having the correct staff tutors in post with the appropriate skills and support will aid student retention as these staff have direct student contact, input into module teams and provide the University's link with its ALs. Staff tutors are also an important group with regards to curriculum development decisions, due to the rich shared pedagogical knowledge which AL staff development sessions provide, through the facilitation of ALs' sharing experiences.

Staff tutors are used in different ways by individual departments, the results of this study will therefore be disseminated through departments to share good practice. Staff tutors are used in different ways by individual departments, the results of this study will therefore be disseminated through departments to share good practice. The dispersed nature of the staff tutor role means career progression goals for this group of employees is particularly complex and there are areas of support which need to be explored by the university and departments if staff tutors wish to engage in certain activities

to a greater depth. This is particularly true in light of the changed OU promotions criteria and the loss of regional centres as their designated contractual place of work.

Enhance students' employability: EMA for publication

Yao Xu and Simone Pitman
Faculty of Science

Writing academic papers and getting published is one of the crucial tasks successful scholars and many STEM professionals must undertake early in their career. The skills required to do this well, are often honed over several years. S807, *Molecules in medicine*, (MSc in Medicinal Chemistry), has been helping students develop such key employability skills.

Since 2014B, the format of the EMA was revised from a mini-review (6000 words) to the author-specified review structure of a peer-reviewed journal (Future Medicinal Chemistry). The top performing reviews identified at the Award meeting, were selected and revised by students for submission to the Journal. From the first cohort, 4 of 8 reviews submitted will be published shortly.

This assessment strategy has many benefits: (a) offering an opportunity for all students to apply their acquired knowledge and skills into practice, thus enhancing their employability; (b) stretching the top students' scholarly ability and potentially promoting their career and professional progression; and (c) raising the University's academic standing in the field and increasing the OU's exposure globally.

This presentation will cover how the option of publication motivates able students, what practical assistance Module Teams can offer students pursuing publication and how we plan to optimise the activity in the future.

Developing praxis for learning, teaching, and working amongst OU postgraduate students

Martin Reynolds
Faculty of Mathematics, Computing and Technology

The presentation explores the wider implications for the Open University on the final report of an 18-month eSTEeM project - *Enhancing Systems Thinking in Practice at the Workplace*. The project aimed to design a learning system for transforming the 'threats' of a gap between postgraduate study experiences and post-study work experiences into 'opportunities' for radical pedagogic adaptation and (re)design. One such course where the gap is

evident is with the postgraduate suite of qualifications in Systems Thinking in Practice (STiP) launched at the OU in 2010.

Pedagogic models of design and delivery of learning can reinforce the learning experience as a dualism (either learning or working) rather than promoting the duality of praxis (theory-informed-action, or thinking-in-practice). Since the first presentation of core modules in 2010, the STiP programme has endeavoured to address this pedagogic dilemma through enabling students to practice their learning through workplace-oriented activities and assessments, and through reflective conversations amongst students sharing experiences of using module materials in their activities and assessments through vibrant student forums. The STiP programme has registered significant success in achieving praxis during core module presentations, but there remain challenges at a higher level in bridging the divide between STiP study experiences, and post-study workplace experiences.

The report proposes a model of praxis in pedagogic design that builds on a long-standing triadic relationship between research, teaching, and capacity building, unique to the OU. The model is one based on the OU being a complex adaptive system; engaging students, alumni, employers, and educators, for (re) designing more innovative models for pedagogic praxis. Such praxis invokes the need for promoting 'conversation' (engaging dualities rather than reforcing dualisms) at different levels; individuals, communities of practice, and institutional workplaces. Whilst focusing on one PG programme, the overall rationale is based on the need for the Open University to become more responsive to changes in the environment (agile), and adaptive to postgraduate needs more generally, and particularly in making learning more relevant to the workplace.

Parallel Session F: Short Oral Presentation – *International Curriculum Delivery & Technologies for STEM learning*

Evaluating the design and delivery of a Smart Cities MOOC for an international audience

Lorraine Hudson, Gerd Kortuem and Annika Wolff
Faculty of Mathematics, Computing and Technology

The Smart Cities MOOC (Massive Open Online Course) is a 6 week course that explores the role of technology and data in cities, and teaches learners how to co-create a smart cities project in their own city. The course, which is hosted on FutureLearn (https://www.futurelearn.com/courses/smart-cities/), has been developed as part of MK:Smart, a £16 million collaborative smart city initiative led by The Open University and partly funded by a grant from the Higher Education Funding Council for England (HEFCE).

Cities are incubators of innovation and opportunities but they also face great challenges such as rapid urbanisation, climate change and inequality. The course explores how smart cities can address such challenges and become more resilient through the use of technology and data. The MOOC has been designed to help learners to navigate their own path through the complex landscape of smart cities, including the role of citizens in their design and planning. Smart Cities is a multidisciplinary topic and the course draws on many STEM subjects including ICT, engineering, design, systems thinking, environmental sciences, the social sciences and also the arts.

This talk will present research being conducted to evaluate the design and delivery of the MOOC. In particular, it will focus on how the course was designed to build upon FutureLearn's pedagogical approach of social learning, i.e. learning through telling stories, provoking conversations and celebrating progress. The talk will discuss preliminary results of an analysis of data sets to understand the background, motivation, online participation and experiences of learners. The research is also evaluating learners' views on smart cities through an analysis of social learning interactions such as comments and discussions.

Because of the global nature of the course topic, the Smart Cities MOOC attracted a large number of international learners from across the world who brought their own country-specific background to the learning experience. For example, the 14000 learners who joined the first and second presentations live in over 100 countries. The international character of this course raises important questions about designing a MOOC for a global audience, the role of cultural differences on learning experience, expectation and course participation, and the challenge of creating learning resources that are relevant and meaningful in the context of the learners' home countries. The talk will discuss how the course team addressed these challenges and ensured that the MOOC is suitable for a global audience.

Learn to Code for Data analysis on Futurelearn: the good, the bad and the ugly

Michel Wermelinger and Tony Hirst
Faculty of Mathematics, Computing and Technology

We summarise the pedagogical approach taken for a hands-on introductory MOOC on programming for data analysis, and compare to extent the approach fits or comes short of Merrill's First Principles of Instruction. We briefly describe the production process. We muse on the highlights and low points of the 6 weeks of student interaction. We compare the Futurelearn platform against the VLE with respect to assessment and discussion. We synthesize lessons learned and conclude on whether it's worth your time doing a MOOC for STEM teaching and engagement.

Supporting the teaching of Science in development contexts: OpenScience Lab and TESSA

Kris Stutchbury
Faculty of Education and Language Studies

The OpenScience Lab (OSL) has the potential to bring practical experiences to school students in contexts where the opportunities for practical work are extremely limited.

In FELS, we have ten years of experience of working in Africa to support primary science and maths education, through the collaborative production of open educational resources (OER). We have made a significant impact in some countries in primary education, supporting teachers and teacher educators in challenging traditional teacher-led, passive approaches to learning and moving to more participatory, active approaches.

Between 2010 and 2012, working with partners in Ghana, Tanzania, Kenya, Zambia and Uganda, we developed a set of materials to support secondary science teaching. Encouraging secondary teachers to change their pedagogic practice is challenging and they prioritise subject knowledge over subject pedagogy. Secondary science teachers have a very strong subject identity and the most popular TESSA Secondary Science units are the ones which focus on 'making science practical'. However, schools have very little access to equipment and even when it is available, very little practical work takes place. Working with IMMARSAT, we have had the opportunity to try OSL in 10 schools in Kenya. However, supplying content alone is not sufficient; there needs also to be a focus on pedagogy that will support learning.

Current development priorities in education involve a focus on quality and integrating ICT into the school curriculum; OpenScience Lab is a tool that could support both of these aims, and motivate secondary science teachers. By providing content and pedagogical support, and by appealing directly to secondary science teachers and the way in which they see themselves as scientists, OSL has the potential to stimulate teacher change. This brief talk will highlight how new modes of delivery and cross-faculty working, could enable OSL to make a significant contribution in this area.

Parallel Session G: Workshop / Demonstration – *Accessibility*

Listening to graphs

Karen Vines[1], Chris Hughes[1], Hilary Holmes[1], Victoria Pearson[2], Claire Kotecki[2], Laura Alexander[2] and Chetz Colwell[3]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2], Institute of Educational Technology[3]

Graphs are an excellent way of conveying quantitative data; indeed, in some STEM subjects, graphs form part of the core learning materials and are key to interpreting data. So for a module to be fully accessible, equally effective alternatives to visual representations of graphs are required for students with visual impairments.

Currently such an alternative is provided by writing a verbal description of the graph. These descriptions are inherently subjective as they are based on the background of the person writing them, and the use to which they think the graphs will be put. Users that rely upon verbal descriptions may not receive the same benefit that is so often absorbed implicitly by sighted users; as such, they may still be at a disadvantage. In this workshop we will describe another approach to providing graphs in an alternative format – sonification. That is, using sound to 'draw' the graph, thus allowing the user to form their own impression of the graph without the inevitable bias that verbal descriptions have.

During the workshop we will demonstrate how different graphs can be turned into sound; for example by using pitch to distinguish between high and low points and using time to indicate positions along the horizontal axis. In particular, participants will be given the chance to listen to some graphs – and to compare them with their original visual, and other alternative, versions.

We will also present early results from a study designed to investigate the effectiveness of sonifications in situations such as those encountered by OU students. In this study, learning scenarios similar to those encountered on Level 1 Maths or Science modules were presented to participants, some sighted, some visually impaired. The extent to which participants were able to use sonifications to assist their learning was recorded. In the case of the sighted participants the sonifications were compared with verbal descriptions and the graphs. In the case of the visually impaired participants the sonifications were compared to verbal descriptions and tactile versions of the graphs. We will discuss the extent to which sonifications could be used to improve the accessibility of graphs and hence improve the accessibility of module materials.

Parallel Session H: Structured Discussion / Briefing – *Technologies for STEM learning*

Exploring Citizen Science and STEM learning through iSpotnature.org

Janice Ansine[1], Will Woods[2], Kevin McLeod[2] and Mike Dodd[1]
Faculty of Science[1], Institute of Educational Technology[2]

Today, more and more, people are finding and sharing interests through social networking sites and activities. When combined with citizen science based opportunities the scope for and benefits of inquiry-based learning are further enhanced. iSpot (www.iSpotnature.org) is the OU's award winning, flagship citizen science platform which engages the public through their interest in wildlife by crowdsourcing names to species. Recent research demonstrates the success of its model, which enables beginners to connect with experts, in accurate species identification. A joint Faculty of Science/Institute of Educational Technology (IET) initiative, iSpot was launched in 2009 and provides a multifaceted learning experience incorporating participatory science research and the use of innovative educational technology, which provides a unique informal to formal learning journey.

The framework of the site, and how it is used, contributes to STEM learning by building natural history skills, a specialism noted as missing from current biological education at all levels. On the cutting edge in the use of technological innovation in pedagogy, iSpot utilises and embraces many of the new forms of teaching, learning and assessment identified as the way forward for Science education. This session will share the iSpot experience and impact so far as a framework to discuss 'what next' i.e. how to gain maximum advantage for this citizen science platform as a technology in STEM leaning.

Themes include:

1. What can iSpot contribute to a social form of teaching and learning?: iSpot uses a combination of social networking, public engagement, informal access to expertise, and learning opportunities currently integrated into modules, MOOCs and Open Media/OpenLearn resources, with plans for further integration but its potential for teaching and learning is not yet fully exploited.

2. How can iSpot's contribution to science, though participatory research, be demonstrated? Research looking into the success of the iSpot model has found the structure of the platform's social network to be a key feature. Combining learning technology with crowdsourcing, enables beginners to connect with experts, leading to plant and wildlife species being identified accurately. Over 94% of observations submitted to iSpot receive some sort of identification with more than half being named within an hour. Using iSpot's unique user 'reputation', the

platform motivates iSpotters to verify species and rewards them for doing so. The research concluded that by effectively connecting users in this way they are able overcome the social as well as geographic barriers that prevent the sharing of knowledge. There is still untapped scope for the analysis of iSpot data.

3. Are there ideas for new technological innovation to advance further learning opportunities? The technology that supports this had a comprehensive redesign and redevelopment in 2014, how can these be enhanced further? This included improving the user experience and navigation; new features providing location mapping and inquiry learning; customised content and personalisation and an optimised user experience for presentation across a range of devices.

We plan to develop these themes with the audience, discussing which areas of iSpot are the most advantageous to explore and develop in order to further STEM leaning. The audience will gain new insights, ideas etc. around effective strategies using citizen science to engage and further enhance OU research, teaching and learning in the future.

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Parallel Session I: Structured Discussion / Briefing – *Technologies for STEM learning*

Student perspectives on learning in OpenStudio, the online 'studio' environment

Elaine Thomas, Karen Kear, Helen Donelan, Leonor Barroca and Jon Rosewell
Faculty of Mathematics, Computing and Technology

Studio-based learning provides a model that can be adapted for online learning. The 'Using OpenStudio in STEM learning' project is evaluating the use of online studio-based learning in the Open University.

In the first phase of the project we invited module team chairs from STEM modules to share information about the use of OpenStudio on their modules in

a workshop. From the workshop, we derived a simple model of OpenStudio which categorized the student activity in terms of these processes:

- Showing and sharing – students upload a digital artefact, such as a photograph or a graphical image, and display it to their peers;
- Viewing and reviewing – students look at the work of other students and review their own work in comparison to that of others;
- Commenting and critiquing – students are asked to evaluate the work of other students and give them feedback in the form of comments; and
- Receiving and reflecting – students receive the comments of other students, reflect on the comments and then think about how they might improve their own work.

In this session we will report on our analysis of data gathered from the second phase of the project. We selected two Computing and IT undergraduate modules for more detailed analysis, one at level 1 and another at level 3. A survey was carried out to collect both quantitative and qualitative data from students on these modules. Analysis of the survey data revealed the range of student views and the diversity of student experiences in using OpenStudio. Comparison between our OpenStudio model and the survey findings with Kolb's Experiential Learning model (1984) provides valuable insights into students' views and behaviour in carrying out the activities.

The findings suggest that students enjoy the OpenStudio activities, especially the visual nature of artefacts and the idea that shorter comments may be made, rather than longer more discursive pieces of writing. Importantly, there needs to be an opportunity to complete the cycle of the experiential learning model in the activity by improving the artefact. The experiential nature of the online studio activity presents an opportunity for students to reflect-in-action as well as reflect on their actions (Schön, 1983).

In addition to learning about their subject area, students are also learning how to give feedback to their peers and how to use the feedback they receive, both of which are important skills. Many students are confident in their own ability and are able to evaluate the feedback they receive. However, some students lack confidence in their own ability to give feedback on the work of their peers, particularly those at level 1. Therefore, consideration also needs to be given to the timing and scheduling of the different types of the OpenStudio activities across modules.

The next stage of the project involves analysing the data from the cohort of tutors on both modules and also examining some of the students' artefacts in OpenStudio and the feedback on them given by student peers.

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Closing Keynote Presentation

Supporting lifelong learners: resilience and care in a digital age

Helen Beetham
Consultants in Higher Education

For all the opportunities afforded by the ongoing digital revolution, digital spaces introduce new challenges for learners, new stresses, and even new kinds of inequality. Helen Beetham will explore some recent research into students' expectations and experiences of digital learning outside the OU. She will ask what digital experiences enable learners to become more resilient to change, and whether we can design online environments that meet our learners' needs for care, affirmation and wellbeing, as well as their needs for knowledge and information.

HAPTICS FOR EDUCATION WORKSHOP ABSTRACTS

Keynote Presentation

Haptic perception of shape and space

Astrid Kappers
Vrije Universiteit

The aim of my research is to gain a fundamental understanding of touch by means of a systematic and extensive exploration on the haptic perception of shape and space. In this talk, I will present an overview of some of the research we did in the last decade. This research yielded many interesting and often surprising findings. Among others, we found strong after-effects of haptic curvature perception: after touching an object for just a few seconds, your perception of the next object you touch will be influenced. We also found that the shape of your hand (longer than wide) biases your perception. Comparing the volumes of small objects in your hand leads to large shape-dependent biases. We developed paradigms for investigating haptic search and found haptic pop-out effects. Finally, it was found that physical space and perceptual space are far from identical. Simple tasks like making two bars parallel or perpendicular yielded large but systematic deviations. By running a diverse set of psychophysical experiments, we now know how to understand these deviations in terms of different reference frames that are involved in performing such tasks.

Presentations and Demonstrations

Haptics in Music and Motion: Multi-Limb Haptic Interaction From Music To Stroke Rehabilitation

Simon Holland
Faculty of Mathematics, Computing and Technology

The Haptic Bracelets are lightweight wireless devices, designed to be worn on wrists and ankles. They contain accelerometers, gyros, processors and low-latency, powerful, precise vibrotactiles. The multi-limb Haptic Bracelets have innovative applications in music and music education, but also in rehabilitation after stroke. Key theoretical perspectives will be outlined: entrainment, dalcrose eurythmics and neural resonance theory. A range of musical applications are considered, and preliminary results noted. Findings from gait rehabilitation with stroke patients are summarised. Applications are outlined for Parkinsons, cerebral palsy, spine injury, and the deaf.

Touching Creativity – A baseline review on haptics in education for applied design

Lisa Bowers
Faculty of Mathematics, Computing and Technology

This presentation offers the highlights of a recent baseline review of literature from three strands of research area 1) haptics (manual/machine), 2) adaption to a universal distance learner, 3) education in applied design.

Design Practice – is presented from the 'germinal' stage (otherwise known as the prototype stage) of the traditional Product Design cycle. This specific focus is due to the act that typically the germinal stage is the most 'hands on' section of process and therefore he section where haptic technology could offer the most impact to learners.

The presentation also offers a spot light on to how furthering hands on applications via haptic can offer better creative interactions across all STEM (STEAM) subjects.

Haptic as a contribution to immersive learning in online labs

Nick Braithwaite
Faculty of Science

The OpenSTEM initiative is making available a number of remotely controlled instruments in configured for remote access experiments. In principle the interaction could be entirely via on-screen alpha-numeric text, but we have so far opted built-in webcams and are experimenting with live sound to create the sense of presence. Survey feedback suggests that until it has been tried, sound is not missed – the same was probably true with vision and we do not plan to leave our remote users 'in the dark'. In a hierarchy of sensory data for an observer, texture and force-feedback are next in the expectation that these too will add to the immersive experience. So the questions we wish to explore are about which applications most need a haptic element and how should we develop our expertise.

Keynote Presentation

Haptic interfaces for learning skills and reinforcing spatial concepts

William Harwin
University of Reading

Haptic interfaces are beginning to find application in medical skills training with work in surgery, triage, veterinarian and dental arenas. Haptic interfaces may is also a mechanism to investigate and simulate complex spatial concepts and may be an appropriate way to provide technology enhanced learning in secondary schools. This talk will overview research in these areas

Presentations and Demonstrations

Role of wearable activity-tracking technologies in the well-being and quality of life of people aged 55 and over

Shailey Minocha[1], Duncan Banks[2], Caroline Holland[3], Jane Palmer[4], Catherine McNulty[5] and Alice Peasgood[6]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2], Faculty of Health and Social Care[3], Age UK, Milton Keynes[4], Faculty of Education and Language Studies[5], Institute of Educational Technology[6]

We will discuss our project that involves investigating the role of wearable activity-tracking technologies in the well-being and quality of life of people aged 55 and over: how such devices may promote behaviour change but also the challenges associated with making sense of the data, the ethical issues of sharing the data and the perceived risks. We will outline our project's plans for the empirical investigations with older people, family members, carers and medical professionals.

The Sir Halley Stewart Trust has funded this project. The views expressed in this presentation and any follow-on publications are those of the authors and not necessarily those of the Trust.

More details of the project are here: http://www.shaileyminocha.info/digital-health-wearables/

Design and materiality: collaborative learning at a distance

Iestyn Jowers[1], Mark Gaved[2] and Gary Elliott-Cirigottis[2]
Faculty of Mathematics, Computing and Technology[1], Institute of Educational Technology[2]

Design education is a field in which distance learning based universities can encounter challenges in providing equivalent experiences to face-to-face education institutions. Tangible aspects of design education such as making and prototyping are difficult because access to the tools and materials required are typically highly limited. This can result in graduates with little exposure to the materiality of design processes. In this paper we explore haptics in terms of considering one approach to overcoming the challenge of enabling distance based design students to engage with the physical aspects of prototyping.

The RE:FORM project was a feasibility study pairing Open University design students (graduates of T217 '*Design essentials*') with vocational workshop based learners in the community makerspace MAKLab. Learners were paired and tasked with designing and making flat-pack chairs from plywood, cut on CNC routers from software designs developed on CAD programs. The two sets

of learners were given specific roles to carry out: OU students as designers, with MAKLab trainees as manufacturers. A successful conclusion could only be achieved by the pairs communicating and providing their respective competencies and expertise. This replicated a real-world scenario of distributed manufacturing, which enabled students to develop their technical skills, and also a range of crucial soft skills (communication, collaboration with other professionals, project management) which have been identified as important by the manufacturing sector.

OU students benefitted from extending their prototyping experience from small scale cardboard models to full size plywood prototypes, gaining insight into the challenges of moving from conceptual designing to practical realisation. These challenges included the performance of materials and tools, and the need to articulate design decisions in terms of making as well as creative exploration.

Soft haptics: Tactile multimedia for immersive learning experiences

Trevor Collins
Knowledge Media Institute

Haptic technologies typically use actuators that apply a force against the skin in order to create tactile feedback. Haptic interfaces have been adopted in a range of augmented and virtual reality systems to enhance the user's sense of immersion. In this presentation we'll introduce the use of 'soft haptics' that create the perception of feedback without direct physical force. The idea of 'tactile multimedia' was introduced by Peter Whalley (see http://oro.open.ac.uk/6211) as a means for designing layered media that encourages active enquiry-driven learning. Critically, Whalley argued that interaction could be designed to facilitate learning through active exploration because "the interactivity designed into the interface becomes central to the learning processes that it is intended to facilitate". These 'tactile effects' manipulate or constrain interaction in order to emphasise a point for educational purposes. For example, constraining the available actions within a simulation to mechanically correct movements, or manipulating the dragging movement of a simulation to create a perception of the realistic physical behaviour. The increasingly ubiquitous use of touch interfaces brings an opportunity to use tactile effects through common computing and communication devices to improve the sense of immersion and encourage more analytical manipulation of online simulations and experiments. We will demonstrate how soft haptics have been applied to create a sense of touch within a forces and motion shared simulation on tablets.

Alternative versions of graphs for visually impaired students

Victoria Pearson[1], Karen Vines[2] and Andrew Whitehead[3]
Faculty of Science, Faculty of Mathematics[1], Computing and Technology[2], Learning Teaching Solutions[3]

Providing alternative versions of graphs suitable for use by visually impaired students has traditionally resulted in the production of figure descriptions, which are now standard module production items. In this session we will demonstrate two types of alternate renderings of graphs, tactile and sonified, and briefly describe how such renderings can be created.

POSTER PRESENTATIONS

Evaluating assessment strategies for online group work

Helen Donelan and Karen Kear
Faculty of Mathematics, Computing and Technology

This project investigates the challenge of implementing and assessing online group work. The perspectives of students, who recently took part in the online group project on the level 2 module T215 *Communication and information technologies*, have been explored through the evaluation of three key aspects: the collaboration and how students interact; the task and what students produce within their group; and the assessment of group work.

The majority of students who took part in the research enjoyed the group project and understood the benefit of taking part. Students generally found the collaboration challenging yet rewarding. However, the research also highlighted that group work causes anxiety in some students. In terms of the task, a tension was identified between allowing students to explore technically challenging solutions to the task set and ensuring that the group focus their time on the important aspects being assessed. In addition, giving students the opportunity to showcase their final products may improve their motivation to do well. Students were divided in their opinions about the assessment of group work. Whilst the majority of students were happy with the group marks they received, the necessity and fairness of having group marks was questioned and these were obviously a cause of concern and worry for some students.

See page 62 for poster

The perception and use of on screen study by students of S217 "Physics: from classical to quantum"

Andrew Norton and Silvia Bergamini
Faculty of Science

S217 "*Physics: from classical to quantum*" is in the midst of its first student presentation (2015J) and is the first physics module that the OU has presented entirely on screen, following the decision by the Science Faculty that all new modules will be presented this way. Using results from two on-line questionnaires (offered to S217 students near the beginning and middle of the presentation). I will explore students' perception of on screen study and the extent to which they prefer to study on screen or on paper (via print-on-demand or self-print), and whether they prefer to work on-line or off-line when studying on screen. I will also explore how students use or find

beneficial the different components of the on screen study materials. In addition the questionnaires will allow a comparison between students' intentions when they began their study of the module and their reported behaviour when they are actually studying it.

See page 63 for poster.

Associate lecturers on MU123 experience of using OU analyse predictive data

Hayley Lang, Carol Calvert and Rachel Hilliam
Faculty of Mathematics, Computing and Technology

The pilot project aims to test the functionality and validity of the OU Analyse model on the level one mathematics module MU123, by monitoring its predictions and engaging identified students and Associate Lecturers. The data will be recorded including less tangible information such as anecdotes from ALs and compiled to facilitate improvement and future implementation

8 ALs are involved in the pilot project and they are given the freedom to decide how best to use the information provided by OU analyse. OU Analyse is a dynamic predictive model used to identify students who are unlikely to submit their next TMA and ultimately those who are at risk of failing to complete their studies. This model aims to provide timely indicators of struggling students to allow early and meaningful intervention and improved retention. The lessons learned in this early project will help to model the future use of OU Analyse throughout the Open University.

See page 64 for poster.

Student experience of university email communication

Linda Robson[1], Lynda Cook[2] and Nicolette Habgood[2]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2]

Same abstract as short oral presentation parallel session A on page 22

See page 65 for poster.

Sharing good practice and creating community spirit online - an AL Staff Development initiative in Science

Janet Haresnape and Nicola McIntyre
Faculty of Science

Same abstract as short oral presentation parallel session A on page 22

See page 66 for poster.

Listening to graphs

Karen Vines[1], Chris Hughes[1], Claire Kotecki[2], Victoria Pearson[2], Hilary Holmes[1], Laura Alexander[2] Kaela Parkes[4] and Chetz Colwell
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2], Institute of Educational Technology[3], Portland Community College, USA

Same abstract as workshop/demonstration in parallel session G on page 38.

See page 67 for poster.

Graduate workplace development and postgraduate study: an analysis of a postgraduate certificate designed by industry and academia with recommendations for future module design

Kay Bromley
Faculty of Mathematics, Computing and Technology

Graduate trainees for IT professional roles can be recruited from non IT-related disciplines and graduate training programmes may therefore need to address specific knowledge or skills gaps as well as inducting the graduate trainee into the organisation.

e-skills and OU academics designed a programme to combine graduate training schemes with a postgraduate certificate. The postgraduate certificate assessment was by formative assignments and summative assessment in an e-portfolio of reflective commentaries with supporting evidence. The e-skills, and industry, knowledge of graduate trainees likely prior knowledge, aptitudes and skills was taken into account in selecting the material to be included in the postgraduate certificate. e-skills were also closely involved in composing learning outcomes.

During the delivery of the postgraduate certificate tensions arose from the structure and timescales of the programme and also from the portfolio design. For employers wishing the portfolio to establish a firm foundation of professional knowledge and skills there was an expectation that professional skills would be demonstrated in the inclusion of work-based appraisals in the portfolio. However students appeared less prepared for reflective writing than expected and the preparation of the portfolio became more of a challenge to completion of the certificate than expected.

This investigation reviews approaches to e-portfolio assessment strategy and considers how reflection can be supported and assessed in a work-place context. A survey of a small number of students suggests that prior study had not typically facilitated the development of reflective practitioner skills. However, analysis of the e-portfolios, shows that the application of academic and theoretical learning within the workplace was largely achieved with students providing evidence of this application from a variety of sources supported by reflective commentaries. For future modules aiming to bring together theoretical learning and application in practice, there are other models of portfolio structure and assessment that should be considered and more support and guidance for reflection and reflective writing needs to be integrated in the materials, even for postgraduate students.

See page 68 for poster.

Can webcam video of animal behaviour offer students practical experience?

Vicky Taylor[1], David Robinson[1], Adele Clegg[2] and Manfusa Shams[1]
Faculty of Science[1], Woburn Safari Park[2]

Previous work in an eSTEeM project on researcher-led science modules, suggested that a single researcher could run a learning module in their subject area, one component of which was practical work centred on an existing data set provided by the researcher. The idea was to provide a realistic practical experience for a third level module. Following on from this work, we are at an early stage of looking at the use of data sets across all levels, including outreach, drawing on experience from video analysis of elephant behaviour used in S295 (The biology of survival). The videos were shot at Woburn Safari Park and further collaboration is proposed. The concept is to provide access to one or more streams from cameras observing animal behaviour in a zoo setting and writing projects around these that are suitable for different levels of learner expertise. We outline progress to date and seek to generate interest in the acquisition and use of such data sets.

See page 69 for poster.

Study of online modules – impact on the tutors

Vikki Haley
Faculty of Science

SK143; *Topics in health sciences* is a 30-point, level 1 module formed by merging two 15-point modules together. For economic reasons, the short anticipated lifetime and the understanding that only continuing students would

study this module it was decided to use the Study Advisor (SA) student support model rather than named Associate Lecturers. Study advisors (usually 4 or 5) support 1000 to 1200 students via a dedicated forum.

For the first few presentations of SK143 there were no synchronous tutorials on the module and student support was only offered on a reactive basis through the forum. Whilst it was intended that this module would be studied at the end of level 1, a significant proportion of the students are completely new to the OU. Following a series of complaints about the lack of support on the module and poor student satisfaction (despite high retention), particularly on the 13J presentation, tutorials were introduced for the 14J presentation. The purpose of the tutorials was to provide supportive and appropriate tuition for the students, create a sense of community, reduce feelings of isolation, and improve the perceived value for money.

Data from student satisfaction surveys show that following the introduction of tutorials on the 14J presentation, 86% of students either strongly agreed or agreed that they were satisfied with the quality of the module compared with only 45% on the 13J presentation. Conversely, there was a reduction in students who disagreed or strongly disagreed from 29% on the 13J presentation to 12% on the 14J presentation. On the 14J presentation 60% of students either strongly agreed or agreed that they were satisfied with the tutor support compared with 40% on the 13J presentation, whilst 42% of students disagreed or strongly disagreed on 13J compared to only 20% following the introduction of tutorials. Anecdotally, there were also less complaints via the study advisor forum. Whilst the attendance at the tutorials was much lower than anticipated, it appears that availability of synchronous tuition helped improve satisfaction, potentially due to an increased sense of support and inclusion on the module and better value for money. Therefore, reducing tutorial provision due to poor attendance may have larger ramifications for student satisfaction.

See page 70 for poster.

Breaking the coding barrier: Transition from Level 1 to Level 2 programming

Frances Chetwynd[1], Helen Jefferis[1] and Fiona Aiken[2]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2]

Same abstract as short oral presentation in parallel session B on page 26.

See pages 71, 72 and 73 for posters.

Exploring Citizen Science and STEM learning through iSpotnature.org

Janice Ansine[1], Will Woods[2], Kevin McLeod[2] and Mike Dodd[1]
Faculty of Science[1], Institute of Educational Technology[2]

Same abstract as structured discussion/briefing in parallel session H on page 39.

See page 74 for poster.

Open π-Lab: The OpenScience Laboratory offline

Nicholas Braithwaite[1], Kris Stutchbury[2], Janice Ansine[1] and Gillian Hosier[3]
Faculty of Science[1], Faculty of Education and Language Studies[2], Development Office[3]

Building on the experience and success of the OSL award-winning platform, between January 2015 and March 2016, the OSL team developed an offline demonstration version of the OSL, known as the Open π-Lab (or pi-Lab). This was part of a major externally funded project from UKSA via Inmarsat and as part of this programme the Open π-Lab was made available as a teaching and learning resource for trialling by secondary educators in Kenya. This poster summarises the findings of an evaluation exercise of this Open π-Lab conducted in Kenya, in collaboration with the Equity Foundation. The Open π-Lab resources were recognised as having significant potential though it is clear that cultural and infrastructural barriers will need to be addressed before the full benefits of on-screen-offline practical science can be realised.

See page 75 for poster.

Improving retention: using a voluntary diagnostic quiz

Carol Calvert[1], Rachel Hilliam[1] and Juliet Coleman[2]
Faculty of Mathematics, Computing and Technology[1], Academic Services[2]

Same abstract as short oral presentation in parallel session D on page 30.

See page 76 for poster.

Lessons learnt from students who succeed “despite the odds”

Carol Calvert[1], Andrew Norton[2], Juliet Coleman[3], Rachel Hilliam[1], Linda Brown[1] and David Edwards[1]

Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2], Academic Services[3],

We have two active predictive analytics models and this plan combines the use of outputs from both models. The intention is to identify successful students who had low predictions of success at various points both within module and for module pass and return. The students would be asked about key factors in their success. This project is therefore a combination of quantitative and qualitative work. The project would rely heavily on using AL's to talk with students

See page 77 for poster.

The impact of technology on the teaching and assessment of 'systems diagrams'

Andy Lane
Faculty of Mathematics, Computing and Technology

Same abstract as short oral presentation parallel session B on page 25.

See page 78 for poster.

Provision of online drop-in centres for students requiring additional support in mathematics

Susan Pawley and Chris Hughes
Faculty of Mathematics, Computing and Technology

Same abstract as short oral presentation parallel session D on page 31.

See page 79 for poster.

Supporting vocational students studying STEM subjects: making the hard stuff easier

Hilary MacQueen[1], Glenn Dickinson[2] and the Science Work-Based Learning Team[1]
Faculty of Science[1], Business Development Unit[2]

We have analysed the performance of students studying the Foundation Degree in Paramedic Sciences. These vocational students have little or no academic background and typically find the scientific approach challenging. The hands-on practical aspects of this distance-taught qualification are

delivered in the workplace by qualified Paramedic Educators, and success in achieving practical competence is essential to pass the qualification and to become a Registered Paramedic. We sought an association between the support offered by employers and student outcomes. In spite of large reported differences in the formal support structures put in place by different employers there was little difference in student retention and success rates, although student satisfaction was noticeably affected. It appears that informal support mechanisms such as Tutor Group Forums, social media and the support of colleagues in the workplace are of much greater importance for student success. We suggest some ways in which these findings might be used to enhance future teaching of vocational students, for example those engaged in Apprenticeships.

See page 80 for poster.

Associate Lecturer perspectives on supporting students through tuition in groups

Ann Walshe[1], Anne-Marie Gallen[1], Anne Campbell[2] and Mark Jones[3]
Faculty of Mathematics, Computing and Technology[1], The OU in Scotland[2], Faculty of Science[3]

Same abstract as short oral presentation in parallel session A on page 23.

See page 81 for poster.

Proactive support for students to make the transition from print material to online study

Martina Gibbons[1] and Elaine McPherson[2]
Faculty of Mathematics, Computing and Technology[1], Faculty of Science[2]

The Science, technology and maths Access module, Y033, is designed to help students who are new to higher education or returning to education following a break, to develop the skills necessary for successful OU level 1 study in STEM. On Y033, the delivery of the first two blocks of material are based around printed books, but Block 3 is delivered entirely online. Feedback from tutors and comments from students in module surveys, suggest that many students find the transition to online learning difficult and dislike the online component.

As there are an increasing number of modules across the university being delivered online, including at Level 1 in STEM, students are potentially being placed at a disadvantage if they are not adequately prepared for fully online study. Resources offering tailored support for online study are few and some

of the recently developed university support materials are themselves online and not necessarily appropriate for Access students.

This project focusses on: improving student retention during the move from print to online module material with proactive support by tutors; improving students' confidence in study using online materials; improving student study habits to prepare them for future online study.

We are in the first phase of the project, where we have been examining past feedback from students and tutors, conducting focussed conversations with Y033 tutors about the transition to online learning and recruiting tutor support for the project.

Final outcomes of this work are planned to include: tutor-led resources on how to study online material effectively; an intervention checklist for tutors to enable a decision making process to direct students to appropriate support resources; better information about what provides the best support for students when they first encounter online material.

See page 82 for poster.

Study of online modules – impact on the tutors

Catherine Halliwell, Vikki Haley, Julie Robson, Vicky Taylor and Elaine Moore
Faculty of Science

Following the recent introduction of online only delivery of module materials in the Science Faculty, we wanted to canvass tutor perceptions of this new style of delivery of OU modules, and assess the impact this has had on their support of students throughout the module. Tutors on 6 modules across science disciplines, SDK100, S206, S209, S215, S217 and S295 have been asked to complete a questionnaire addressing;

- Their confidence in supporting students on an online only module
- Whether there was adequate staff development to prepare them for online only tuition
- If any changes have been made in their delivery style, the way they support students, TMA marking or exam/revision support
- How they have engaged with the module materials, such as format and interactive activities
- Advantages and disadvantages of online only modules
- Students awareness and readiness for online only delivery
- Their ability to support the development of study skills online, e.g., note-taking
- The impact of online only modules on students with disabilities and dyslexia

- The impact on tutorial attendance, e.g., via OU live

Preliminary results indicate a varied impact on the tutors, dependent on their previous experience with online tuition. However, on S295 over 50% of tutors found it difficult studying the material online, with almost 25% of tutors printing off the material. The interactive nature of the module and flexibility to study on the move were thought to be particular advantages of an online only module. In contrast, the duration of time spent on the computer for both tutors and students was considered a disadvantage, as was the inability to bookmark material easily and assimilate information when scribbling hand-written notes. Finally, 89% of the tutors felt the change to online only modules had had a greater impact on students with additional requirements.

See page 83 for poster.

Academic literacy and communicating assessment to students on Level 1 science modules

Claire Kotecki[1] and Prithvi Shrestha[2]
Faculty of Science[1], Faculty of Education and Language Studies[2]

Academic literacy skills have been identified as key predictors of successful progression in science. Genre-based pedagogy has a positive effect on outcomes. This work extends this knowledge through research directed at the OU distance education student cohort and learning environment. Retention & progression are key challenges facing STEM subjects, particularly L1 Science, and successful assessment outcomes are vital to achieving this.

This poster is a presentation of the methodology and interim results of the first stage of a study examining entry-level academic literacy skills, assessment perception and feedback in a cohort of Level 1 science students studying a cross-discipline module via distance learning. Initially, student understanding of key terminology and perceptions of assessment have been assessed via a survey prior to the start of their study. In addition, student scripts and tutor feedback are being analysed via a combination of quantitative tools to characterise linguistic complexity, use of key terminology and structure. This approach is combined with an analysis of how assessment tasks are communicated to students to provide a holistic view of assessment communication, student expectation, cohort performance and value-based tutor feedback. A second phase of the project will take place later this year, including follow-up student surveys and analysis and individual student interviews.

See page 84 for poster.

Remote Drop-in Clinics: A new, student-centred, approach to distance learning

Nicholas Chatterton and Elaine Moore
Faculty of Science

Generally speaking the drop-out rates for distance learning and part-time degrees are much higher than those seen on degrees delivered in the traditional manner. There are multitude of reasons for this but the "transactional distance" between learners and instructors is inevitably a factor. This project seeks to mimic chemistry drop-in classes that have been established at some traditional universities. Here, students come to tutors with their academic problems and receive one-to-one or small group help. As such it is an excellent example of student-centred learning, allowing student ownership of their learning as they decide what they want to cover.

Specifically, we wish to provide drop-in revision of chemistry key content from S104 in the four weeks prior to the start of the 16J presentation of S215 thereby targeting a period where students are most likely to drop-out. In addition, we will provide a VLE webspace containing structured content that will be the basis for drop-in appointments.

Various tools will be used to assess the performance of the project including:

- Relative student performance of S215
- Analytics from the webspace and from the S215 VLE
- Implementation of "tricky topic tools" to gain feedback on threshold concepts

This poster will provide details of our progress to-date.

See page 85 for poster.

The trials and tribulations of S217: putting a second-year physics module online

Tara Hawes[1], Chris Hough[1], Will Rawes[1], Peter Twomey[1] and Andrew Norton[2]
Learning and Teaching Solutions[1], Faculty of Science[2]

Same abstract as short oral presentation in parallel session C on page 29.

See page 86 for poster.

Achieving authenticity, sociability and metafunctionality in online labs

Marcus Brodeur[1], Nick Braithwaite[1], Shailey Minocha[2] and Ulrich Kolb[1]
Faculty of Science[1], Faculty of Mathematics, Computing and Technology[2]

The Wolfson support for the OpenScience Laboratory part-funded doctoral studies exploring the effectiveness of online practical science, particularly contrasting onscreen, remote access and proximal labs. The core research questions address issues of authenticity, sociability and metafunctionality. Survey data was obtained from student cohorts following the S288 Practical Science and S382 Astrophysics module. The conclusions are being used to shape the new OpenSTEM Labs. (Based on PhD studies by Marcus Brodeur).

See page 87 for poster.

Evaluating assessment strategies for online group work

Helen Donelan
Karen Kear

The Open University

Investigating how to design and assess online group projects which are engaging to students and fairly assessed. Considering three key aspects: the *collaboration*; the *task*; and the *assessment*.

- Context of the research: online group project in T215 *Communication & Information Technologies*.
- Students work in small groups (6-8 members) over 5 weeks to develop a website for a given scenario.
- Marks awarded for:
  - product (website) & process (collaboration)
  - group & individual aspects
- Online tools (WordPress, forum, wiki …)

Method:

- 27 students, 6 focus groups using OULive
- Open questions (e.g. Did they find it rewarding? What were the biggest challenges?)
- Data from the focus groups were coded and emergent themes identified:

Recommendations/further work:

- Support to reduce student anxiety in group work.
- Balance between authentic tasks and realistic expectations.
- Showcase student work to increase motivation.
- Careful wording in assessment to encourage collaboration.
- Transparency of marking for group marks.

Main Findings:

The collaboration:
For most, the group project was an enjoyable experience; the collaboration was challenging but rewarding; it caused anxiety for some students.

The task:
Students wanted to showcase their website; there was cooperative rather than collaborative working; students were frustrated by the limitations of the tools.

The assessment:
Mixed opinions on whether the group project was fair; some evidence of students 'carrying' others; students wanted to know the marks of others in their group.

eSTEeM
The OU centre for STEM pedagogy

The perception and use of on-screen study in S217 "Physics: from classical to quantum"

Andrew Norton & Silvia Bergamini, Dept. of Physical Sciences

The Open University

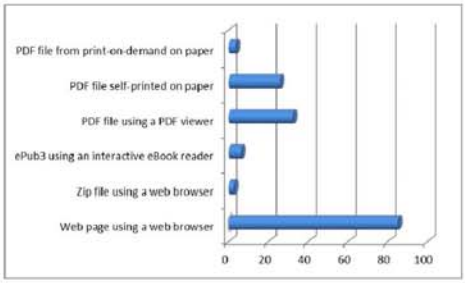
S217 is the core Level 2 Physics module, covering the Institute of Physics' key material required for degree accreditation. New for 2015J, it was written to be presented entirely on-screen, with the intention that it be studied on-line.

Study materials comprise 25 weekly study units presented via the VLE, plus short (3-4pp) printable PDF summaries of each. Off-line formats (PDF, ePub3 & Zip file) of study units are also provided.

Assessment is via 5 formative TMAs, 1 summative TMA (25% OES) and an Exam (75% OES). On-line open-mark quizzes linked to each TMA allow further practice and self-reflection.

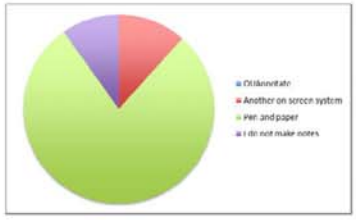
Student support is via OULive tutorials delivered though tutor group clusters plus 2 face-to-face workshops to develop problem solving skills.

Study material formats



Most students study on-screen on-line, as intended.
Significant use of PDF (on-screen & on paper) too.
Little use of on-screen off-line formats (ePub3 & Zip).

Note taking



No students use OUAnnotate.

Most students take notes using pen & paper.

Study Support

51% participate in Forums.
44% use OULive tutorials in real time.
68% use OULive tutorial recordings.
24% attend f2f problem solving workshops.

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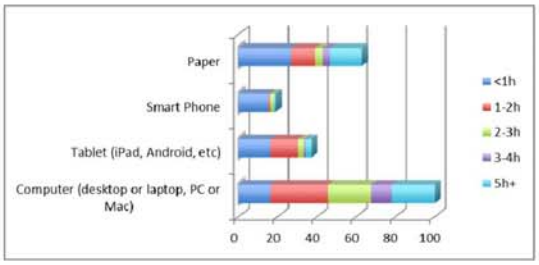
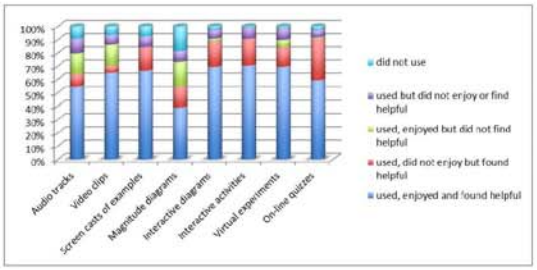
Devices used & times of study



Almost all students study on computer screen.
Over half of students also study on paper.
Very few students study via tablet/smart phone for >1h

Non-text & interactive items

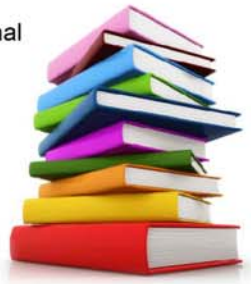


Most non-text & interactive items within the Study Units are **used**, **enjoyed**, and found to be **useful** by students.

All of these non-text / interactive items require use of on-screen formats, either on-line (webpage) or off-line (ePub3 or Zip). None are accessible via PDF or paper.

Other comments?

When asked what additional resources would help in their S217 studies, **60% of students** say that the module would be greatly improved if it had printed Study Books.



Based on responses to an online questionnaire by 108 students during study weeks 19-21 of the 30 week study calendar

MU123 Associate Lecturers experience of using OU analyse predictive data.

Hayley Lang, Carol Calvert and Rachel Hilliam

The Open University

Introduction

OU Analyse is a dynamic predictive model used to identify students who are unlikely to submit their next TMA and ultimately those who are at risk of failing to complete their studies. The project aims to provide timely indicators of struggling students to allow early and meaningful intervention and improved retention. The lessons learned in this early project will help to model the future use of OU Analyse throughout the Open University.

Background

Improvement of student retention is a key target for the Open University with an aim of 75% retention from year 1 to year 2 universally. Completion and progression rates are calculated from the 25% fee point which is identified on J presentation as 31st October – the week before the MU123 TMA 01 cut-off date and the approximate point at which this project began to take action.

The aim is to achieve a minimum pass rate of 75% for the students still engaged at this point. For 2014-2015 MU123 J succeeded in achieving 74% pass rate but other mathematics and statistics modules were not as healthy with a pass rate of as low as 42.9 recorded for MST124 B.

Methodology

The pilot for MU123 15J in Region 05, included all 8 Associate Lecturers (ALs). The project was coordinated by 1 AL, with access to all students. Students flagged as 'at risk' by the OU Analyse system at key points were the main focus. Answers to questions such as 'Were you concerned about this student before now?' and 'Did the student submit the relevant TMA?' were captured for discussion and analysis.

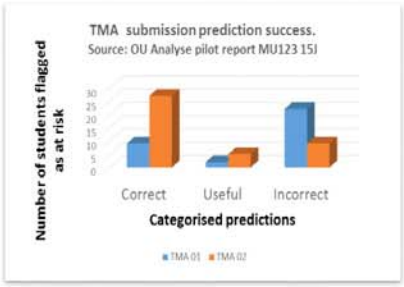


Figure 1—TMA submission predictions.

All members of the team had access to data held about their own students and were encouraged to frequently access the system to get an understanding of the mechanics of the software and a feel for the status of their students. ALs were encouraged to give their opinions as the project progressed and were given the freedom to decide how best to use the information given to support students in their studies.

The method of implementation was documented to aid best practice recommendations for the future. Figure 1 shows a comparison of the predictions from OU Analyse as defined by Associate Lecturers following discussions with the students identified.

Students in the 'correct' category were struggling in some way while 'incorrect' predictions includes students that were experiencing no real difficulties at that point. 'Useful' predictions were defined as those where the AL was unaware of the student difficulties and were able to offer guidance or support as a direct result of the predictions.

Expected outputs or findings

It is hoped that this project will identify whether OU Analyse could provide a useful tool for future implementation. It is unlikely that a prescriptive approach would be advocated as the project has highlighted that Associate Lecturers are often fully aware of the status of their students. The aim is for OU Analyse to remove the reliance on current indicators of student engagement such as the last log in date and the student contact history and improve retention with minimal disturbance to current workload.

Findings so far

While ALs are frequently aware of their struggling students and offer support and guidance where appropriate, some students inevitably suffer in silence and it is these students that we're hoping to rescue using the OU Analyse model. The project is still in progress and the current feeling is that early predictions were unreliable, yet still useful in places while the predictions for TMA 02 were much more accurate. There have been positive reports of contact made as a direct result of an OU Analyse flag yielding useful action and possible student retention. A gut feeling from ALs can also be backed up by checking OU Analyse and it provides a useful tool to enhance the AL-Student experience.

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Graphics based on a design concept by Roy Lichtenstein.

Student experience of University Email Communication

Linda Robson*, Lynda Cook, Nicolette Habgood
Faculties of MCT* and Science, The Open University, Milton Keynes, MK76AA, UK

The Open University

Introduction
This project investigated student's perception of email communications from the Open University (OU). Email forms an important communication link for distance learners and students receive emails from a number of different functional areas, including from their own personal tutor. Students' perception of the number and relevance of emails was determined in this study.
This study complied with the Open University's Student Survey Research Panel requirements.

Method
Quantitative data analysis: The number and origin of emails sent to four individual students studying one of the nine STEM modules, starting February 2014 was determined (Figure 2). Further analysis was performed on three of the STEM modules for the February 2015 presentation (Figure 1)
Qualitative data collection: Student volunteers (20 per module) were recruited from the February 2015 presentations of Topics in Science (S142), Introducing Health Sciences (SDK125) and Environment: Journeys through a changing World (U116). The students were interviewed about their experience of university email.

Results
Analysis of the quantitative data for the nine STEM modules revealed:

1. Significant variation in the number of emails sent to individual students studying the same module.
2. Variation in the average number of emails sent to students on different modules. For example,55 emails on *Discovering Mathematics* MU123 and 124 on *Topics in science* S142.
3. No correlation between the average number of emails sent and credit rating of the module.
4. No correlation between the February 2014 retention rate and the average number of emails sent.

The peak shown in figure 1 for S142 was due to a high number of email communications sent to students from the faculty in 2014. The origin of all other emails in S142 was similar in 2014 and 2015.

Thematic analysis of the interview responses revealed that:

- All students had received email communications from the university
- Email is the preferred form of communication, with those from a personal tutor being most useful
- The majority of messages were timely and useful but they could be improved by greater personalisation.
- Short messages with links to further information are preferred over longer messages
- Students keep emails in order to refer back to them when needed
- Students dislike receiving messages whilst waiting for module results
- 76% of students were happy with the volume of messages received, 24% felt there were too many generic messages.
- Messages from the student union were considered least useful, but students still wanted to receive them.

Interestingly, student's perceptions of the number of emails received differed to the number of emails actually sent, as shown in figure 3.

Discussion
The quantitative research appeared to support concerns that students may be being inundated with emails from the university. It is important to note that the total number of emails presented excludes emails sent directly from the student's personal tutor. However, the overall conclusion from the qualitative research of thematic interview response analysis indicated that students prefer email as the main form of communication.
An asynchronous survey carried out by a parallel project within the OU Science Faculty, found students studying science modules are content with the number of messages received. However, our study suggested students significantly underestimate the number of messages they received from the university. Emails sent by tutors were consistently seen as being the most useful and most likely to be read.

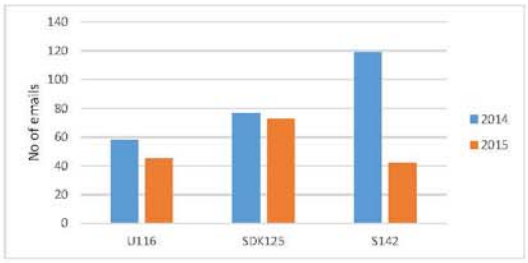

Figure 1: The average number of emails sent to four students on three STEM modules. Data are shown for the 2014 and 2015 presentations.

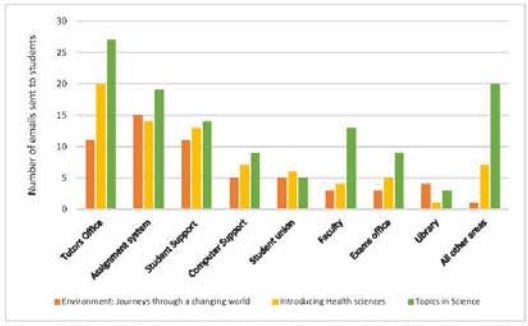

Figure 2: The origin of email communications to students on three STEM modules (2014 presentation).

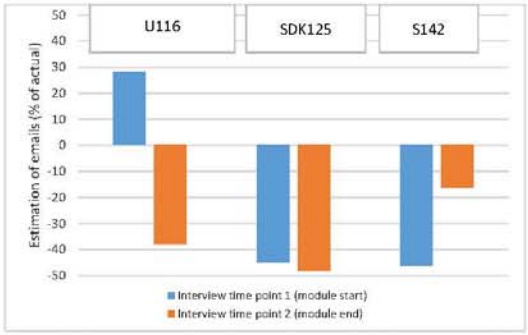

Figure 3: The number of emails received by students compared to the number of emails sent to students.

Some students found some messages too generic and would like more personalisation – again, this was the outcome of the asynchronous study in Science. Some students reported that emails made them feel part of the University community. For distance learners feeling part of a learning community can be more difficult. Lee *et al* suggests that students need to identify with their institution to be successful and it may be argued that emails could play an important role here.

This study tell us that students prefer to receive the majority of communications from the OU by email. This is in line with Robinson *et al* who found that students' preferred c communication method for both work and university communications was email.
Whilst some feel that there is a need for more personalisation in the emails sent, students are happy with the number of emails and able to filter the messages themselves and select which are relevant.

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References
Robinson, S. & Stubberud, H. (2011) Student communication preferences for school/work and social purposes. *Proceedings of the Academy of Educational Leadership*, 16(1), pp.55-61
Lee, Y., Choi, J. & Kim, T. (2013) Discriminating factors between completers of and dropouts from online learning courses. *British Journal of Educational Technology*, 44(2), pp.328-337

Sharing good practice and creating community spirit online
An AL Staff Development initiative in Science

Janet Haresnape
Nicola McIntyre

The Open University

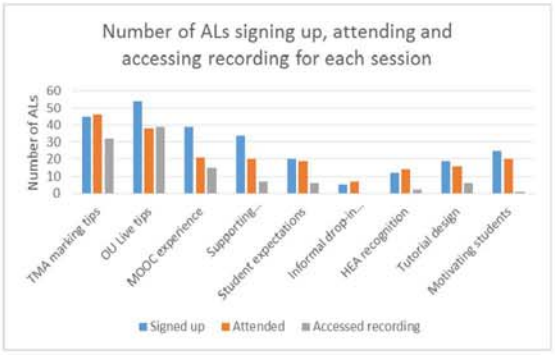
All Science ALs invited to participate in a regular programme of AL-led online events. Feedback collected after each event and analysed

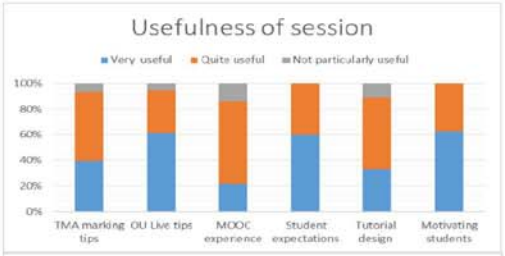
Rationale and Aims

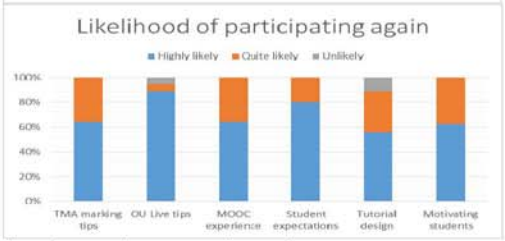
- Now most Science modules are all online, online teaching skills are more crucial than ever before
- Staff Development should be about developing teaching practise, but often ends up being 'imparting information'
- Aim was to enable ALs to share good practise, and to build community feeling among Science ALs
- All ALs have experiences worth sharing and tips to offer others

Events:
Feb '15 Sharing best practise in marking TMAs
Mar '15 Making OU Live a positive experience for students
Apr '15 What could a MOOC and bit of money do for you as an AL?
May'15 Supporting geographically dispersed students
Jun '15 Managing student expectations – retention and progression
Oct '15 Informal discussion of experience of early TSA
Dec '15 HEA recognition via the independent route
Feb '16 Tutorial design – linking theory with practise
Mar '16 Supporting and motivating students

- Attendance recorded on ALs Staff Development record
- Staff Tutors asked to encourage participation – presenting is a good development opportunity







Feedback:

- Provides great opportunity to meet up with other ALs and share ideas
- Provides useful teaching model for what works well in OU Live – and what doesn't
- Interesting to see how ALs replicate students' behaviour in OU Live rooms
- ALs appreciate variety of Staff Development opportunities
- Presenting was generally a positive and enjoyable experience
- Helps ALs to feel part of supportive network – especially important when working remotely

Next Steps:
Capitalise on supportive community feeling generated
Extend to include MCT ALs – now all in STEM Faculty

With grateful thanks to all the AL presenters - Call for contributions for coming year going out soon

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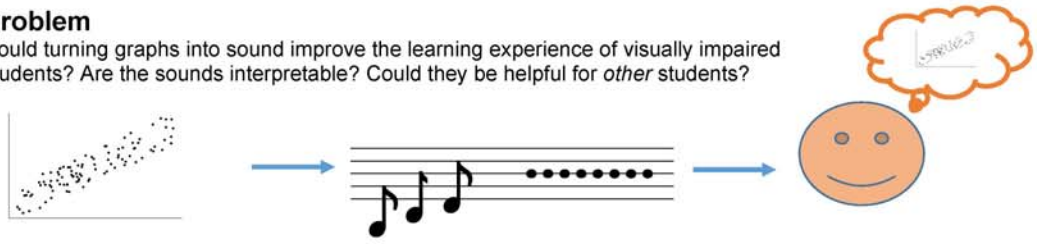
Listening to graphs

Karen Vines, Chris Hughes, Claire Kotecki, Vic Pearson, Hilary Holmes, Laura Alexander, Kaela Parkes*, Chetz Colwell
*Portland Community College, Portland, Oregon, USA

The Open University

Problem

Could turning graphs into sound improve the learning experience of visually impaired students? Are the sounds interpretable? Could they be helpful for *other* students?



What we did

About our process:

- We chose 6 examples that simulated level one maths/science learning activities that use graphs.
- Each participant was given:
  Context → Sonification → Figure Description → Reproduce graph →`Big reveal' (visual plot/tactile plot)
- We recorded participants' responses to the sonifications, figure descriptions and graphs/tactile versions.
- Participants also commented on the usability of the three approaches.

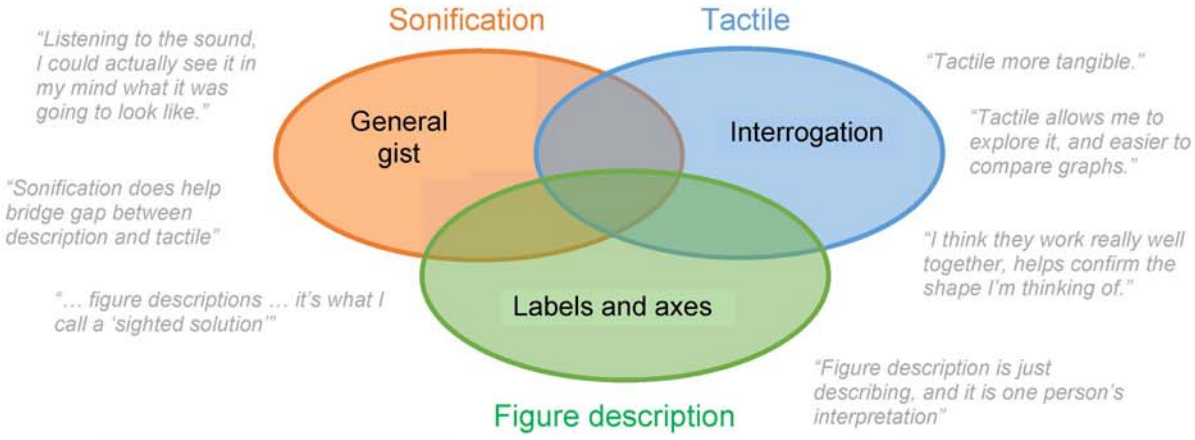
About our participants:

- 5 OU level one Maths/Science students
- 5 blind people with an interest in Maths/Science
- 2+ students at Portland Community College

Preliminary results

- Participants found sonifications helpful for quickly getting the 'gist' of a graph – and this improved with practice.
- For detail and interrogation of the plot, tactile diagrams were more suitable, but took longer.
- Some plots seemed better suited to sonifications than others.

Overall sonifications, tactile plots and figure descriptions aided the participants in different, complementary ways.



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Assessing the transfer of academic learning into workplace achievement

Kay Bromley

Aim of the research project

- To inform STEM departments wishing to develop assessment that is closely related to employer needs.
- To recommend teaching approaches to enable students to demonstrate competencies within industry frameworks and standards

Background

- MCT academics worked with e-skills to develop a Postgraduate certificate
- Employers contributed to the topics to be covered and the learning outcomes (related to the SFIA framework).
- PG cert to run alongside employers Graduate Training programme.

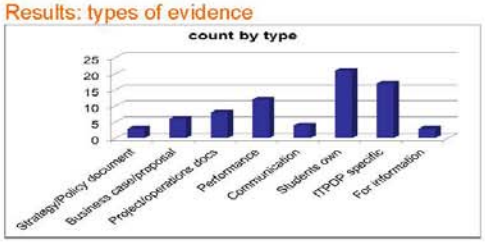
Postgraduate certificate assessment by portfolio

- Based on Kolb learning cycle (Kolb and Kolb (2005) and many others).
- Commentary for each of the 6 topics (template provided) with supporting evidence of achievement.
- Integrative commentary - learning from 2 or more topics. Evidence to demonstrate achievement
- Employers expected strong links between the portfolio and graduate appraisals.

Method

- The portfolio commentaries examined for benefits identified by students - Three step approach based on grounded theory and thematic analysis (Adams et al, 2008).
- Types of evidence in integrative commentaries identified – link to graduate appraisal?
- Survey by questionnaire and structured interviews of small group of students
- Semi-structured interviews with tutors.

Results: types of evidence



Conclusions so far

- There is a mismatch between employer's expectations and employee motivations.
- Avoid assumptions about graduates study skills/experience.
- Students 'sent' on qualification need (more) clarification and support from tutors.
- Line Managers need to be engaged
- HR/training manager support makes a difference and is needed throughout.
- Students - not many connections to graduate appraisal.
- Performance related evidence in the portfolio shows that employers expectation of links to appraisal could probably have been met.

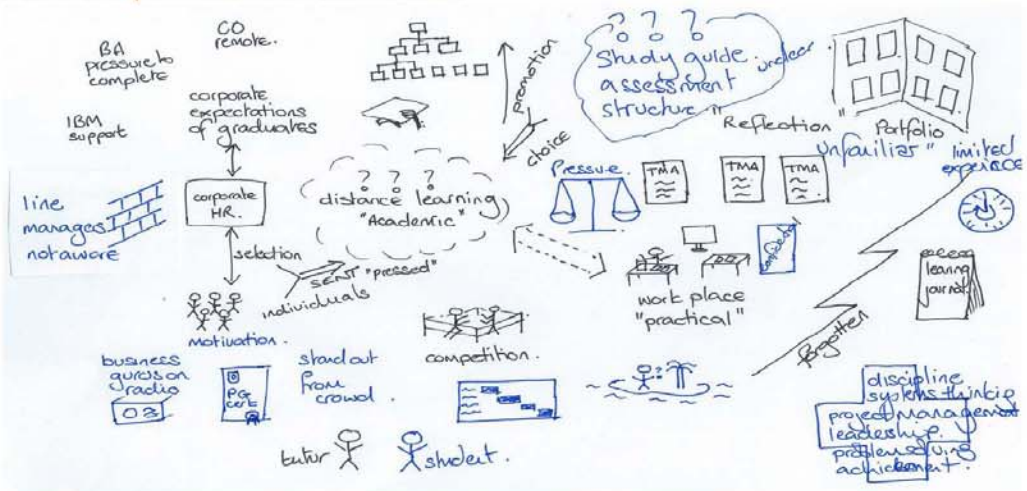
References

ADAMS A., LUNT P., and CAIRNS P (2008). A qualitative approach to HCI research. In Cairns P and Cox A eds Research methods for Human-Computer Interaction. Cambridge, UK: Cambridge University Press pp 138 – 157

KOLB, A.Y. and KOLB, D.A., 2005. Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education. *Academy of Management Learning & Education*, 4(2), pp. 193-212

An extensive literature review in progress. Please contact me if you would like to know more about this or about the research project k.s.bromley@open.ac.uk

Results: Rich picture student and tutor interviews



Can webcam video of animal behaviour offer students practical experience?

Vicky Taylor*, David Robinson, Adele Clegg and Manfusa Shams

The Open University

Introduction

Previous work in an eSTEeM project** on researcher-led science modules, suggested that a single researcher could run an online learning module in their subject area, one component of which was practical work centred on an existing data set provided by the researcher. The idea was to provide a realistic practical experience for a third level module. Following on from this work, we are at an early stage of looking at the use of data sets across all levels, including outreach or citizen science, drawing on student experience of video analysis of seagull (SD206) and elephant behaviour (S295 -*The biology of survival*). The S295 videos (Figure 1) were filmed at Woburn Safari Park and further collaboration with them is proposed, perhaps using a range of different species. The concept is to provide access to one or more video streams from static cameras observing animal behaviour in a captive or managed setting and writing projects around these that are suitable for different levels of learner expertise (Table 1).

FIGURE 1. *top panel: Seagull breeding colony footage (SD206) and bottom panel: Asian elephants foraging footage (S295).*

TABLE 1 *Level*	*Description*	*Learning outcome examples*
Outreach, Citizen Science, MOOC and Level 1	Provide an edited output from a webcam feed and offer learners the opportunity to analyse behaviour using a 'recipe' sheet of detailed instructions	Introduction to scientific method through observing animal behaviour. LO: Given instructions, make meaningful observations of behaviour in a given situation.
Level 2	Provide regular unedited, recorded output that students can analyse following outline principles for behavioural analysis. Data sets obtained by, for example, Level 3 students could also be used to give experience of data analysis.	Gain practical experience of gathering usable data and techniques for analysing behavioural data sets. LO: Draw appropriate conclusions about the behaviour studied from analysis of a given data set.
Level 3 and Postgraduate	Project work for advanced students. Recorded and live stream available, with students tasked with working out for themselves an appropriate experimental approach. Their protocols and data sets would be available for others to use	Technique development and sharing of protocols/data sets. LO: Ability to devise analytical methods and implement them in a study of animal behaviour.

We seek to generate interest in the acquisition and use of such data sets and would like to run a pilot with volunteer learners. In addition, we would like to make some video publically available. An option for this video is using it to give visitors to Woburn another view of the animals and the opportunity of engagement after their visit. in addition to being used with learners. Although elephants are a possibility we will look at other animals as potential subjects. **We would welcome comments and suggestions for how we might take this project forward.**

*Contact: vicky.taylor@open.ac.uk

**https://intranet7.open.ac.uk/project-collaboration/researcher-led-science-teaching/SitePages/Home.aspx

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WOBURN Safari Park

The impact of tutorial provision on student satisfaction on SK143

Vikki Haley, Faculty of Science

The Open University

Background

SK143; Topics in Health Sciences is a 30-credit module formed by the merger of two 15-point modules. For financial reasons, the short anticipated lifetime of the module and the understanding that only continuing students would study this module, the Study Advisor (SA) student support model was used.

No synchronous tutorials were initially offered on the 12J and 13J presentations and student support was offered on a reactive basis by 4-5 study advisors, via dedicated forums. Following several complaints about a lack of support on the module and poor student satisfaction (despite high retention), particularly on the 13J presentation, a series of tutorials was introduced for the 14J presentation.

The tutorials were delivered by the SAs on a fortnightly basis, covering both academic content and study skills.

Results

Figure 1. At least 35% of students on SK143 are new to the OU (left) and are 15-20% less likely to successfully complete the module (right), irrespective of tutorial provision (numbers based on Reg25)

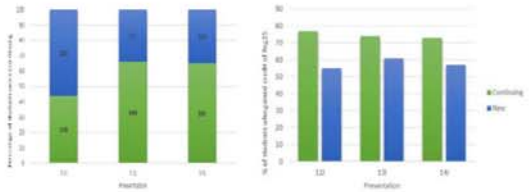
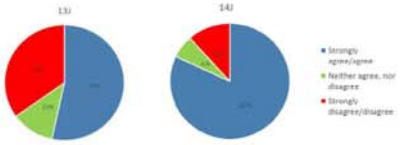


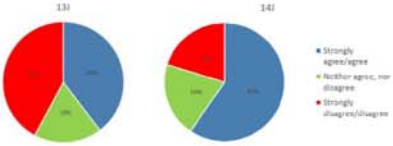
Figure 2. Poor student SEaM feedback on the 13J presentation, with repeated mention of the lack of tutors/tutorial support

Figure 3. IET data showed increased satisfaction in the module overall (A), tutor support (B) and value for money (C) after the introduction of tutorials between 13J (n=126) and 14J (n=94) presentations

A – 29% increase in module satisfaction



B – 20% increase in tutor satisfaction



C – 20% increase in perceived value for money

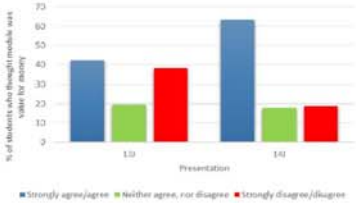
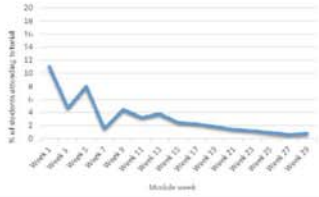


Figure 4. Tutorial attendance ranged from 11% at module start to 1-2% for most of the presentation (n=922)



Discussion

Tutorial provision improves student satisfaction by 20-30%, even with only a small subset of students attending, potentially due to a perceived increase in value for money. Therefore, it is important to consider factors other than attendance rates when deciding on tutorial provision, in case this affects satisfaction rates.

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Acknowledgments;
A big thanks to Angelika Fischenich and the IET team for helping to provide the data, to Diane Butler for critically reading the abstract and to Nicolette Habgood/Carlton Wood for their advice and guidance on the tutorial programme.

Breaking the coding barrier: Transition from Stage 1 to Stage 2 programming

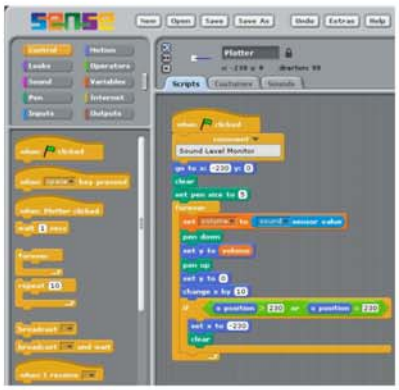
Frances Chetwynd
Helen Jefferis
Fiona Aiken

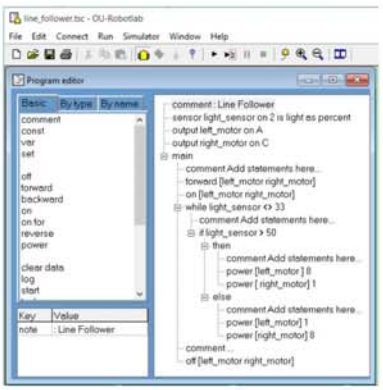
The Open University

How well do the programming activities and tools used at stage 1 prepare students for "conventional" programming at stage 2?

SENSE
Is an untyped, graphical programming language, based on Scratch that can be used with a Sense Board.

Programs (right pane) are assembled jigsaw wise from control structures dragged and dropped from menus (left pane).





ROBOTLAB
Is a programming environment which allows simple robot simulations to be run.

Commands are selected from the list pane (left pane) and dragged and placed onto the right pane to create programs.

STAGE 1

THE CODING BARRIER

STAGE 2

Python
Is a weakly (dynamically) typed interpreted language. It is promoted as being simple to use as it is can be more easily read than some languages.

Programs are entered and debugged using an editor or IDE (Integrated Development Environment)

```
def binarySearch(alist, item):
    first = 0
    last = len(alist)-1
    found = False
    while first<=last and not found:
        midpoint = (first + last)//2
        if alist[midpoint] == item: found = True
        else: if item < alist[midpoint]: last = midpoint-1
        else: first = midpoint + 1
    return found
```

```
public class Neuron implements Serializable {

  private int neNumber;
  private String nenName,
  …

  public Neuron(int i,String n) {
      neuronNumber = i;
      nenName  = n;
  }
 } // End of class Neuron
```

Java
Is a (fairly) strongly-typed object-oriented programming language. It is a general-purpose language designed to be able to run on many platforms.

Programs are entered and debugged using an editor or IDE

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Breaking the coding barrier: Transition from Stage 1 to Stage 2 programming

Frances Chetwynd,
Helen Jefferis,
Fiona Aiken

The Open University

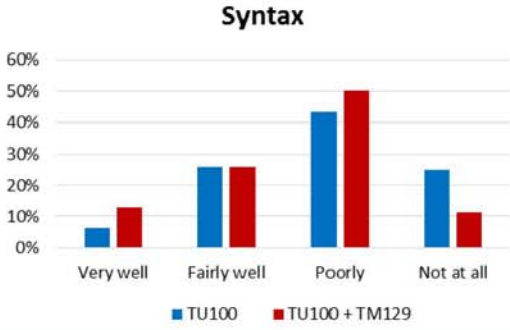
The survey

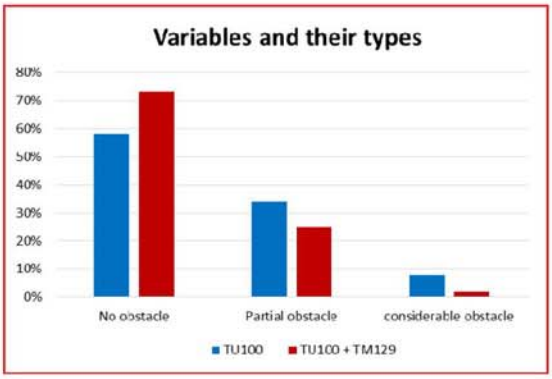
In this survey we aimed to gain an insight into how well students believed their Stage 1 studies prepared them for specific aspects of Stage 2 programming and here we show the results for questions about syntax and variables.

Over 60% of respondents reported that the block construction approach to programming used in TU100 and TM129 meant they were **poorly prepared** or **unprepared** for using languages, such as Java and Python, where syntax errors are possible.

"I felt that it was almost an entirely new concept with the syntax. Sense is great for making you think how to solve a problem without having to worry about Syntax."

"Syntax is particularly difficult to get to grips with, particularly if you are not familiar with it."





Students who studied only TU100 and those who also studied TM129 reported that moving from a weakly typed language to a strongly typed language such as Java **did not present** a considerable obstacle.

"Some languages offer strong typing, others weak. I would have preferred to learn that in TU100, but ultimately, having to type variables is a feature of Java, not a shortcoming of Sense."

"I took the words 'programming language' very literally from an early stage: languages have rules, Sense has one set of rules while Java has another."

We also asked if students believed that Sense and Robotlab had prepared them for stage 2 programming?

TU100 was good preparation for the planning of the programs but not for the actual coding

It's very easy to move Sense blocks around until they do what you want them to do without really thinking about what they do or understanding any of it. Not so easy in Java.

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Breaking the coding barrier: Transition from Stage 1 to Stage 2 programming

Frances Chetwynd,
Helen Jefferis,
Fiona Aiken

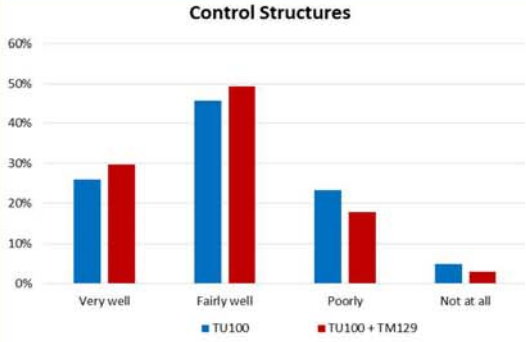
The Open University

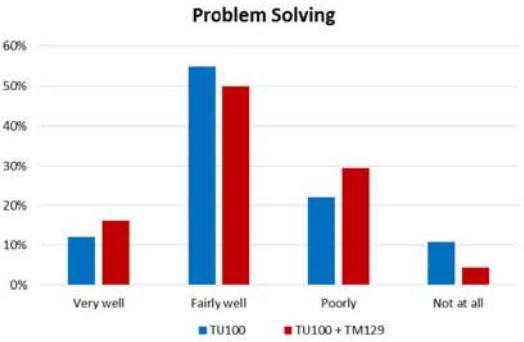
The survey

Here we show the results for questions about problem solving and control structures.

A large majority of respondents reported that the use of control structures in the block construction approach at Stage 1 prepared them **fairly** or **very well** for building procedures or methods at Stage 2.

"While the sense programming was very different to the level 2 modules it did give me good experience with loops and conditional statements and influenced my choice greatly to focus on more programming heavy modules which I was not disappointed by even though there was quite a big difference."





More than half of survey respondents reported that they found studying TU100 or TU100 and TM129 had prepared them **fairly** or **very well** for for solving the programming problems presented at Stage 2.

"TU100 was a great starter it highlighted where my weaknesses are …."

"TU100 was good preparation for the planning of the programs but not for the actual coding"

"I enjoyed TU100 and TM129 mostly because the courses only had one tutor for each subject as several tutors can confuse how to solve a problem"

We also asked students to tell us if these Stage 1 studies influenced their choice of Stage 2 modules.

100% I had no idea I'd love it as much as it did. It's changed my career choices, study choices to choose programming and IT and I am so, so glad I did it!!

The basic concepts of programming I learned in sense gave me the confidence to proceed with more complex languages.

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Exploring citizen science and STEM learning through iSpotnature.org

Janice Ansine, Will Woods*, Mike Dodd, Kevin McLeod*
Faculty of Science and *Institute of Educational Technology (IET)

The Open University

Introduction

Today, more and more, people are finding and sharing interests through social networking sites and activities. When combined with citizen science based opportunities the scope for and benefits of inquiry-based learning are further enhanced. iSpot **www.iSpotnature.org** is the OU's award winning, flagship citizen science platform which engages the public through their interest in wildlife by crowdsourcing names to species. Recent research demonstrates the success of its model, which enables beginners to connect with experts, in accurate species identification[1].

Background

A joint Faculty of Science / Institute of Educational Technology (IET) initiative, iSpot was launched in 2009 and provides a multifaceted learning experience incorporating participatory science research and the use of innovative educational technology, which provides a unique informal to formal learning journey. The framework of the site, and how it is used, contributes to STEM learning by building natural history skills, a specialism noted as missing from current biological education at all levels. On the cutting edge in the use of technological innovation in pedagogy, iSpot utilises and embraces many of the new forms of teaching, learning and assessment identified as the way forward for Science education[2].

What next for iSpot?

The lessons learnt from the iSpot experience and its impact so far are under review as we consider what next for the future i.e. how to gain maximum advantage for this citizen science platform as a technology in STEM leaning.

What can iSpot contribute to a social form of teaching and learning?

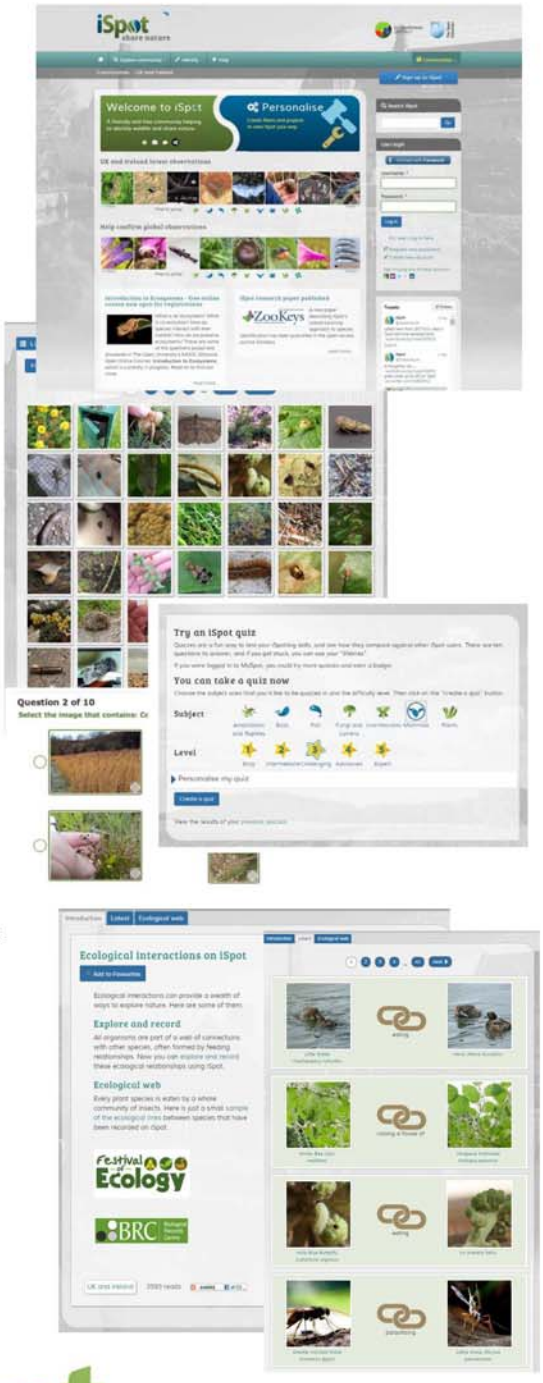
iSpot uses a combination of social networking, public engagement, informal access to expertise, and learning opportunities. It is currently integrated into modules, MOOCs and Open Media / OpenLearn resources, with plans for further integration, but its potential for teaching and learning is not yet fully exploited.

How can iSpot's contribution to science, though participatory research, be demonstrated?

Research looking into the success of the iSpot model has found the structure of the platform's social network to be a key feature. Combining learning technology with crowdsourcing, enables beginners to connect with experts, leading to plant and wildlife species being identified accurately. Over 94% of observations submitted to iSpot receive some sort of identification with more than half being named within an hour. Using iSpot's unique user 'reputation', the platform motivates iSpotters to verify species and rewards them for doing so. The research concluded that by effectively connecting users in this way they are able overcome the social as well as geographic barriers that prevent the sharing of knowledge. There is still untapped scope for the analysis of iSpot data[1].

Are there ideas for new technological innovation to advance further learning opportunities?

The technology that supports this had a comprehensive redesign and redevelopment in 2014 and is now under further review. So far this has included improving the user experience and navigation; new features providing location mapping and inquiry learning; customised content and personalisation and an optimised user experience for presentation across a range of devices.



[1] Silvertown, J., Harvey, M., Greenwood, R., Dodd, M., Rosewell, J., Rebelo, T., Ansine, J., & McConway, K. (2015). Crowdsourcing the identification of organisms: A case-study of iSpot. *ZooKeys*, (480), 125.

[2] Woods, W., McLeod, K., Ansine, J.,(2016) 'Supporting mobile learning and citizen science through iSpot', Chapter 6 in Crompton, H., Traxler, J., **Mobile Learning and STEM case studies in practice**, Taylor & Francis, Abingdon, pp 69 -85.

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iSpot
ispotnature.org

@iSpotnature

Open π-Lab:
The OpenScience Laboratory offline

Nicholas Braithwaite, Kris Stutchbury,
Janice Ansine and Gillian Hosier

The Open University

Background

With funding from the UK Space Agency, we have collaborated with Inmarsat and Equity Foundation (Kenya) to expand opportunities for satellite communications in remote 'international development' settings. The aim was to provide digital content relevant to schools in an area where resources are limited. The OSL's specific brief was to provide demonstrators for the secondary sector relating to laboratory science:

- 3 practical activities for offline use via local hot-spots
- piloted in Kenya by secondary science teachers (Fig 1.)
- integrated in Equity Foundation *Wings to Fly* program*
- available in 10 schools (500 teachers, >6,000 pupils)

Fig 1
Open π-Lab trials: on-screen offline

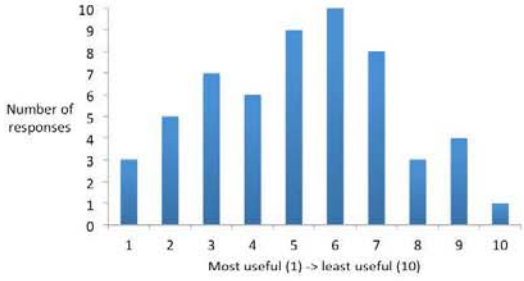

Fig 2 Comparative 'usefulness' of Open π-Lab

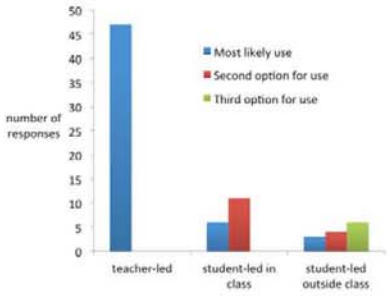

Fig 3 Expected mode of use of Open π-Lab

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Evaluation

93% of 75 respondents to the *Wings to Fly* trials recognised that (Open π-Lab) "science practicals will help students learn the knowledge they require"

Fig 2. shows the ranking given to Open π-Lab practicals in comparison with nine other blocks of learning resources in the *Wings to Fly* program:

- Video Tutorials (not ethnicly matched)
- Video Tutorials (by Kenyan teachers and students)
- Past KCSE Exams and marking schemes
- Leadership, life skills and career talks
- E-books
- E-textbooks
- Wikislice chemistry and physics
- Education websites
- *Open π-Lab Practicals*
- Teacher resource websites

Given that all *Wings to Fly* content is selected for its utility, the spread of responses in Fig 2. indicates that the Open π-Lab exemplars of on-screen-offline practical science made a significant, positive impression.

The expected mode of use reveals a conservative teacher-led model (Fig 3). This reflects culture and infrastructure more than functionality. Although the resources do function when projected from a presenter PC in a didactic delivery, the vision of the Open π-Lab is to enable a student-centred model of learning. This will require further work and creates the opportunity for collaboration with TESSA (based in FELS) whose focus is improving classroom practices.

Using a diagnostic quiz to increase retention: MST124

Carol Calvert, Rachel Hiilliam, Juliet Coleman, Maths SST and MST124 ALs

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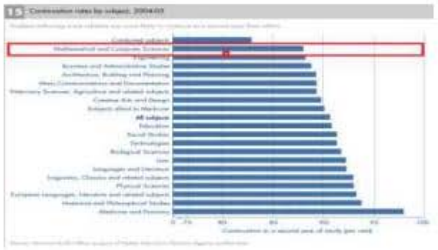
HEA wide issue- students on maths modules fail to thrive

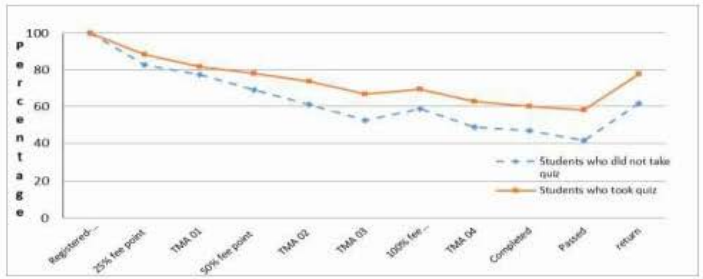
Photo credit: CIMMYT on Flickr

National Audit Office report identified only "combined studies" had a poorer continuation rate than Maths

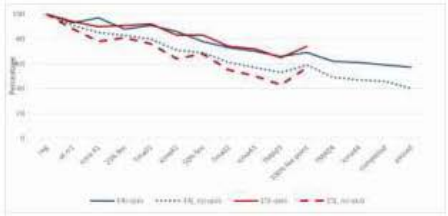


One of our solutions – get students to take a high quality diagnostic quiz

For 14J the percentage of those registered who passed was 60% amongst those who took the quiz and 40% for those who did not take the quiz.



More information



Three times as many students took the quiz in 15J than in 14J AND
So far the same better performance compared to those who did not take the quiz is being maintained

- SSTs and AL's encouraged students to take quiz. Numbers taking quiz increased from around 200 in 14J to 700 for 15J.
- Evaluation shows that at 31st March 2016 there are 50 more students than we would expect still on MST124 (allowing for a larger entry in 15J but assuming 14J attrition rates).
- The students who took the quiz in 2015 are doing just as well those who did so in 2014
- The manual process involved to identify students to be contacted is automated

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Succeeding against the odds

Carol Calvert, Andrew Norton, Juliet Coleman, Rachel Hilliam, Linda Brown (Maths AL), David Edwards (Science AL)

The Open University

Coverage and Timeframe: The two modules involved in the project are MU123, which is the Introduction Maths module, and S217 is a second level Physics module (From Classical to Quantum). Students from October presentations in 2014 and 2015 will be involved.

Being a "test case": Contacting students
The project uses predictive probabilities of success to identify samples of students. A survey of students requires approval from the Student Research Project Panel and in this case, because this was the first time predictive probabilities had been used in this way, the application was also referred to the HR Ethics committee.

What do the students get out of participating?
- The satisfaction of having their views heard directly.
-
- Helping future students on the modules.
-
- By reflecting, with the AL, on why they felt they succeeded, hopefully they can identify a clearer strategy for their future success

Questions of Interest
Q1: What can the University learn from students who have succeeded despite low predicted probabilities of success based on OU analyse, the Information Office data and , for S217, previous study of mathematics

Q2: Are some groups of students consistently more likely to be able to overcome the obstacles that have previously prevented their success on OU modules

Q3: Are there different factors for Maths Level 1 to Science level 2

Q4: Does it matter which predictive

Introduction: The University has two active predictive analytics models and this project combines the use of outputs from both models. The intention is to identify successful students who had low predictions of success at various points both within module and for module pass and return. Students will be asked, by experienced AL's, about key factors in their success. The aspiration is that we may find some transferable skills to help future students.

This project is a combination of quantitative and qualitative work.

Methodology
The basic design is :
- Central team identify students to be contacted and obtain all necessary OU agreements;
- Al's to email students (at most twice) to see if they were willing to be involved ;
- Al's obtain students' views via a telephone interview and produce a short summary of the conversation. The summary is returned to the student for their comment / revision re accuracy etc.
- Process to start with 14J students and then move to 15J students;
- Al's extract any summary points and identify / discuss with central team what may be transferable to other students/ subjects/ levels.

The design has been developed with helpful input from the eSTEeM group, SRRP, Research Analytics, HREC and IET

Which model? For MU123 15J,just after module start, OU analyse and the Information Office model predicted the same result for over 80% of students.

For October 2014 : How does 2,500+ = 5 AND 500+ = 6 ??

500 + S207 students. **35** with a low probability of passing did pass	**31**- available to be included in the survey	**6**- expected to agree to interview
2,500 + MU123 students. **43** with a low probability of passing did pass	**27**- available to be included in the survey	**5**- expected to agree to interview

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The impact of technology on the teaching and assessment of 'systems' diagrams in two online environmental management modules

Andy Lane

The Open University

Introduction

Diagramming is a process where the context and tools used to create the diagram may hinder or help students in learning both how to create diagrams that represent a situation and how to learn about diagramming and the situation at the same time.

There is a long history of teaching and researching 'systems' diagramming as a 'thinking and doing' technique at the Open University (Lane, 2013; Blackmore et al, 2015). A recent manifestation of this has been two mainly online undergraduate modules dealing with environmental management (T219 and T319), where students share diagrams with other students throughout the duration of the module, have to work collaboratively on diagrams in small groups for one part of the module and include diagrams in all assignments.

Methods

The study looked at students' experiences of using diagrams and in particular the part that familiarity, experience and confidence in the technique and the technology played in supporting learning.

The findings draw upon student postings in online forums; on samples of assignments with specific questions about diagramming as a practice; an online survey of students who studied one or both of the modules; and telephone interviews with a small sample of students and tutors.

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Results

Few students were familiar with the type and nature of the diagramming techniques involved in these modules before they studied these modules:

'As someone who doesn't draw or have any past experience of using diagramming I initially found the use of systems diagrams to be a challenge.'

In terms of learning about the necessity and mechanics of diagramming students seem to very much like the printed resource book over the online materials.

'I actually thought the resource book was probably the thing that helped me the most because it was fairly succinct and it had got lots of examples in it of how systems diagrams… first of all how systems thinking works and why it is important and second how systems diagrams need to be put together.'

The problems with the Display Wall, difficulties with creating digital copies of diagrams, the limitation of sharing and discussing diagrams in online tutorials and within the group work, also appear to hinder learning about the value and relevance of diagramming for improving their own learning in general and for use in environmental management in particular.

'The gallery where we were supposed to upload our diagrams was ineffective as a collaborative learning tool as no-one commented on posts, despite requests for feedback. This site also became an obstruction to learning when working on the collaborative task as students posted their diagrams here while others posted them as attachments to conversation threads. Posting diagrams here did not contribute to my learning about the course content. I ceased to use it eventually as it provided no additional benefits. The navigation was clunky and the smiley/sad face indicator useless.'

While many did gain value from, and see relevance in diagramming, it looks as if the number of diagrams to learn about, and the number of diagrams that needed to be produced throughout study of the modules, contributed to a significant intellectual and practical time burden that may have contributed to the more negative views expressed, with technology a contributing factor.

'Also the other thing I found in the course generally; the amount of reading material, the material that you actually read through was, compared to other courses that I have done, excessive I thought. It was just difficult to get to... you had to get all the reading done that you needed to and cover all the various exercises and that that you were doing as you went along so the course became very very intensive and I know from comments on the forums during the course, from other students, they also found the same thing; the course content was rather heavy.'

Despite this array of factors that has hindered students' learning about diagramming most claimed that they were very likely to continue using them in their studies and possibly in their work. For a few diagramming was seen as a waste of time anyway and the technological issues just seem to have compounded this negative view.

'I now use systems and spray diagrams along with rich pictures in my day to day work. I run continuous improvement workshops and find these methods well accepted by the attendees.'

'Because I don't understand them, didn't find them helpful or useful, found them complicated and time consuming and I don't see a place in my future studies or career for them'

In conclusion, technology in this case is at best an enabler but not an enhancer for teaching and learning this particular practical technique at a distance.

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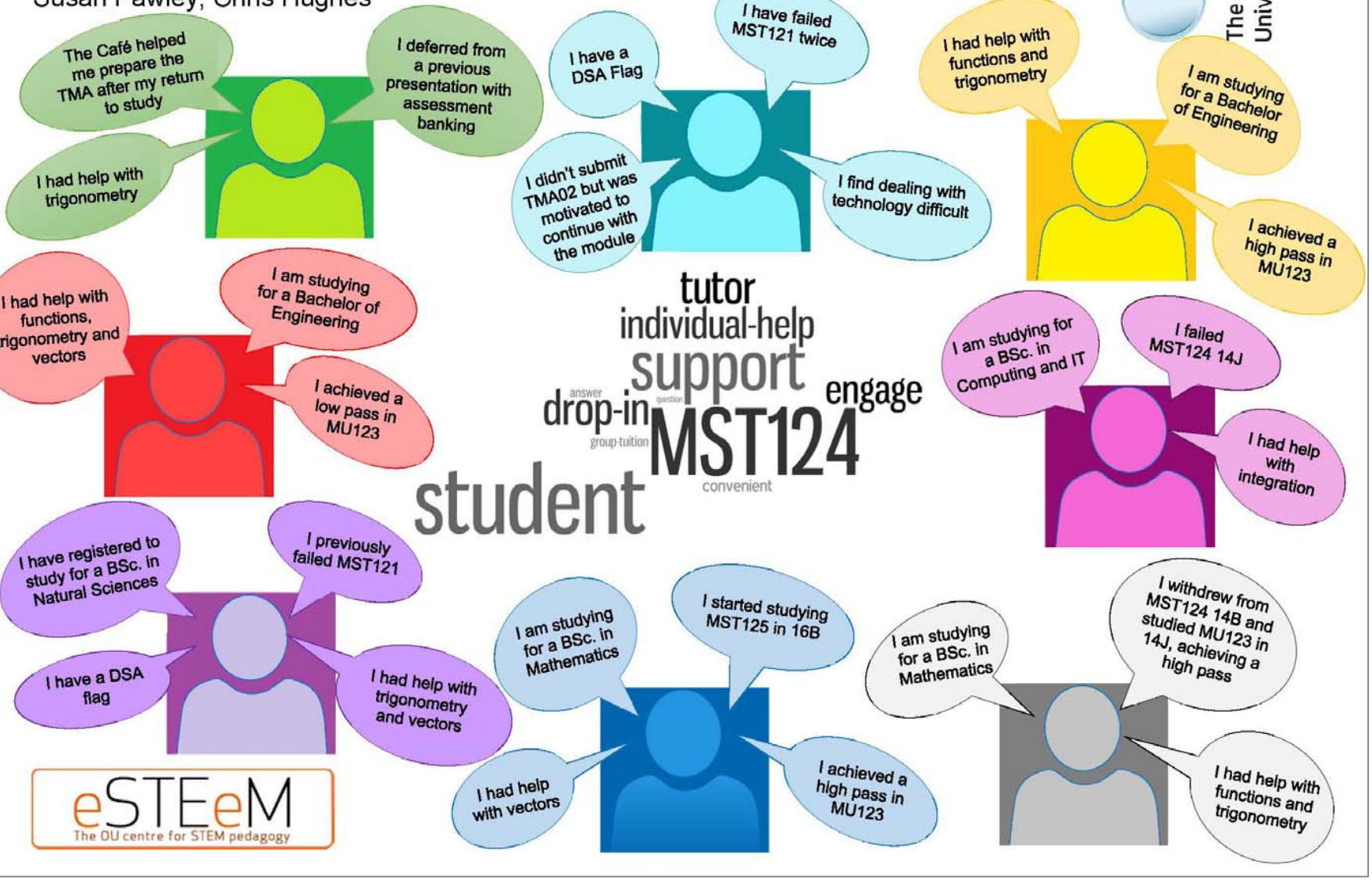
OU Live Drop-in Café for TMA Support in MST124

Susan Pawley, Chris Hughes



Supporting vocational students studying STEM subjects: making the hard stuff easier

Hilary MacQueen, Glenn Dickinson and the Science WBL Team

The Open University

Introduction

The Paramedic Sciences Foundation degree is delivered in partnership with employers. The OU provides an AL, module materials and assessment; the employers provide a suitable study environment, a Mentor, and practice placements. Employers provide two kinds of support: formal (measured by amount of Study Leave offered to students) and informal (a supportive environment).

Student retention (75-79%) and pass rates (76-100%) are good, but student satisfaction is poor. Much of the dissatisfaction centres around placement and workplace support.

Methodology

We collected data from three cohorts of students completing S211, the 'capstone' work-based learning module where paramedic skills are acquired. Students were from three NHS Ambulance Trusts and from a number of small, independent providers, which were pooled for data collection.
We used EMA data and SEAM survey results to identify links between student success and the formal and informal support provided by their employer. The metrics used were pass rate and 'quality' of pass, measured as the ratio of (Pass 1 + Pass 2) to (Pass 3 + Pass 4).

Results

Does the amount of formal support by employers matter?

Employer	Study days per year	Pass Rate %	Pass 1/2 vs Pass 3/4
NHS Trust 1	17.5	86.7	1 : 1.78
NHS Trust 2	29	78.9	1 : 1.31
NHS Trust 3	0	80.7	1 : 1.48
Independents	n.d.	37.5	1 : 12

Amongst the NHS Trusts there was no effect of formal study time on pass rate, although there was a significant relationship with pass quality ($P = 0.03$, ANOVA). There was a highly significant difference in the pass rates and quality achieved by students in the NHS Trusts compared with those achieved in the grouped independent providers ($P = 0.0002$, Fisher's Exact test). N.d., not declared.

Does the infrastructure matter?

There are clear differences between students working in NHS Trusts and those in independent providers, but little difference between the three Trusts. This suggests that the better infrastructure in NHS organisations, and the resulting supportive environment, is an important component of student success. Even among successful students, the main complaints were about support in the workplace:

- Only 47.9% felt practice feedback was good
- Only 43% felt they got good support from their placement provider
- Only 13% felt their Mentor understood the needs of the module

Discussion

Students appear to benefit from a workplace environment in which they feel well supported. Although in this delivery model the OU has no role in workplace support, 85% of students who responded felt that the OU could provide more in this area. 74.9% of them felt that their AL's understanding of the workplace context was a great help.

In future work-based learning projects, such as Apprenticeships, the OU should pay more attention to the informal aspects of workplace support, as well as ensuring that the formal mechanisms are well embedded. Organisations without a robust infrastructure, such as small independent businesses, pose a particular threat to student success.

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Associate Lecturer perspectives on supporting students through tuition in groups

Ann Walshe, Anne Campbell, Anne-Marie Gallen & Mark Jones

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"Do students know what tuition is for?"

Our starting point was to question whether students understand what tuition is for.
This led to a wider question of whether there is a common understanding between all stakeholders about the role of tuition within the Open University.

Drawing on AL experience and reflective practice

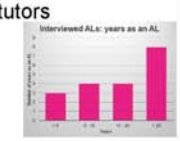
Our investigation focuses on Associate Lecturers. This is because they:

- are experienced in delivering and reflecting on tuition
- have views on student and module team perceptions of tuition
- see the practice of delivering tuition in groups as part of their professional identity

Who did we speak to?

20 ALs from MCT and Science, all Level 1 tutors
May not be a representative group…

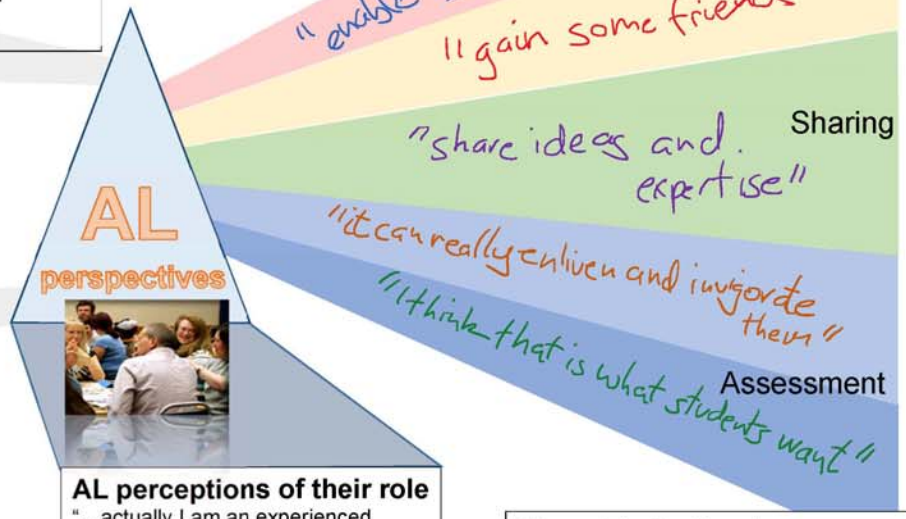
- ALs already deeply interested in tuition
- extensive experience at other levels
- extensive external teaching experience
- no younger tutors



What does the literature tell us?

"A common understanding of the role of the tutor is crucial so that tutors and students will know what to expect in a tutorial session." [Ogina and Mampane (2013)]

"We need to rethink pedagogy in tuition in order to deliver a more positive student experience" [Goodfellow (2015) citing Campbell (2014)]



AL perceptions of their role

"…actually I am an experienced educator and I should be able to judge what my group needs..."

"I don't know the module team's views on group tuition"

Thoughts for the day:

- Tuition in groups – the only way?
- Online – is it an alternative to f2f?
- How to create social presence online?
- Whither AL professional identity?

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Proactive support for students to make the transition from print material to online study

Dr Martina Gibbons and Dr Elaine McPherson

The Open University

Introduction to Y033 Science, technology and maths Access module

The Science, technology and maths Access module, Y033, is designed to help students who are new to higher education or who are returning to education following a break, to develop the key skills necessary for successful university study. The module introduces a range of STEM subjects and prepares students for a wide range of qualifications at Level 1. As part of its remit to prepare students for further study it also provides a gentle introduction to computing and to online learning.

In-module transition from print to fully online study in Y033

On Y033, the delivery of the first two blocks of materials is based around core printed texts (with only a small unit in Block 1 being online), but Block 3 is delivered entirely online. While the move is designed to prepare students to work on other online modules at level 1, e.g. S141 (and upcoming new modules such as S111), anecdotal feedback from ALs and open comments in module SEAM returns from students, suggest that many dislike the online component and find the transition to online learning difficult.

Increasing use of online study across the OU

As there are an increasing number of modules across the University being delivered online, students are potentially being placed at a disadvantage if they are not adequately prepared for this mode of study. On the science module and qualification forums there are numerous comments from students who dislike learning online and who are struggling to work out how to study online, when all their previous educational experience involves print-based learning. Students on these forums are supporting each other in an ad-hoc way and module teams are also trying to support these students. However resources offering appropriate support are few (in comparison to those designed to support study of print) and it is still unclear what is the most effective way to support the move to online learning.

While the University has recently provided some resources to guide and support students with online learning material [http://www2.open.ac.uk/students/help/topic/computing/category/study-skills-for-online-learning and also resources developed by CICP], this material itself is online and not necessarily the most appropriate mode of delivery for those at an early stage in their learning journey such as Y033 students.

Project aim

This project will focus on:

- improving student retention when they move from print to online module material, including use of proactive support by ALs
- improving students' confidence in computing and study using online materials
- improving student study habits to prepare them for future online study

Outcomes of this work will include:

- tutor-led resources on how to use online material effectively for study
- an intervention checklist for tutors to enable a decision making process to direct students to appropriate support resources
- better information about what provides the best support for students when they first encounter online material.

Working closely with ALs who tutor on Y033 and also on Level 1 STEM subjects will help broaden our understanding of how to deliver this support most effectively. It may identify additional issues which affect retention and progression of students, not just at Access level, but at level 1 or any level where online material is the main mode of module delivery. It should complement the work being undertaken in the eSTEeM project 'Students' study of online modules' related to level 2 online Science modules.

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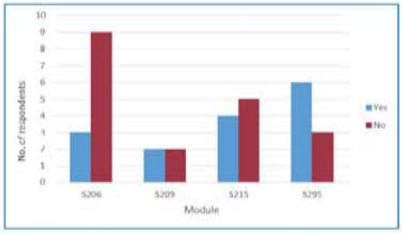
Study of online modules – impact on the tutors

Catherine Halliwell, Vikki Haley, Julie Robson, Elaine Moore

The Open University

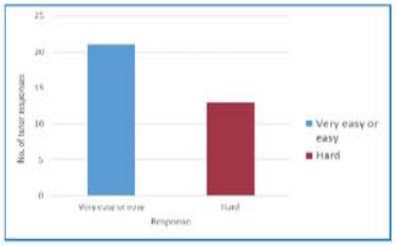
As part of an eSTEeM project investigating how students engage with online only delivery of module material, ALs on the first presentation of online only modules, S206, S209, S215 and S295, were invited to complete a questionnaire asking if and how the new delivery method had affected student support, TMA marking, tutorials, and their own learning of module content. Some of the key responses are summarised here (number of responses = 34, 65%).

Have you changed the way you support your students?

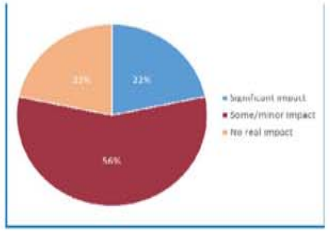


'I did not change because I was very short of time. However, for the next presentation intend to be far more active in reminding them which part of the module they should be studying...it is about trying to think if they are using an online explanation or exercise as well as they should.'

How did you find studying the material online?

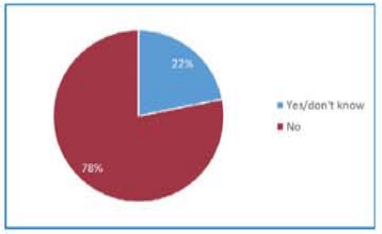


Do you feel online only delivery has had a greater or lesser impact on students with disabilities?



'Having worked with students with specific learning difficulties such as dyslexia and dyspraxia, they generally find it easier to work from a screen than a book,...It is also flexible regarding size of font, which would help people with visual disability. There have been a number of students with additional requirements in my groups and they seem to manage well with the online course'

Do you think the students are truly interacting with the activities?



'Some fully participate, others don't - mostly because of time issues (which are mostly related to illness, family problems or changing work commitments rather than bad time management).'

Discussion

Following the introduction of online only modules there were concerns about the impact this may have on both students and tutors, however;

- **This doesn't appear to have affected tutor's support of students as much as expected, however the module content seems to have the biggest effect**
- **Difficulties associated with studying material online are less than expected, but 75% felt it took students longer to work through (data not shown) which needs to be considered when writing online material. This has had an impact on the ability of students to fully engage with all the interactivity**
- **Some students with disabilities, such as visual impairment, have benefitted from online delivery as there are more ways to modify the text and format.**

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Academic literacy and communicating assessment to students on L1 Science modules: Phase 1 Interim Report

Claire Kotecki (LHCS, S111 MTAC), Prithvi Shrestha (FELS)

The Open University

Abstract

Academic literacy skills have been identified as key predictors of successful progression in science. Genre-based pedagogy has a positive effect on outcomes. This work will extend this knowledge through research directed at the OU student cohort and learning environment. Retention & progression are key challenges facing STEM subjects, particularly L1 Science and successful assessment outcomes are vital to achieving this. This poster is a presentation of the interim results of the first stage of a study examining entry-level academic literacy skills, assessment perception and feedback in a cohort of Level 1 science students studying a cross-discipline module via distance learning. Initially, student understanding of key terminology and perceptions of assessment have been assessed via a survey prior to the start of their study. In addition, student scripts and tutor feedback are being analysed via a combination of quantitative tools to characterise linguistic complexity, use of key terminology and structure. This approach is combined with an analysis of how assessment tasks are communicated to students to provide an holistic view of assessment communication, student expectation, cohort performance and value-based tutor feedback. Phase 2 and 3 of the project will take place later this year, including follow-up student surveys and analysis and individual student interviews.

Project Map

Phase 1	Phase 2	Phase 3
Terminology mapping of current Level 1 assessment tasks (process words)	Textual analysis of student scripts and tutor feedback	Late-module student survey: student perceptions and experiences of assessment
Pre-entry student survey: assessment language and student perceptions	Assessment of consciously and unconsciously 'valued' characteristics	Follow-up student interviews of limited cohort of respondees to explore attitudes and experiences

Key Term: Academic Literacy (AL): Academic Literacy is defined as the language and literacy skills required for and developed during academic study, to comprehend and produce a wide range of texts for a wide range of academic purposes in a particular discipline by engaging with the expectations, practices and needs of a wide range of audiences.

Student perceptions of comprehension of process words differs from demonstrated comprehension

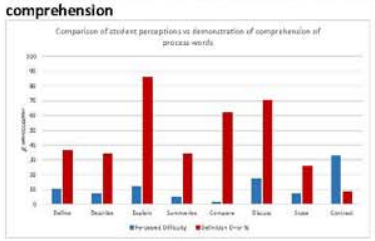

Figure 1: A comparison of self-reported student perception of difficulty of key process words (blue bars) & frequency of definition error by students (red bars), $n = 58$.

Students were asked to independently define in context 8 key process words identified from a study of current assessment material on a L1 entry-level science course and then later choose the terms they found most difficult to understand. Students estimated low perceived difficulty (between approx. 2 -32%) whilst demonstrating a much higher definition error frequency (between approx. 8-88%). This disparity between perception and actuality was particularly pronounced for the terms 'explain', 'compare' and 'discuss'. The process word with the highest student-rated difficulty frequency, 'contrast', was the only term that showed a reverse of this trend with a very low definition error frequency despite the high student perception of difficulty.

Student perceptions of purpose of assessment differs according to the assessment type

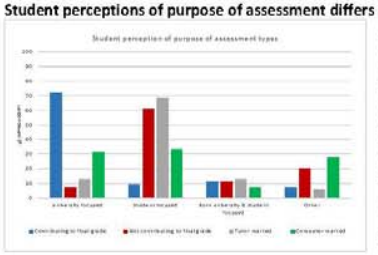

Figure 2: A comparison of self-reported student perception of the purpose of different types of assessment, grouped according to whether the benefit was university or student focused, $n = 54$.

Students were asked what they felt the purpose of 4 key types of assessment used in L1 science modules was (assessment that contributes to their grade, assessment that does not contribute to their grade, tutor marked assessment and computer marked assessment) and their responses were categorised based on whether they focused on benefit to the university (i.e. to grade, assess or judge performance) or benefit to the student (i.e. to receive feedback, become more self-aware, improve performance), components of both of these or something other than these. Students perceived assessment that contributed to their final grade as having a strongly university-focused purpose (>70% of responses identified this) in comparison to assessment that did not contribute to the final grade (<10% of responses identified this). While students perceived the purpose of assessment that did not contribute to the final grade as predominantly student-focused (>60% of responses identified this), this was balanced by the perception that assessment marked by tutors was also predominantly student-focused (>65% of responses identified this). A relatively low percentage of responses identified that all types of assessment have both a university-focused and student-focused purpose (<15% for each assessment type). Students reported much more varied perceptions of the purpose of computer marked assignments with a number of responses falling into the category of 'other', i.e. neither university-focused (as defined above) nor student-focused. A number of these responses identified cost-reduction, time-benefit or accuracy/inaccuracy as the primary purpose.

Discussion and Further Work

Early analysis suggests that entry-level students are not always able to accurately judge their competency in the use of key assessment process words. This may affect how they access literacy support at key early assessment points and could provide a point for early skills intervention. Student understanding of the purpose of assessment types is also key to success early in their student experience. Data presented here indicate that communicating the value to the student of assessment that is summative or that is marked by computer rather than tutor prior to the outset of their studies could be a key early intervention that encourages students to engage fully with all types of assessment and incorporate the feedback in their personal developmental journey. These early indications will be further explored in the remaining phases of this project.

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1. Holder G.M., Jones J., Robinson R.A., Krass I (1999) *Academic literacy skills and progression rates among Pharmacy students* HERD Vol 18 No 1
2. Mort P. & Drury H. (2012) *Supporting student academic literacy in the disciplines using genre-based pedagogy* JALL Vol 6 No 3
3. Davey B. & Dommett E. (2014) *SDK125 Student Retention & Intentions Study* eSTEeM Final Report

Remote Drop-in Clinics: A new, student-centred, approach to distance learning

N.P. Chatterton (LHCS), E.A. Moore (LHCS)

The Open University

Background

- Drop-out rates for distance learning and part-time degrees are very high compared to degrees delivered in a traditional manner.
- Evidence suggests drop-out rates "front-loaded" i.e. highest at start of a module.
- Chemistry clinics, or drop-in centres, have been established at numerous traditional universities.
- They provide an excellent opportunity for student-centred learning that is known to enhance engagement.
- Online clinics could reduce the "transactional distance" between students and tutors.

The Project

This eSTEeM proposed project has two main components.

1. The development of a stand alone topic based online teaching resource containing:
   - Vignette-style 5 minute screencast "how-to" guides
   - Links to external resources such as the Khan Academy
   - Structured questions with accompanying answers
   - Tutor delivered "pencasts" on how they approached problems
2. The opportunity for students to book and take part in one-to-one online drop in classes that:
   - Are focussed around specific student problems from the structured problems
   - Provide an opportunity for students ask questions and gain instant feedback.

Which students?

This pilot scheme will target students who have just finished the level 1 science module S104 and who are deemed as "struggling" in chemistry and are progressing onto S215 (Chemistry: essential concepts).

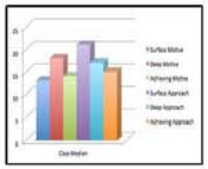
When will the clinics be?

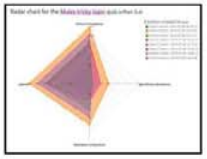
The drop-in sessions will run for the 4 weeks prior to the start of the 16J presentation of S215 and will be available for 10 hours for each of these weeks. The VLE will be available 4 weeks prior to this i.e. August 2016.

How will success be measured?

The effect of the project will be measured in several ways, these include:

- Metrics from the VLE "analytics for action" team on student visits to site.
- Metrics on the relative student performance of students in S215 compared with analogous students from previous presentations
- Analysis of students difficulties and approaches to learning via use of "Tricky Topic Tools" and a Survey Monkey questionnaire.





Potential benefits and impact?

- Improved retention rates.
- Improved awareness of concepts students struggle with.
- Inform future OU retention policy.

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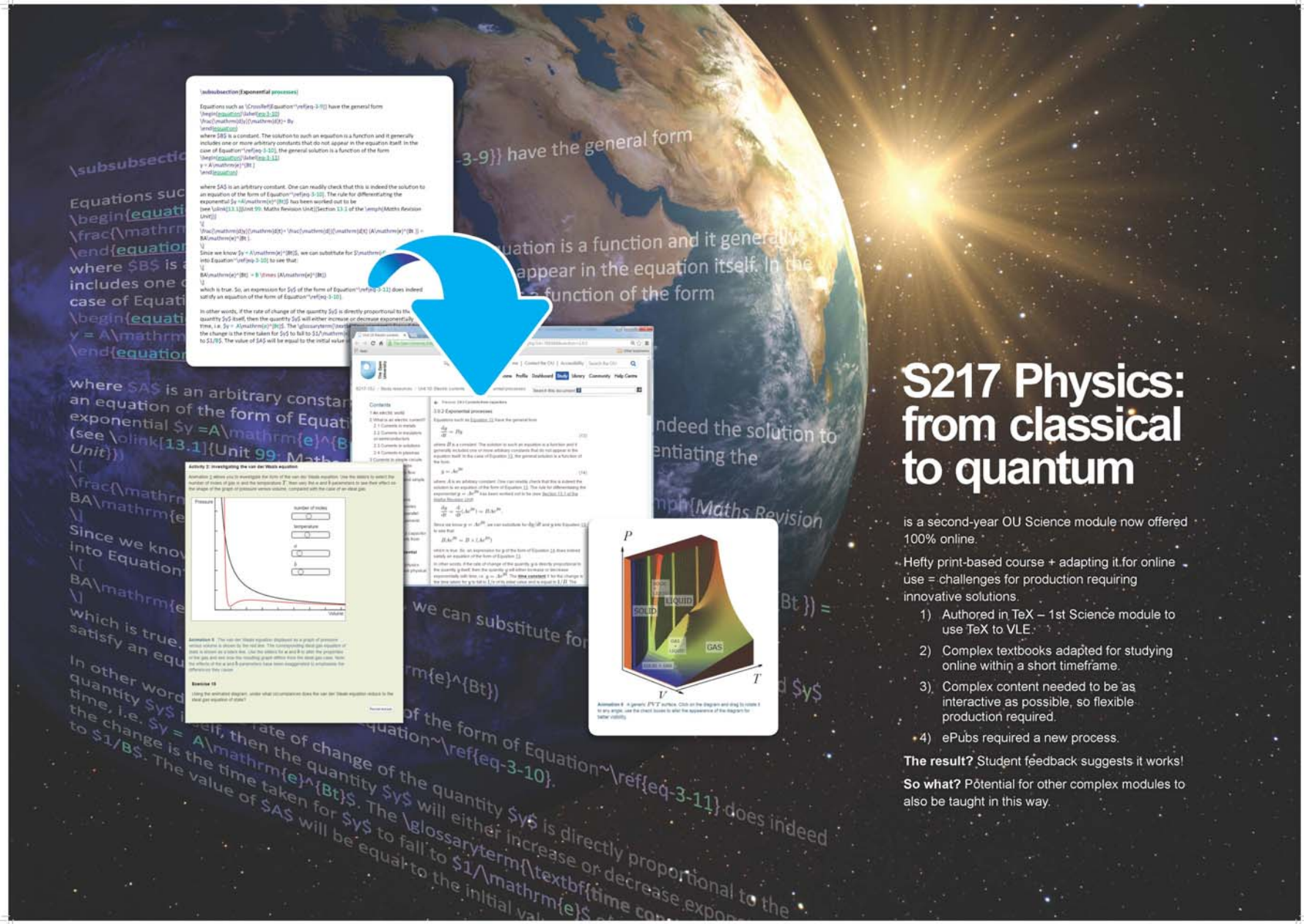

S217 Physics: from classical to quantum

is a second-year OU Science module now offered 100% online.

Hefty print-based course + adapting it for online use = challenges for production requiring innovative solutions.

1) Authored in TeX – 1st Science module to use TeX to VLE.
2) Complex textbooks adapted for studying online within a short timeframe.
3) Complex content needed to be as interactive as possible, so flexible production required.
4) ePubs required a new process.

The result? Student feedback suggests it works!

So what? Potential for other complex modules to also be taught in this way.

Achieving authenticity, sociability and metafunctionality in online labs

Marcus Brodeur, Nicholas Braithwaite, Shailey Minocha and Ulrich Kolb

The Open University

on·line lab (ôn´līn´ lăb), *n.* **1.** a scientific investigation conducted over a computer network (as contrasted with on-site presence). **2.** the combination of software, hardware and pedagogy underpinning such an experiment.

In 2013–2015, a large-scale (*n*=1348 across 4 studies) mixed-methods research project investigated the use of online laboratories in undergraduate science instruction. We sought to establish the extent to which student perceptions of three aspects of computer-mediated practical work impact effective learning. Key findings are summarised below.

authenticity

(elements of practical work that feel real, relevant and reliable)

- perceived **agency** is paramount for students to learn from mistakes
- **photorealism** is not essential; diagrammatic labs are still valued
- practical techniques must not be taught in **isolation**
- real-world **scenarios** deepen lab engagement
- "messy" **real-world data** are highly prized by students

sociability

(provisions for collaborative learning and shared presence)

- solitary labs are considered unnecessarily **isolating**
- absence of **on-call experts** engenders feelings of helplessness
- **live multi-user awareness** increases online lab acceptance
- **screensharing** conveys presence better than webcam chat
- online labs are vital to support **socially-averse** learners

metafunctionality

(features that would not be possible in a traditional lab setting)

- students remain sceptical of the educational value of **AR & VR**
- any use of **time alteration** must be clearly signposted
- virtual labs should offer optional practice with **non-ideal** scenarios
- students want access to **setup & teardown** stages in remote labs

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

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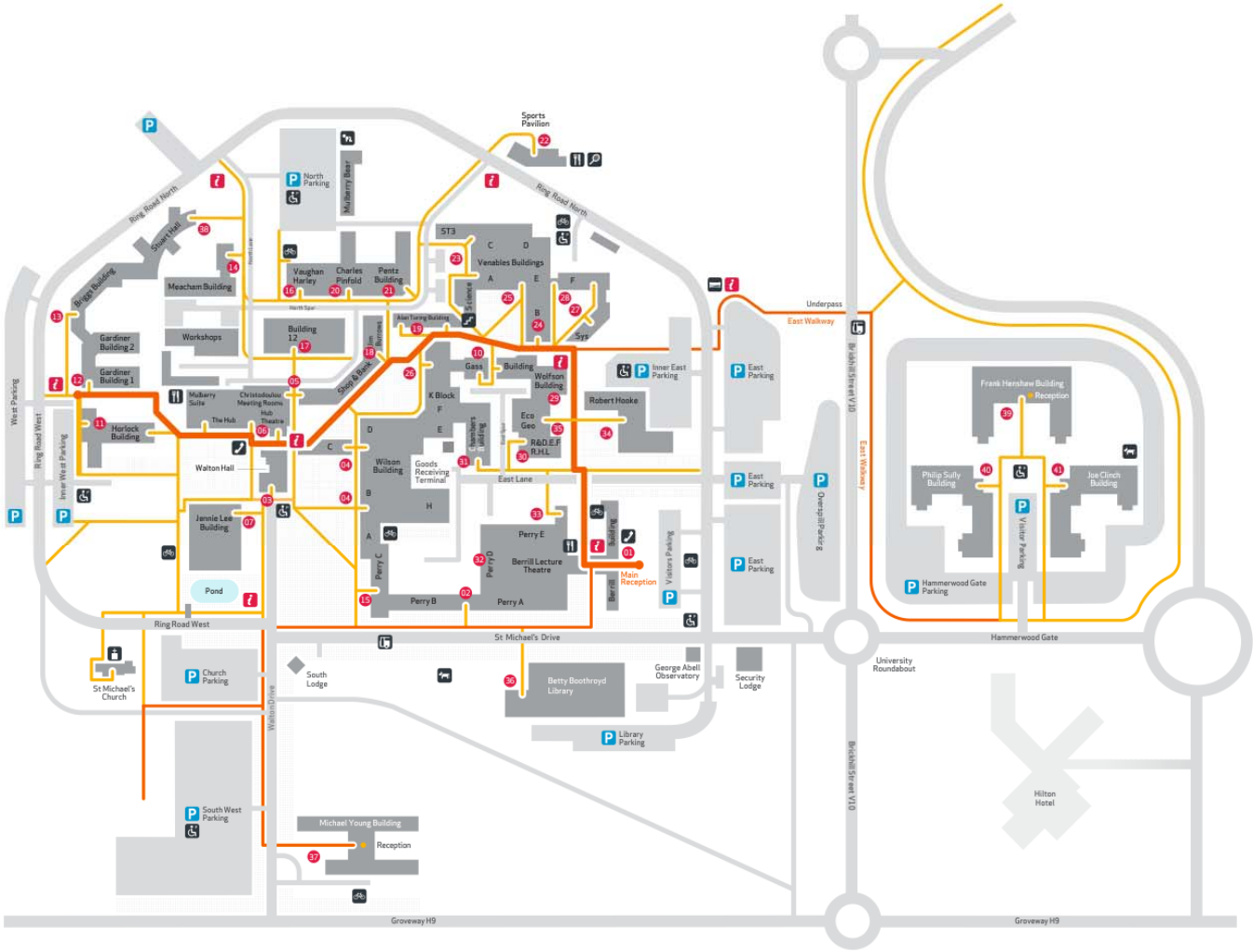
The Open University is incorporated by Royal Charter (RC 000391), an exempt charity in England & Wales and a charity registered in Scotland (SC 038302).

OU CAMPUS MAP

Walton Hall
Campus Map

Key to Building Entrances

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



Key to Symbols

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

Key to Walkways

- Footpath
- Central Walkway