The 12th eSTEeM Annual Conference 2023

Conference Booklet

19-20 April 2023
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THE OU CENTRE FOR
STEM PEDAGOGY

Contents

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Programme – Day 1

Wednesday 19th April 2023

Time	Session	Room
9.15-10.00	Registration and Coffee	Medlar and Juniper
10.00-10.15	Welcome and Introduction Mark Jones and Sue Pawley, eSTEeM Directors	Hub Lecture Theatre
10.15-10.30	Welcome Address Diane Butler, Associate Dean (Academic Excellence)	Hub Lecture Theatre
10.30-11.15	Keynote Presentation Harriet Dunbar-Morris, Dean of Learning and Teaching, University of Portsmouth *Co-Creation Success*	Hub Lecture Theatre
11.15-11.30	Break	Medlar and Juniper

11.30-12.30	Parallel Session A: Workshop/ Demonstration – Access, Participation and Success		CMR 1
	Nicole Lotz and Muriel Sippel	Designing and supporting more inclusive project modules	
11.30-12.30	Parallel Session B: Workshop/Demonstration – Student Support		CMR 11
	Vicki Brown and Cath Brown	"Personal tutor" pilot scheme on a Mathematics Level 1 module	
11.30-12.30	Parallel Session C: Workshop/Demonstration – Innovations in STEM Education		Online Session
	Melanie Gregg and Vivien Cleary	Cultivating student led tutorials - The effects of a flipped online classroom	
12.30-13.30	Lunch		Hub Lecture Theatre
13.45-14.45 Chair: Daphne Chang	Parallel Session D: Short Oral Presentations – Access, Participation and Success		CMR 1

	Sarah Davies, Elaine McPherson, Mary Keys and Debra Croft	Pathways and Intersections: Investigating awarding gaps on cross-faculty modules and degrees
	Christopher Hutton and Fiona Aiken	Evaluation and improvement of print pack use for Environmental Science students
	Petra Wolf and Mary Keys	Improving gender balance through a combined STEM degree
13.45-14.45 Chair: Arosha Bandara	Parallel Session E: Short Oral Presentations – Continuation and Completion & Student Support	CMR 11
	Sue Pawley and Cath Brown	Building a sense of community through social activities on the Maths and Stats Study Site
	Rachel Slater, Elaine McPherson, Anne Campbell and Christine Pearson	Tailored tuition: Associate Lecturer examples of responding to students' needs
	Michael Bowkis, Christine Gardner	Early Start for TM470 project students

	and Alexis Lansbury		
13.45-14.45 Chair: Andrew Norton	Parallel Session F: Short Oral Presentations – Assessment and Feedback		Library Seminar Rooms 1-2
	Gemma Warriner, Becca Whitehead and Fiona Moorman	Can we reduce anxiety of students sitting online exams? Sharing best practice between SPS and LHCS	
	Harriet Kopinska and Jenny Duckworth	Tutor and student experiences of marking grids for assessment on a L3 interdisciplinary module	
	Anton Dil, Sharon Dawes, Lindsey Court, Richard Walker and Matthew Nelson	A demographic analysis of automated assessment feedback use for coding, with an examination of areas where students experience difficulty	
14.45-15.00	Break		Medlar and Juniper
15.00-16.30	Student Engagement in Scholarship Workshop		Hub Lecture Theatre

16.30-17.15	Impact of Scholarship of Teaching and Learning Publication Launch and Networking	Hub Lecture Theatre
17.15	Close of Day One	

Programme – Day 2

Thursday 20th April 2023

Time	Session		Room
9.30-10.00	Registration and Coffee		Medlar and Juniper
10.00-11.00 Chair: Trevor Collins	Parallel Session G: Short Oral Presentations – Access, Participation and Success		CMR 1
	Carlton Wood, Lynda Cook and Anactoria Clarke	Supporting students effectively in an online teaching environment at the beginning of their student journey	
	Sarah Daniell and Lorraine Waters	What holds students back from attending live tutorials and using online forums on S294 and SK299?	
	Fiona Aiken and Paul Collier	Typical Support Seeking Behaviour of STEM Students, their Outcomes and Successes	
10.00-11.00 Chair: Shailey Minocha	Parallel Session H: Short Oral Presentations - Innovations in STEM		CMR 11

	Education and Assessment and Feedback		
	Abi Kirk	Interactive Online Problem-Solving Session	
	Anne Jay, Marcus Badger, Robert Barnes, Brian Richardson and Geoff Austin	High Resolution Virtual 3D Geological Outcrops for Teaching and Learning	
	Martin Braun	What is known about how to write online maths heavy physics exams and how to prepare students for them?	
10.00-11.00 Chair: Sally Jordan	Parallel Session I: Short Oral Presentations – Student Support & Continuation and Completion		CMR 15
	Anne-Katrin Klehe	Forming a sense of belonging to aid retention at a level 2 Physics module	

	Rachel Hilliam, Emma Steele, Carol Calvert and Di Haigney	Statistics anxiety: what is it and how do we measure it?	
	Elouise Huxor and Theodora Philcox	The Postcard project – an intervention to improve student success on level 1 design	
11.00-11.15	Break		
11.15-12.00	Poster Presentations		Hub Lecture Theatre
12.00-13.00	Lunch		Hub Lecture Theatre
13.00-14.20 Chair: Tom Olney	Parallel Session J: Short Oral Presentations – Employability, Post-graduate Student Experience and Student Engagement		CMR 1
	Alan Cayless and Arabella Nock	Learning Logs: Employability skills for remote experiments	

	Janet Haresnape and Ruth Gilbert	Evaluation of a programme of employability-focussed workshops run in summer 2022 for biology students	
	Ann Grand, Victoria Pearson, Iain Greenlees, Snezana Levic and Joanna Shelton	Collaborative leadership in a research group: what does it mean, how is it practised and what are its impacts on postgraduate students?	
	Sarah Davies, Cat Cowie, Philip Holden, Lorraine Hudson and Kadmiel Maseyk	Embedding research into teaching: practices, motivations and impacts	
13.00-14.00	Parallel Session K: Workshop/Demonstration – Access, Participation and Success		CMR 11
	Karen Kear, Helen Donelan, Jon Rosewell	Online tutorials: addressing the challenges of active student participation	
13.00-14.00	Parallel Session L: Workshop/Demonstration – Inclusivity		CMR 15

	Silvia Varognolo, Alice Moncaster, Hedieh Jazaeri, Fiona Gleed and Jo Smedley	Rehearsing with the Mechanicals: convenience and conventions in distance learning group work	
14.20-14.30	Break		Medlar and Juniper
14.30-15.00	eSTEeM Scholarship Projects of the Year and Best Poster Presentation Awards followed by Closing Remarks		Hub Lecture Theatre
15.00	Conference Close		

Welcome and Introduction

Mark Jones and Sue Pawley, eSTEeM Directors

Welcome to the 12th Annual eSTEeM Conference titled Enabling student success – expanding engagement in scholarship. The conference will be run in a hybrid mode that facilitates both in-person and remote participation. This will be our first face-to-face gathering since 2019 and our first properly hybrid event. We hope that this format will provide a good balance that allows all who wish to participate to gain as much as possible from the conference.

The theme of the conference is increasing student engagement with our scholarship of teaching and learning. Since improving student success is the aim of our scholarly activities, we should always be seeking to maximise opportunities for student input, not only to ensure that student experience informs our scholarship work but also to make scholarship a joint enterprise with students. To this end we have two events that focus on student engagement, our opening keynote presentation, and a student engagement workshop. Our keynote speaker is Harriet Dunbar-Morris, Dean of Learning and Teaching at the University of Portsmouth, who will describe the work she has led to develop the student experience through partnership with students. The student engagement workshop, which will be held on the afternoon of Day 1, will consider ways to

increase student response rates to surveys and other research tools as well as developing student involvement as partners in scholarship projects.

Another special event will be the launch of a report on the impact of eSTEeM's Scholarship of Teaching and Learning. We hope you will join the report's authors, Shailey Minocha and Trevor Collins, to celebrate the launch of their publication and network with colleagues as Day 1 draws to a close.

This year's programme also includes twenty-two short oral presentations and five workshops, grouped in three parallel strands across two days. Organised thematically, the sessions will focus on: Access, Participation and Success; Assessment and Feedback; Continuity and Completion; Employability; Inclusivity; Innovations in STEM Education; Postgraduate Student Experience; Student Engagement; and Student Support. We also have a collection of ten posters which will be available online as well as being on display. We will award a best poster prize, so please make sure you get a chance to review them and vote for your preferred poster. And as is now usual, we will close the conference with the awarding of Project of the Year prizes.

We hope that over these two days you will have ample opportunity to find out about recent and on-going projects, engage in conversations about scholarship of teaching and learning and be inspired to try new things that will contribute to student success. We hope you enjoy the conference.

Keynote Speaker Biography

Dr Harriet Dunbar-Morris PFHEA, NTF

Dean of Learning and Teaching, Reader in Higher Education, University of Portsmouth

As Dean of Learning and Teaching at the University of Portsmouth, Harriet is responsible for providing leadership in the enhancement and evaluation of the student experience. She champions the student voice, and facilitates partnership working, ensuring student engagement is central to the University's activities. She led the revision of the Curriculum Framework including embedding the Hallmarks of the Portsmouth Graduate within the curriculum. Other projects have included Personal Tutoring and Content Capture which she undertook in partnership with students.

Harriet undertook research in Higher Education at the University of Oxford. Post-Oxford, Harriet held positions at UCAS, the 1994 Group, and the universities of Bath and Bradford.

See www.harrietdm.com for more detail. Harriet tweets as @HE_Harriet.

Conference Information

Registration

For delegates attending the conference in person, please make your way towards the Hub Lecture Theatre for registration which will take place between 9.15-10.00 on Wednesday 19th April and between 9.30-10.00 on Thursday 20th April. Please visit the Estates website for a map of the campus.

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

For delegates joining the conference remotely via Microsoft Teams, please visit the eSTEeM & Co website at the following link – https://bit.ly/esteem-and-co. It may be useful to bookmark this page as this is the link you will need throughout the conference. If you become disconnected from a MS Teams call at any time, make your way back to the eSTEeM & Co website to find all the links you need. Please click on the conference programme for the relevant day and select the link for the required session.

If you do not already have the Teams app installed on your computer, upon clicking the link you will be asked whether you wish to 'Download the Windows app' or 'Join on the web instead', we would recommend that you install and use the app version which will allow you access to all of the features within Teams.

It is advisable to sign-in to MS Teams using your OU credentials – OUCU@open.ac.uk followed by your network password, otherwise you will

appear as a 'Guest' and may experience issues accessing some of the features or viewing the content.

Luggage storage

If required, we will have a secure room available for you to store light luggage until the end of the day on Wednesday 19th April and Thursday 20th April. Please ask at registration for more details.

Conference refreshments

Conference registration for delegates attending in person includes tea and coffee on arrival, morning and afternoon breaks, refreshments during the Impact of Scholarship of Teaching and Learning Publication Launch at 16.30-17.15 on day one and a buffet lunch on both days.

Conference sessions and recordings

As the conference will be hybrid, all sessions will be available for online participation and will be recorded. Recordings will be made available as replays soon after the conference via the eSTEeM Scholarship Community Channel (MS Stream).

Members of the eSTEeM conference team may capture photos and screen shots of the sessions, which 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 networking

For delegates attending in person, we respectfully ask that you use any personal electronic equipment with respect for session presenters and fellow delegates. We suggest using mobile phones and electronic equipment in silent mode.

For delegates participating online, please ensure that you mute your microphone and switch off your camera during the sessions if you are not presenting and when you are not speaking. You may also wish to set any mobile phones/devices to silent. Do not forget to set your status to 'Do Not Disturb' in Skype for Business, especially if you are presenting.

Wi-Fi

Whilst on campus you can connect to the internet via eduroam using your OU credentials. Alternatively, you can use The Cloud for which you will need to create an account if you do not already have one.

Social Media

You can also get involved with the discussions throughout the conference via Twitter @OU_eSTEeM using #eSTEeMConf23

Poster Presentations

A poster presentation session will take place for delegates attending in person on day two, Thursday 20th April between 11.15-12.00 in the Hub Lecture Theatre. You are welcome to continue browsing posters over lunch between 12.00-13.00 and during day one as posters will be displayed throughout the conference.

Delegates attending remotely on day two will be invited to watch the pre-recorded interactive poster presentation. Recordings will be available shortly prior to the conference.

All delegates will be invited to vote for the best poster presentation. The winning presentation will be announced at the end of the conference on Thursday 20th April, 14.30-15.00

eSTEeM Scholarship Projects of the Year Awards

We will be announcing the 6th eSTEeM Scholarship Project of the Year Awards which celebrate excellence in eSTEeM projects. The winners will be announced at the end of the conference between 14.30-15.00 on Thursday 20th April.

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 and the eSTEeM & Co website.

Helpdesk

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

For delegates attending online, eSTEeM conference staff will be available in the Medlar and Juniper online room to help you with any queries you may have. You are welcome to use this space to informally network with other conference delegates who are attending the conference online.

Security

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.

Parking and transport

If arriving by car, please ensure that you park in a designated parking space. Any vehicle clearly parked in an unauthorised location will be issued with a parking charge notice by campus security.

Accessibility

There is level access in most areas of the campus, 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 smoking points/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 or email esteem@open.ac.uk.

Book of Abstracts

Keynote Presentation

Co-Creation Success

Harriet Dunbar-Morris, University of Portsmouth

Approaches for staff-student co-creation will be presented. Attendees will be introduced to approaches that have been employed successfully at the University of Portsmouth and elsewhere to develop the student experience in partnership with students.

Firstly, during the keynote I will highlight relevant findings and practices from a QAA-funded collaborative enhancement project (Dunbar-Morris et al, 2021 and Dunbar-Morris et al, under review), which was focused on how student perceptions differed by ethnicity. To understand differing student perceptions of the quality of learning and teaching in the context of the Covid-19 pandemic, the universities of Portsmouth, Nottingham, Manchester Metropolitan, and Solent carried out a survey and conducted focus groups with students on a comparable set of courses across the four institutions. Recommendations included co-creating with students, taking account of student preferences, and providing scaffolding for independent distance learning.

In addition, I will present for example, the Charrette approach to curriculum design (Dunbar-Morris, forthcoming). This draws upon student experience data and promotes a research-based, evidence and data-informed approach to

curriculum design/redesign by undertaking a staff-student workshop to tackle key issues together, such as the awarding gap.

Parallel Session A

Designing and supporting more inclusive project modules

Nicole Lotz and Muriel Sippel, STEM Faculty

Research suggests that assessment is a key threat to student wellbeing: "high-stakes assessment practices particularly threatened wellbeing by heightening consciousness and anxiety of failure" (Jones et al., 2021, p. 441). Kendall (2016) highlights that a disabled student may face additional barriers around assessment. More and more OU modules integrate project work in their assessments. Project-based assignments are more complex and less structured which causes uncertainty and anxiety amongst learners. This creates barriers to wellbeing and success (Lister, 2022). Disabled students, those with mental health issues or neurodiverse learners are impacted most, and while other students may be more resilient or resourceful, parttime distance students generally struggle more with project work.

Our eSTEeM funded study aimed to gain a deeper understanding of the specific issues experienced by Design students with mental health disabilities throughout their study. Design modules use project-based assessment throughout levels of study. Our goal was to derive at recommendations that could inform the learning design of modules in production and the development of positive interventions during presentation of modules to reduce the awarding gap and facilitate progression.

The study gathered data of experiences across all levels of study from students with a declared mental health disability. This led to a rich qualitative data

analysis that revealed 'tensions' - conflicts between student experiences and the requirements of the design and delivery of learning (Jones et al., 2021). Tensions can either create or increase barriers, or they can be resolved and enable learning through module design and learner support. For example, a tension in project assessment may be around the ambiguity in project assignments to entice creative/innovative responses and the clarity of instruction and student feedback. The study decided to focus on how barriers in project modules are resolved and enable student wellbeing.

The workshop will invite participants to review and discuss in small groups the tensions identified in our study, and how these were resolved to enable student wellbeing, or not. This discussion will lead to a brainstorming session on how participants would resolve tensions either in the production of new modules or during the presentation of project modules.

Our intended audience are central and regional academics, ALs and support staff who want to develop a more inclusive practice when designing or supporting modules with project assessment.

References:

Kendall, L. (2016) Higher education and disability: Exploring student experiences, Cogent Education, 3:1. doi.org/10.1080/2331186X.2016.1256142

Jones, E., Priestley, M., Brewster, L. and Spanner, L. (2021) Student wellbeing and assessment in higher education: the balancing act, Assessment & Evaluation in Higher Education, 0(0), pp.438–450. doi:10.1080/02602938.2020.1782344

Lister, K. (2022). Mental Wellbeing in Distance Learning: Barriers, Enablers and Solutions. EdD thesis, The Open University. doi:10.21954/ou.ro.0001404d

Parallel Session B

”Personal tutor” pilot scheme on a Mathematics Level 1 module

Vicki Brown and Cath Brown, STEM Faculty

In this workshop we will be discussing a pilot project that involves introducing personal tutors onto MST124 23B. This pilot project involves some MST124 tutors also acting as personal tutors for students who need some extra support during the module.

Personal tutors are present in some form in many higher education institutions (Lochtie et al, 2018), and a good personal tutor relationship has shown positive impacts on students (Yale, 2017). We intend that the introduction of personal tutors to MST124 will have a positive impact on student experience and engagement.

Nine experienced tutors have volunteered to be part of this trial and will be supported by a dedicated forum and regular drop-in sessions. They will also be recording overview data of their personal tutor interactions and reviewing the pilot at the end of the presentation. We will also survey students involved to receive feedback and evaluations of the scheme from a student perspective.

Any students joining the scheme are allocated a personal tutor from outside their cluster. The personal tutors are able provide additional support to students on more general study topics, such as study skills and time management, as well as signpost students to additional resources as needed. They can also provide an ongoing source of support for students who need extra support to that provided by their tutor.

Students can self-refer to a personal tutor, or be referred by their tutor (with student consent). The scheme will be publicised to students and tutors, with reminders being sent a critical point in the module (prior to TMA01 and after each TMA). This is intended to target support to students at times when student engagement can otherwise decrease.

The key goal of this project is to improve student experience and engagement on MST214 23B and increase students' confidence both with their mathematical skills and abilities and more generally with their studies.

This workshop will introduce the pilot scheme and the tutor feedback so far. We invite discussion and feedback on this initiative so that we can continue to develop it through the course of the B presentation.

References:

Lochtie, D., McIntosh, E., Stork, A. and Walker, B., 2018. Effective personal tutoring in higher education. Critical Publishing.

Yale, A.T., 2019. The personal tutor–student relationship: student expectations and experiences of personal tutoring in higher education. Journal of Further and Higher Education, 43(4), pp.533-544.

Parallel Session C

Cultivating student led tutorials - The effects of a flipped online classroom

Melanie Gregg and Vivien Cleary, STEM Faculty

The concept of active learning within a peer group is backed by many studies (Stigmar, 2016), but it is the quality and relevance of the learning tasks that drive the outcome (Ramsden, 2003). Therefore, our attention focused on creating a comfortable tutor free place within a tutorial that would allow student interaction to solve a pre-determined problem; to introduce an element of fun and create a relaxed space to encourage greater student engagement (Reeve et al, 2020).

Activities were designed to practise skills acquired on the course and investigate the benefits of applying this in a peer group, where students were able to bounce ideas off each other. A short tutor led plenary session followed the activity to discuss student ideas and solutions. An online survey was piloted and distributed to students after each tutorial to determine engagement and learning. One-to-one structured interviews were carried out with a small sample of students at the end of the project. A final questionnaire was sent to all students in the tutor groups to establish motivations for attending tutorials.

The majority of students reported that the peer led tasks boosted their confidence and engagement and the tutor free space was deemed less intimidating for student interaction. The pre tutorial activities were recounted as

fun and laid a foundation for positive social interaction in the skill orientated tasks. This allowed the development of a good rapport with both tutor and fellow students. 86% of students surveyed felt specific breakout room tasks enhanced their learning and developed essential skills which increased their performance in the assignments.

This workshop will include an initial ice break activity as participants enter the room. The presenters will describe the background and theory, methods; results and impacts of the study. The session will also include examples of the skill based and fun activities in break out rooms.

The intended learning outcomes at the end of the session are:

Participants will be able to:

1. Understand from this small-scale study, ways of developing a friendly online tutorial where students are confident and comfortable to answer questions/solve problems in a non-threatening environment.
2. Apply any of the skill based or fun based ideas in their own practice.
3. Create other fun based and skills-based activities, based on their own area of expertise.

References:

Stigmar, M., (2016). Peer-to-peer Teaching in Higher Education: A Critical Literature Review, Mentoring & Tutoring: Partnership in Learning, 24:2, 124-136, 1178963. http://dx.doi.org/10.1080/13611267.2016.1178963 (Accessed 2/03/2022).

Ramsden, P., (2003). Learning to teach in higher education. London: Routledge Falmer (2nd edition).

Reeve, J., Cheon, S. H., & Jang, H., (2020). How and why students make academic progress: Reconceptualizing the student engagement construct to increase its explanatory power. Contemporary Educational Psychology, 62(July), 101899. https://doi.org/10.1016/j.cedpsych.2020.101899 (Accessed 2/3/22).

Parallel Session D

Pathways and Intersections: Investigating awarding gaps on cross-faculty modules and degrees

Sarah Davies[1], Elaine McPherson[1], Mary Keys[2], Debra Croft[1] and Russ Rimmer[1], STEM Faculty[1], PVC-S[2]

Despite our environment modules being designed to be studied by students on multiple degree programmes (Environmental Studies, Environmental Science, the Open degree, etc.), awarding gaps are evident for students taking these modules on different degree pathways.

These kinds of 'pathway' gaps are often thought to be the result of students lacking particular skills or knowledge that is needed for success in these modules, especially if they have come through a pathway that means they have not taken relevant supporting modules. However, other elements such as student learning strategy (Vermunt & Donche, 2017) and sense of belonging (Macmillan & Chavis, 1986), including community and help-seeking behaviours (Goodenow, 1993), may be relevant.

There were also concerns that this might be particularly evident for certain groups of students, from low socio-economic status backgrounds, students with disabilities (particularly mental health issues) as well as for those on certain degree pathways, such as the Open Degree.

This project explored the awarding gaps in three ways:

- through interrogation of module data over several cohorts (18J, 19J, 20J on DST206, S206/SXF206, SDT306) – to determine where there are consistent awarding gaps, whether particular degree pathways or groups of students are affected and whether pinch-points in modules could be identified that are problematic for these students;
- through focussed discussion with staff from module and qualification teams, to determine their experiences with students from different degrees on their modules and whether there are particular disparities or difficulties; and
- through exploring student experiences (through a survey and interviews) – whether they felt well prepared for that module, where they struggled on the module and what could have made them more prepared for study or helped them during their studies.

The project yielded information on student learning motivations, conceptions of learning, processing strategies and highlighted eco-anxiety as a substantial phenomenon in students studying OU environment modules (which a follow-on project is seeking to explore and address.) It also suggested a potential mismatch of perspectives between students and staff on preparedness (in

terms of study skills) for modules and the need for longitudinal information and further study to explore this.

Understanding of issues faced by students who design their own learning pathways should have wider relevance across the external HE sector where there is increasing interest in personal learning journeys, microcredentials and portability of learning.

References:

Vermunt, J. D. & Donche, V. (2017). A learning patterns perspective on student learning in higher education: State of the art and moving forward. Educational Psychology Review, 29, 269-299. https://doi.org/10.1007/s10648-017-9414-6

Macmillan, D. W., & Chavis, D. M. (1986). Sense of community: A definition and theory. Journal of Community Psychology, 14, 6–23.

Goodenow, C. (1993). The psychological sense of school membership among adolescents: Scale development and educational correlates. Psychology in the Schools, 30, 70-90.

Evaluation and improvement of print pack use for Environmental Science students

Christopher Hutton and Fiona Aiken, STEM Faculty

Distance learning in Earth and Environmental Science modules is delivered entirely online via module websites in Moodle. Students in Secure Environments (SiSE) and those with some additional requirements due to a disability are

frequently unable to study online. The reasons students experience challenges studying online vary from access to the internet (e.g., in a prison) to a disability which makes working on screen or at a computer difficult.

There is a legal requirement (Equality Act, 2010) to provide students who have declared disabilities with reasonable adjustments which address their learning needs. An Advance HE report on making reasonable adjustments in Higher Education (Falsinger & Bryford, 2010) includes 'resources available' as a reasonable adjustment that needs to be addressed. One way that OU does this is through producing print packs of materials for students who can't access on-screen resources as a result of their disability. The use, utility and efficacy of print packs as a way of providing reasonable adjustments to some of our disabled students on environment modules, and more broadly in STEM, has not been formally evaluated. Anecdotal evidence suggests utility and efficacy are variable.

This project sampled students who use print packs on a range of modules in the School of Environment, Earth and Ecosystem Sciences. The first phase surveyed students on how they used the resource, the problems and benefits associated with the print packs, and identified ways to improve the utility and efficacy of print packs for students. Educational Advisors in the Student Support Team and tutors who work regularly with students using print packs also took part in focus groups. Based on the results of the first phase, we trained two Associate Lecturer (AL) champions on our two largest modules (S112 Science: concepts and practice, and S(XF)206 Environmental Science) to provide guidance and support on the use of print packs to students and ALs. Our intention is to

evaluate the efficacy of this intervention at the end of this academic year. In this presentation, we will share our initial evaluation findings and interim progress with our print pack champions.

References:

Equality Act (2010) Equality Act 2010. The Stationery Office, London. www.legislation.gov.uk/ukpga/2010/15/contents

Felsinger A., & Byford K., (2010) Making reasonable adjustments in Higher Education, Advance HE report, [online] Available at file:///C:/Users/fja2/Work%20Folders/Documents/ESTEEM/Print%20pack%20project/managing-reasonable-adjustments-in-higher-education_1578587125.pdf (Accessed 04/01/2023)

Improving gender balance through a combined STEM degree

Petra Wolf[1] and Mary Keys[2], STEM Faculty[1], PVC-S[2]

UK universities (including the OU) have consistently reported gender imbalances in some STEM subjects despite best efforts to improve recruitment of women. The 'BSc (Hons) Combined STEM' degree (R28) was launched in 2017 to allow students who wanted to retrain in STEM access to funding and a flexible degree structure. The proportion of women registering on the Combined STEM degree has been higher than expected in those disciplines where the proportion of women is typically lowest (for example, key introductory Level 1 modules in engineering and computing).

The Combined STEM degree offers a structure where students must choose at least half their credits from STEM modules at Stages 1 and 2 and 120 credits of STEM in stage 3. Within the 'STEM' credits can be included modules from science, engineering, design, computing, environment, maths, psychology and sports science. Recommended routes are provided for guidance on the Combined STEM degree website but students are free to choose their own path. This study aimed to gain a better understanding of why the proportion of women is higher on the Combined STEM degree than other STEM degrees within specific STEM disciplines.

A survey was carried out amongst students on both the Combined STEM (R28) and single honours degrees who had recently started the STEM Access module (Y033) or one of the Stage 1 key introductory STEM modules. The survey explored students' motivations and how they made those choices when designing their degrees. 383 students responded to the survey including 67% female. Semi-structured interviews followed with 9 women enrolled on different qualifications, to explore more deeply their survey responses and motivations around qualification choice.

The project team undertook a thematic analysis of the survey responses, focussing on student motivations for degree choice which included career/employer motivation, influence of others (family/friends/other students), desire for choice, interest in the subject(s), lack of confidence and self-identity. Some of these themes were revisited in the interviews. Two things that were mentioned as being of particular value in the Combined STEM degree were the ability to combine more than one STEM subject, for personal interest or career

reasons, and the ability to change subject/emphasis within STEM without changing qualification should they encounter difficulties or if their interests/career goals change. However, interviewees also noted difficulty in articulating the concept of a 'Combined STEM' degree to others beyond the OU.

Findings from this eSTEeM supported project suggest that perceived 'flexibility' and choice are particularly valued by women when choosing STEM degrees. Placing more emphasis on these aspects during STEM qualification design and in qualification descriptors may be important to encourage engagement of women in STEM subjects where they are traditionally underrepresented.

Parallel Session E

Building a sense of community through social activities on the Maths and Stats Study Site

Sue Pawley and Cath Brown, STEM Faculty

In a continuation to our 2021 project on building a sense of community amongst students on a module, we have extended the scholarship to look at the larger community of students within a school. This has included the creation of a community website located on the school study site.

One of the advantages of hosting community events on the study site is that it nurtures vertical connections amongst students, enabling informal mentoring relationships to develop. This builds on a number of initiatives elsewhere in the OU, including the student buddy system [Robson 2019] and general interest events run by the Open Programme in 2020 [Cooke 2020].

A strong sense of community amongst learners has been shown to contribute to development of resilience [Barber et al 2019], attainment [Cançado et al 2018] and retention [Foster et al 2012]. However, from NSS data (2022), only 46.7% of OU Maths & Stats students feel part of a staff and student community, but social media indicates there are significant numbers of students that actively seek connections with their peers.

Our approach is to run social activities, such as quizzes, games and talks. These entail students interacting synchronously in small groups, in a non-threatening

way, with enjoyable activities to carry out. Thus, removing the potential for awkwardness for less outgoing students.

During the summer of 2022 we monitored the effectiveness of our initial project using student questionnaires and during this presentation we will give details on our findings including an analysis of demographic and academic data on participants. Further exploration of student perceptions has been investigated during 2023 using student focus groups.

References:

Barber, W., van Oostveen, R. and Childs, E (2019), Situating Resilience, Grit and Growth Mindset as Constructs of Social Presence in the Fully Online Learning Community Model , ECEL 2019 18th European Conference on e-Learning. Available online:- https://books.google.co.uk/books?hl=en&lr=&id=ZMjBDwAAQBAJ&oi=fnd&pg=PA65&dq=community+growth+mindset&ots=NNKXoZWbGR&sig=BJrOjmHbI-9nJ5FxhOHrGa0hHtQ&redir_esc=y%22%20\l%20%22v=onepage&q&f=false#v=onepage&q=community%20growth%20mindset&f=false

Cançado, L., Reisel, J. and Walker, C (2018), Impact of first-year mathematics study groups on the retention and graduation of engineering students, International journal of mathematical education in science and technology 49. Available online:- https://www-tandfonline-com.libezproxy.open.ac.uk/doi/pdf/10.1080/0020739X.2017.1423120

Cooke, H (2020) What's next? The series finale, Blog: Celebrating "Open" curriculum at the Open University. Available online:- http://www.open.ac.uk/blogs/openquals/?p=599#more-599

Foster, E., Lawther, S., Keenan, C., Bates, N., Colley, B. & Lefever R. (2012) The HERE Project Toolkit: Higher Education: Retention & Engagement. London: Paul Hamlyn Foundation. Available online:- http://www.improvingthestudentexperience.com/library/UG_documents/Toolkit_-_HERE_Project.pdf

Robson,J (2019) Online Peer-Mentoring Scheme at scale in the STEM Faculty; Preliminary Evaluation and a Resource Pack. Student Buddy Evaluation and Resource_Pack.docx (sharepoint.com)

Tailored tuition: Associate Lecturer examples of responding to students' needs

Rachel Slater[1], Elaine McPherson[1], Anne Campbell[2] and Christine Pearson[1], STEM Faculty[1], Academic Services[2]

There is an ongoing transition in the way the OU tries to make its curriculum inclusive, away from retrofitting responsive post-production adjustments to fix issues, towards designing for inclusion and embedding anticipatory adjustments as part of the production process. This transition reflects the social model of disability approach and one of the key tools for its implementation, Universal Design for Learning (UDL), which aims to remove barriers to learning for *all* students (Rose and Meyer, 2002; Lowenthal, 2020).

A key factor in progressing inclusion is improving accessibility for disabled students. In the literature on accessibility in distance education (DE), there has been a focus on technical and design tools, collaborative work between developers and educators, and the value of blended technological and pedagogical approaches (Cooper, 2006; Seale and Cooper, 2010). What has received less attention in promoting accessibility in DE is the role of lecturer/Associate Lecturers (AL) in tailoring their tuition for individual students. However well designed and inclusive curriculum is, it can never respond perfectly to the needs of every possible student, so there will often be a need for ALs to tailor their provision to address individual students' needs.

In an OU survey measuring accessibility practices and perceptions*, 85% of ALs (n=292) said they have adapted their tuition practice to respond to a disabled student's need (Slater et al, 2021). The need to tailor tuition practice will be broader than that for declared disability too, it might be in response to an unknown/undiagnosed disability (e.g. invisible disability such as dyslexia or dyscalculia), temporary periods of ill health or disruption, or a plethora of life events (Lowenthal et al, 2020).

This presentation will discuss findings from a scholarship project on Accessibility and Inclusion in Tuition which explores the practices that STEM ALs employ to tailor their tuition to respond to the needs of individual students as they encounter them, focusing on the tutor perspective. Practices identified as common across ALs through a questionnaire survey (n=100), such as providing material in advance of sessions, accessible amendments of teaching materials and specific adjustments during live sessions, have been presented elsewhere

(Slater et al, 2020; Slater et al, 2021). This session will focus on findings from individual interviews (n=22) on more tailored, and often more complex approaches, such as collaborative working with disability services and/or student's advocate, as well as one-to-one adjustments, such as how to 'walk throughs', creating short video clips/screencasts to develop understanding and often to support anxiety, and adjusting style of feedback. It will also highlight some of the challenges faced by ALs in responding to students' needs. In interviews, ALs emphasised the importance of a study support approach, of not making assumptions based on a student's declared disability but rather developing dialogue to explore student's needs using informal conversations to build trust and confidence.

* The OU MAPP survey included two questions on adapting tuition provision for this eSTEeM AccIT project.

References:

Cooper, M. (2006). Making online learning accessible to disabled students: An institutional case study. *Research in Learning Technology*, 14(1), 103–115.

Lowenthal, P.R., Humphrey, M., Conley, Q., Dunlap, J.C., Greear, K., Lowenthal, A. and Giacumo, L. (2020) Creating Accessible and Inclusive Online Learning: Moving Beyond Compliance and Broadening the Discussion. *Quarterly Review of Distance Education*, 12 (2), p1-21.

Rose, D.H. and Meyer, A. (2002) *Teaching Every Student in the Digital Age: Universal Design for Learning*. Alexandria (US): Association for Supervision and Curriculum Development.

Seale, J. and Cooper, M. (2010) E-learning and accessibility: An exploration of the potential role of generic pedagogical tools. *Computers & Education*, 54 (4), p1107-1116.

Slater, R., McPherson, E., Campbell, A. and Murphy, P. (2020) Accessibility and Inclusion in Tuition: Examples of Individualised Support. *The 9th eSTEeM Annual Conference: Informing Student Success, from Scholarship to Practice* (Online) The 9th eSTEeM Annual Conference Booklet 2020 | eSTEeM (open.ac.uk)

Slater, R., Campbell, A., McPherson, E. and Pearson, C. (2001) Practitioner examples of improving accessibility in online tuition. *Horizons in STEM Higher Education Conference 2021: Making Connections, Innovating and Sharing Pedagogy* (Online) horizons-in-stem-he-conference-proceedings-2021-final-1.pdf (wordpress.com)

Early Start for TM470 project students

Michael Bowkis, Christine Gardner and Alexis Lansbury, STEM Faculty

Students on IT/computing named degrees must complete a compulsory project at the end of their studies (TM470). Some students face challenges completing the project due to difficulty with independent work and little direct teaching content. Studies have shown that additional tutor support and feedback can help improve student retention (Sharp, Wray and Maxwell, 2020) and such support is particularly important for student retention in distance learning (Arhin and Ekow Laryea, 2020). The prompt for this study was students' poor performance on TM470 if restarting the module, to potentially improve retention among this cohort and thereby improve the overall completion/ pass rate. A

specific issue identified was that students often have concerns regarding returning to study after a break (Robson, 2020).

This is particularly relevant for TM470, as it is a different kind of module to many at undergraduate level, with more emphasis on self-directed study. However, self-directed study is different to unsupported study. By providing direct tutor support before module start it is hoped that students feel more confident about successfully completing their project and, ultimately, their degree. A concern was that students might not have time to commit to the early start project. Therefore, each potential student was contacted to ensure that they could commit spending time on refining ideas before module start. A further project aim was to explore whether the students successfully engage in TM470 project preparation work, and whether they felt that the time was well spent.

A small TM470 20B early start pilot was conducted examining viability of the intervention approach and to determine opportunities for scalability. Candidates were identified using an inclusive selection mechanism that considered: multiple prior registrations, breaks in study, not studying another module, and only requiring TM470 to complete their degree. Each candidate was deemed capable of passing TM470. From November through to module start, students explored project ideas with a chance to reflect on feedback. The pilot provided opportunity to accelerate into TM470 at module start and to continue with the same tutor through to completion.

The main eSTEeM research project commenced in 2021 with initial analysis of students' performance, comparing pass rates for those on early start and those who were not. Feedback was gathered from tutors who engaged in the early

start program, regarding their support for students facing difficulties through a project's early phases. The research was extended in 2022 and 2023 to gather student feedback, via interviews, providing greater insight into the effectiveness of the early start activities. Further comparisons were made of pass rates for those on the programme with those who were identified as potential candidates but either declined the opportunity or could not be offered due to place constraints. Pass rate comparisons have also been made with the main cohort of students. By evaluating a specific Level 3 module in the School of Computing and Communications it is hoped that this will inform module teams in helping students achieve their degree.

References:

Sharp, E., Wray, R.J. and Maxwell, R. (2020). *Improving student retention through enhanced academic and pastoral support: A Case Study*. Available online at: http://journals.staffs.ac.uk/index.php/ipihe/article/view/196 (Accessed 30 January 2022)

Arhin, V. and Laryea, J.E. (2020) *Tutoring support as a predictor of student retention in distance learning: The case of a University in Ghana.* Available online at: https://search.informit.org/doi/pdf/10.3316/informit.620291631811930 (Accessed 30 January 2022)

Robson, L. (2020). *Part-Time Distance Learners' Experiences Of Study Breaks*. In: INTED2020 Proceedings, article no. 393. Available online at: Part-Time Distance Learners' Experiences Of Study Breaks - Open Research Online (Accessed 3 March 2022)

Parallel Session F

Can we reduce anxiety of students sitting online exams?

Sharing best practice between SPS and LHCS

Gemma Warriner, Becca Whitehead and Fiona Moorman, STEM Faculty

This presentation will outline findings to date from our eSTEeM project and will consider issues currently under investigation. Our project was initiated in response to anxiety expressed by some SPS and LHCS students when sitting their 20J remote exams.

Exam preparation sessions were delivered in each school in March and May 2022 involving colleagues from the Student Support Team (SST), Assessment, Credit and Qualifications (ACQ) and the Computing Helpdesk, providing a collaborative community of practice to respond to student queries. In total there were 187 students at the May sessions and 370 views of the recordings. Following the 21J exam period, a survey was disseminated to approximately 2,500 students who sat a remote exam to gather feedback about the usefulness of the preparation sessions and their overall exam experience. We had 349 survey responses and will highlight key elements of student feedback in our presentation. Quite marked in the survey feedback was students' accounts of running out of time. We will explore potential causes for this lack of time and will describe what we have done so far to put more support in place.

We are currently setting up focus groups and interviews to explore the issue of timing, for example what students may understand by "open book exams", and the effects that differing technical equipment can have on exam experience. We hope to continue to monitor the extra support measures put in place by the two schools, and to identify if anything further could be done.

Tutor and student experiences of marking grids for assessment on a L3 interdisciplinary module

Harriet Kopinska and Jenny Duckworth, STEM Faculty

As qualitative learning outcomes (LO) can be subjective, criteria for assessing them require clarity to facilitate consistent application by markers and appropriate interpretation by students. Whilst the provision of feedback (e.g., Hattie and Clarke, 2018) and grading of assessment (e.g., Bloxham et. al., 2016) are relatively well studied, there have been few comparative studies on tutor experience of applying learning outcome assessment criteria to written assignments and student experience of interpreting them.

Here we focus on the L3 interdisciplinary module SDT306 'Environment: responding to change', which uses criterion-based marking according to LOs. Tutors provide feedback through marking grids containing a detailed breakdown of the criteria relevant for each LO. The grids are designed to facilitate application of LO grading scales and enable parity between tutor mark allocations, whilst giving constructive feedback to students around LOs. However, tutors have reported challenges in applying the criteria consistently, whilst student perception of the grids is unknown, hence our research question: "How do students and tutors use the marking grids on this module and what is their experience of this approach?"

We used a mixed methods approach to collect quantitative and qualitative data on how tutors use the marking grids to apply criteria and award marks, and how students interpret the grids and apply them to their learning. Online surveys involving Likert scale and free text questions were completed by tutors and students from the current module. These were followed up by more detailed interviews with a subset of students and tutors. We used summary statistics to interrogate the quantitative results, and thematic analysis to identify the main themes emerging from the interviews.

The student response was generally positive, with a strong theme that marking grids added clarity. However, they stressed the need for script comments as well as grids, as script comments provide specific feedback on particular issues, whilst the grids provide an overview of student performance. Tutors' main concerns with the grids were around the extra time needed when using a marking grid approach, and the difficulty in applying some of the criteria within the grid.

We have taken the opportunity to engage with module leaders, and to contribute to the assessment cycle by prescribing recommendations around marking grid practice for both tutors and students, with short term 'quick fixes' as well as in-depth modifications to consider over the longer term.

In this presentation we will report on the findings and discuss their implications with respect to the module, the pedagogical value and the applicability of this approach to modules using criterion-based marking in STEM disciplines. Delegates, especially those designing assessment approaches, will find the session relevant as many OU modules measure student success against LOs.

References:

Bloxham, S., den-Outer, B., Hudson, J. and Price, M. (2016) 'Let's stop the pretence of consistent marking: exploring the multiple limitations of assessment criteria', Assessment & Evaluation in Higher Education, 41(3), pp. 466-481. doi: 10.1080/02602938.2015.1024607

Hattie, J. & Clarke, S. (2018) 'Visible Learning: Feedback' London, Routledge.

A demographic analysis of automated assessment feedback use for coding, with an examination of areas where students experience difficulty

Anton Dil, Sharon Dawes, Lindsey Court, Richard Walker and Matthew Nelson,

STEM Faculty

In a face-to-face environment, tutor and peer support is readily available to help students interpret specifications of source code and to help them determine what is required of them. However, students working at a distance often rely on asynchronous forum use and tutor support to interpret specifications set out in English in assignments. In the context of large cohorts, it is especially valuable to be able to automate this kind of support.

M250, Object-oriented Java programming relaunched in 2021J with over 1400 students studying material containing formative coding exercises embedded in structured content and with automated feedback. The summative continuous assessment also included automated feedback before submission to allow students to refine their work. The module exam was reworked for online use and to align more closely with the formative and continuous assessment.

From a pedagogical point of view, we hoped that students would make appropriate connections between their implementations of programs and the specification (syntactical, structural, functional and stylistic) that they will have been required to work to. This requires understanding of the technical vocabulary describing programming constructs in Java.

The automated feedback tools now in use on M250 offer a way for students to check their understanding, to a large extent without the need to consult their tutor. Reuse of the tools then offers iterative feedback on student's progress towards completing code that meets our specification. This supports self-help and self-evaluation.

We report on how these changes to our practice have impacted on key performance indicators and forum discussions and we explore whether there are any significant demographic differences evident in use of our automated feedback. We examine early findings on how the low-level data can provide insight into student coding behaviour and identify areas of difficulty.

Student Engagement in Scholarship Workshop

Trevor Collins[1], Fiona Aiken[1], Bart Gamber[2], Stephanie Lay[2], Emma Street[2] and Kim White[2], Mark Jones[1] and Sue Pawley[1], STEM Faculty[1], CIO Piortolio[2]

In this plenary workshop, the eSTEeM Directors will be joined by members of the Student Research Project Panel (SRPP) to discuss the issues impacting students' participation in research, explore strategies to improve response rates, and consider how collaborations with students could enhance the Scholarship of Teaching and Learning in STEM.

Parallel Session G

Supporting students effectively in an online teaching environment at the beginning of their student journey

Carlton Wood[1], Lynda Cook[1] and Anactoria Clarke[2], STEM Faculty[1], FASS[2]

We will report that introducing online teaching to Access students studying a Level 3 Higher Education module at the Open University has long lasting beneficial effects. This study shows that a single online teaching session, focused on a heavily weighted summative final piece of assessment, encourages students who participated to subsequently attend online teaching sessions on future modules to a significantly greater extent that those students who did not undertake the introductory Access module. This effect was seen in students progressing to three subsequent STEM Level 4 modules. Qualitative interviews of students who had undertaken the introductory online teaching session showed that the students could recall the session some three years after it had taken place, were able to report the benefits of having attended the session and also reported that it made them far more likely to attend future online teaching events in subsequent modules they undertook.

What holds students back from attending live tutorials and using online forums on S294 and SK299?

Sarah Daniell and Lorraine Waters, STEM Faculty

It remains the case that despite different initiatives to encourage tutorial attendance, few students attend live online tutorials in LHCS. Similarly, forum use is also unpopular, with many students only using their tutor group forums for activities related to assessment, rather than for communicating with other students and building a sense of community. This lack of engagement is often a source of concern and frustration for associate lecturers as many students appear not to be fully utilising the resources available to help their study. Until now, the reasons for this have been speculative, the concern being that lack of confidence and fear of the online classroom environment may be off-putting to some students. Students experiencing mental ill-health (for example anxiety) may be particularly sensitive to these issues. Students may build up a pattern of behaviour where they don't attend synchronous tuition events, and instead rely on social media platforms such as Facebook, WhatsApp and Twitter to support their studies. In so doing they may be missing out on vital information and module resources, which may impact collaborative and investigative aspects of their studies, assignment scores, motivation and ultimately retention. It's widely accepted that those students who do engage more fully, have a better learning experience, and are more likely to achieve their learning potential.

This study aims to gain a better understanding of our students' perceptions of the synchronous and asynchronous support available on S294 and SK299, and

any barriers which prevent these resources from being used more extensively. Students from both the 21J and 22J cohorts of S294 and SK299 were sent online questionnaires to evaluate their use and perceptions of the tutorial and forum facilities available on those modules and to investigate any barriers to their engagement and participation. Following on from the questionnaire, students who declared having experienced mental ill-health during their studies and a willingness to participate further, were contacted, and invited to interview. Six students were interviewed to gain a more in-depth understanding of their experience, with the aim of increasing our awareness of any accessibility issues and developing strategies to improve our provision of tutorial and forum support to improve equality of access to these resources. Our findings from the questionnaire and interviews will be presented, together with some suggestions to take forwards.

Typical Support Seeking Behaviour of STEM Students, their Outcomes and Successes

Fiona Aiken and Paul Collier, STEM Faculty

The importance of personal, non-academic support of students especially in a distance learning environment is well documented in the literature. An HEA report (Jacklin et al, 2007 stated that the way that support is provided and organised is important and negative experiences result from delays in students receiving a response. Students indicated that it can be difficult to commence their studies and managing students' expectations versus the realities of life in Higher education can be a challenge at the start of a module. In the report

recommendations it stated the importance of knowing who to contact, where to go and what support is available. This is backed up further by Simpson, (Simpson, O., 2018) in chapter 3 he states that' A good adviser will also use his or her experience and skill to help the student clarify and conceptualize the issue or problem, as well as challenging the student's perceptions when appropriate.'

This project is investigating student-initiated interactions with the university in terms of volume, nature and composition in order to understand the potential links between the successful resolution of these queries and the students' academic performance. The investigation focused around the crucial 6 weeks from the final enrolment date through to the submission of the first assignment in a module.

Data from the academic year 21/22 was examined, from our initial findings several groups were identified as not performing as well in their initial assignment following a slower response to a query. These results were shared with colleagues in the student support team and the personal learning advisors who offer a coaching service to our students. The personal advisors are contacting students in one of our identified groups, black students, earlier in the 22/23 academic year than they did in 21/22. The data from this current academic year will be evaluated and compared to the academic year 21/22 with a view to making recommendations of how effective this intervention has been. The results from this analysis will be shared in the presentation.

References:

Jacklin A., Robinson C., O'Meara L., and Harris A. (2007), Improving the experiences of disabled students in higher education, HEA report [online] available at https://www.researchgate.net/publication/253525979_Improving_the_Experiences_of_Disabled_Students_in_Higher_Education (accessed 18/02/2021)

Simpson, O. (2018 ebook). Supporting Students in Online, Open and Distance Learning (2nd ed.). RoutledgeFalmer.[online] available at https://doi-org.libezproxy.open.ac.uk/10.4324/9780203417003 (accessed 18/02/2021)

Parallel Session H

What holds students back from attending live tutorials and using online forums on S294 and SK299?

Abi Kirk, STEM Faculty

A sequence of studies from 2008 to 2016 provides evidence that few students speak in online STEM OU tutorials. Though speech occurred in the early small-group tutorials, the emphasis moved away from this toward text chat. This project has investigated how online tutorials could be designed to encourage students to speak. It began when H.E. teaching was moving online due to Covid-19 lockdowns, and so seemed particularly pertinent.

The project is centred on a problem-solving session design. This was based on initial information gathered on individual support sessions (ISS) in 2020-21. Level

2-3 Maths tutors compiled six logs documenting ISS, including what appeared to encourage speech. These were analysed thematically and combined with responses from a small survey of tutors, to establish desirable characteristics for a session encouraging speech. These included: students seeing benefit from speaking through their needs being met, and reducing anxiety through discussing familiar content first, or by the tutor setting the direction. Other aspects were informed by sources on small-group sessions at other institutions during lockdowns and on online language tutorials. These included clear purpose, format and roles, the chance to look at content in advance, and content relating to assessment.

The session design consists of: initial quiz to establish students' needs, icebreaker on spotting errors in a solution, and problem-solving in three group-work styles. Styles A and B happen in breakout with feedback in plenary. In Style A, a student writes and another gives instructions; Style B is a type of 'Consequences' game. Style C happens in plenary with the tutor providing structure and pointers. The design was tested in two sessions in November 2021. Data was collected in the form of recording transcripts, observations and feedback from students. This was analysed thematically in order to evaluate the effectiveness of each part and inform modifications. The modified design was tested in November 2022, and similar data collected. This is now being analysed thematically, to evaluate effectiveness, and compare with the November 2021 sessions.

This talk will present early findings from the analysis of the November 2022 data, concentrating on two aspects. First: a broad-brush look at the effectiveness of

each part, in terms of level and nature of participation. Second: an outline of issues seen in November 2021, modifications made for November 2022, and whether this was effective. For example, in the Icebreaker one error was too difficult to understand, leading to prolonged discussion where students could have felt exposed. The errors were simplified, and the Icebreaker became shorter and less exposing. Also, not all students followed the formats for Styles A and B correctly, so clearer instructions were given, and this brought improvement. In feedback, the move to displaying whiteboards simultaneously facilitated comparison and the making of links.

It is intended to carry out more detailed thematic analysis of the types of interaction that took place, and also which features of the modified design made it effective.

High Resolution Virtual 3D Geological Outcrops for Teaching and Learning

Anne Jay, Marcus Badger, Robert Barnes, Brian Richardson and Geoff Austin, STEM Faculty

Equitable access to field learning is vital if we want to increase inclusivity and diversity in the environmental and geological sciences. For the latter this requires access to geological outcrops. However, accessing rocks in the field can be impossible or difficult for many due to cost, health and time commitments amongst others. One way to alleviate some of these barriers is to provide virtual field experiences.

In the last decade there have been huge leaps forward in the acquisition and production of virtual geological outcrops. Mostly facilitated by drones which show gross structure of an outcrop well. However, students new to the geosciences need the opportunity to observe rocks from landscape to hand specimen giving them the opportunity to discover the lithology (what a rock is made of) of rocks and associate this with the larger geological features. This project is investigating the methods of creating these high-resolution virtual outcrops and the feasibility of presenting them to students in a way that they can interact with them via a Virtual Learning Environment (VLE).

The virtual outcrops are created using a technique called 'Structure from motion' which creates models from multiple overlapping photographs. We have created a 3D outcrop of a section (5 m by 50 m) of the Friars Point unconformity in Barry, South Wales – a classic introductory geology site. The geology of this outcrop is a classic introductory site. The site features challenging (for 3D capture) topography alongside spectacular millimetre to decimetre scale geology. A second model of Coombs Quarry, Buckinghamshire, has been created and incorporated into a 360-degree panorama of the quarry, establishing a method of "setting the scene" for a high-resolution model, but demonstrating that a different method is needed for students to interact with the model itself.

Here we present the two models, along with lessons learnt for the capture and use of high spatial resolution 3D models using off-the-shelf and on-the-ground techniques.

This project is now part of an OpenSTEM lab pathfinder project to investigate methods of delivery to the students.

What is known about how to write online maths heavy physics exams and how to prepare students for them?

Martin Braun, STEM Faculty

When the Covid pandemic affected education, university and other HE providers around the globe had to move not only their content delivery online, but also their assessments. Besides the fact that Covid caused significant upheaval in HE, this enforced experiment also afforded an opportunity to reflect on traditional, invigilated, closed book exams (ICBE) resulting in research and general advice in this area. A systematic review of this academic and grey literature was performed concentrating on math heavy physics examinations to investigate what guidance is given to exam writers, educators who prepare students for exams and HE examinees themselves.

The literature review results were divided into: Advice for examiners who need to provide an uninvigilated, open book exam (UOBE), discussions on cheating, advice for students and case studies. It was found that ICBEs were good at examining lower order cognitive skills, e.g. recall and understanding, but higher order skills, such as analysing and synthesising, are better examined with access to a larger range of resources. Guidance on making academic misconduct more difficult also suggested using higher order thinking skills in exam questions as responses to this type of tasks are more individual and getting outside help may be more difficult in a time constrained UOBE.

Furthermore, literature encouraged reflection on the motivation for cheating and suggested that overly demanding assessment may encourage students to seek inappropriate help. The advice for students highlighted the need to prepare as thoroughly for a UOBE as they would for a traditional exam. Probably the thrust of it should change from pure memorization in order to preparing their notes to efficiently access the material, so a student may synthesise relevant parts during a UOBE efficiently. Many of the case studies used statistical methods to investigate comparability of grades for UOBEs and ICBEs and some of the studies found them comparable, so a large shift of results may be due to other factors rather than the exam type.

The main recommendation of not using lower cognitive skills can pose a problem for maths heavy exams as they mainly assess how well an examinee has mastered these skills before building on them. Therefore, it seems advisable to climb up Bloom's taxonomy higher up within a UOBE to also include the higher order thinking skills where possible. However, it should also be possible to highly individualise maths type problems by using different data sets for a question. Student advice should highlight the differences between UOBEs and ICBEs so that they can prepare appropriately.

Parallel Session I

What holds students back from attending live tutorials and using online forums on S294 and SK299?

Anne-Katrin Klehe, STEM Faculty

S217 is a core level 2 Physics module with a drop-out rate of 30-40%; nearly half of the official withdrawals happen before Christmas, which could be indicative of a discrepancy between the students' expectations and their initial experiences (Holmegaard et al. 2014) . The NSS survey 2022 indicates that only (47±10)% Physics students at the OU consider themselves to be "part of a community of staff and students". A sense of belonging is known to be one of the most significant factors in student success and retention (Kuh et al 2010).

I have offered a group of initially 60, now 55, students in S217 the opportunity to partake in pre-scheduled weekly online group meetings. All students receive a weekly invite via email. So far, always more than 20% of students have participated regularly in these meetings. At the beginning of each meeting students reply to an anonymous questionnaire about their progress. They tell each other what they enjoyed during the last week as well as what they are concerned about. It is during this time that students mention to each other either support material they discovered, or extracurricular events they found out about. To make the meeting academically relevant to everyone, I then talk to the group about a small aspect of the current module material, I find exciting.

The general aim of the project is to investigate whether a sense of belonging can be fostered among these students, and whether anecdotal evidence can be obtained with regard to student outcomes and retention.

In this presentation I will outline preliminary data based on weekly student feedback, TMA results and student retention in the group. Numbers are too small to be statistically significant, but indications on retention and student outcomes in this group compared to previous years will be discussed.

References:

Holmegaard, H. T., L. M. Madsen, and L. Ulriksen. (2014) A Journey of Negotiation and Belonging: Understanding Students' Transitions to Science and Engineering in Higher Education. Cultural Studies of Science Education 9 (3): 755–86.

Kuh, G. D., Kinzie, J., Schuh, J. H., & Whitt, E. J. (2010). Student success in college: Creating conditions that matter. John Wiley & Sons

Peoples, C. (2021) Personalised Student Support Plans: Examining the Effectiveness of Support Recommendations made by Students, eSTEeM, available at: https://www.open.ac.uk/scholarship-and-innovation/esteem/projects/themes/supporting-students/personalised-student-support-plans-examining-the-effectiveness

Statistics anxiety: what is it and how do we measure it?

Rachel Hilliam, Emma Steele, Carol Calvert and Di Haigney, STEM Faculty

Students who study statistics modules at the Open University do so from a range of educational backgrounds and are studying a range of qualification pathways such as Economics, Data Science, Computing, Mathematics and Statistics, and others. For example, students taking qualifications in data science and economics are now the largest cohort of students on the second-year undergraduate statistics module, M248, Analysing Data and over the last three years we have been looking at different ways to support these students who are studying statistics as part of a non-statistics qualification. This work has led us to consider the question of whether statistics anxiety might affect the students in different ways depending on the qualification they are studying.

There are many scales for measuring statistics anxiety but these not particularly current or relevant for online and distance learning. In the early stages of this project, we have been developing a scale to measure statistics anxiety across our students, based on eight key factors, including online engagement and software anxiety. The factors were identified from an extensive review of existing assessment tools. This talk will explore our approach, current progress and invite feedback.

The Postcard project – an intervention to improve student success on level 1 design

Elouise Huxor and Theodora Philcox, STEM Faculty

At the start of 22J Staff Tutors (the project leads) for U101 (Design thinking for the 21st Century) initiated an eSTEeM project to improve engagement and retention on the module. Student retention has been lower than comparable Level 1 modules in Engineering and Innovation. In 21J U101 had 51.0% 'first time completion rate' compared to the faculty level average of 72.4%. However, U101 has different challenges, in that it recruits from a wider range of qualification pathways and it, therefore, has to work harder to meet the needs of a diverse student cohort who have chosen the module for a variety of reasons that may be extrinsic to their chosen career path.

It is important to understand why so many students drop-out of design at level 1, so that we can develop strategies to ensure students feel more engaged. According to research by the IET (2016), KMI figures estimate the cost of drop-out per student at £2,700. Their report suggested that even small improvements would have significant benefits for the University, for example, enhancing student retention on big population modules (>1000 students) by 3% is estimated to increase University income by £2,195,100 per annum (Van Ameijde, et al (2015).

Our project aims to improve retention by ensuring students have regular engagement with their tutor at least once per week through the delivery of a digital postcard. These present bite-sized, highly visual information that

highlights key learning points from the block materials on the planner for that week.

The project is being run as a pilot to allow for an analysis of the impact of this regular contact, targeting thirteen groups: one from each region. All the postcards have been created by the project leads to ensure all students in the pilot group receive the same content. The postcards are then sent via email by each student's own tutor to develop a stronger relationship and sense of belonging within the group. In this way more ALs are involved in a scholarship project to develop their professional practice. By seeking to encourage more regular interaction between students and their tutor, we hope to better understand how students are responding to the content and delivery of the module and to address their concerns before they choose to withdraw.

In this oral presentation we will share our findings from key collection points which have involved the participating ALs in professional conversations regarding their interactions with students, and their students' response. We will use the predictive data tool OU Analyse to look at student engagement in the pilot and the control groups to ascertain if the project is having an impact.

Reference:

Van Ameijde, J., Cross, S., and Weller M. (2015) Designing for Student Retention. The ICEBERG Model and Key Design Tips [Online]. Available at https://www.open.ac.uk/blogs/learning-design/wp-content/uploads/2020/07/ICEBERG-booklet.pdf

Parallel Session J

Learning Logs: Employability skills for remote experiments

Alan Cayless[1] and Arabella Nock[2], STEM Faculty[1], Academic Services[2]

SXPS288 is the main experimental module at level 2 on the physical sciences pathways. Students carry out projects in astronomy, physics and planetary science, each based around groupwork and remotely operated real time experiments. The module encourages students to develop their experimental skills and also other vital employability skills, with particular emphasis on opportunities in the space sector.

SXPS288 features an innovative new approach to recording, developing and assessing students' progress towards employability-related learning objectives. Threaded throughout the module are skills weeks at strategic points within or between the experiments. These weeks contain activities relating to experimental skills, communication skills, programming and, importantly, employability skills.

To enable students to document and reflect on their progress in developing these skills the module makes use of Learning logs, which are a student-led tool based around familiar forum technology. Each student has access to a personalised Learning Log, visible only to themselves and to their tutor. Importantly the Learning Log will remain available to the student across modules, allowing them to build a skills development portfolio as they progress throughout their chose qualification pathway.

The Learning Logs are based on the online VLE forums, which will already be familiar to students, and therefore offer a minimal learning curve. All of the features of VLE forums are available, including embedding of images and hyperlinks in posts, attachments such as documents or computer programs, and LaTeX formatting of mathematical formulae. Posts can also be tagged with keywords for later searching or retrieval.

To encourage participation, some activities relating to the Learning Logs are built into the module Skills Weeks and some activities are linked to assessment.

The overall aim of the current study was to obtain a better understanding of student engagement with the Learning Logs in SXPS288 and to assess their effectiveness over the first three presentations of the module, using a combination of unstructured student feedback, a targeted questionnaire, and analytics of student engagement, with an emphasis on both the timing and frequency of engagement with the Learning Logs.

The talk will outline some of the challenges encountered in embedding this type of activity in science modules and will present findings on potential ways of improving the effectiveness of the Learning Logs and increasing student engagement. Participants will learn how to embed skills development activities and recording into module materials and how to use analytics and targeted surveys to assess student engagement.

Evaluation of a programme of employability-focussed workshops run in summer 2022 for biology students

Janet Haresnape and Ruth Gilbert, STEM Faculty

A previous eSTEeM project on practical skills progression and employability (Haresnape, 2022) revealed that few students realise the employability benefits of engaging with practical investigations or appreciate the skills they are developing by engaging in practical work.

Here we present the results of a follow-up eSTEeM project which evaluated a programme of workshops which we ran in LHCS during summer 2022. The workshops on 'Skills for biologists' had an employability focus, and were intended to help students to understand the skills required in different biology-related fields of work and appreciate how engaging with the practical elements of their modules help them to develop these skills. In addition, the programme provided a continuation of learning opportunities over the summer months between one J presentation module and the next, and helped to build community among our biology students.

The workshop facilitators shared first-hand experiences of working in biology-related jobs, including working in a research laboratory, undertaking field work in exotic places, and working in bioinformatics. They focused on what it is like to work as a biologist, and on particular the skills required for different jobs. Most of the workshops were facilitated by ALs, with one by a lecturer from LHCS. The sessions were informal with plenty of opportunity for participants to ask questions, and took place in an Adobe Connect room on the Science Study site.

Students who had participated in the programme were invited to complete a feedback questionnaire which explored to what extent the workshops had been successful in helping them to understand the skills required in different biology-related jobs, and also to feel part of a community of OU biology students, and also to give additional free text comments on the opportunities and insights the workshops had provided.

This oral presentation will give a brief overview of how the programme was organised and what was included in it, and will summarise the comments from students, most of which were very positive. It was clear that they had found the workshops not only interesting but also useful in learning what professional biologists think about and work on, how learning is applied to real world situations, and moreover it opened students' eyes to possible employment opportunities which they were previously unaware of.

Participants will be invited to make suggestions for what we might include in next year's programme, and how we might promote it to maximize interest. In particular, the programme was entitled 'Skills for Biology' and we will be asking participants to comment on possible alternative titles which might be more engaging.

The programme helped students to understand the relevance of the skills they are developing during their studies, helped them feel part of a community, provided continuity of learning opportunities during the summer months, and gave them renewed enthusiasm for continuing their studies.

Reference:

Haresnape, J. (2022) Practical skills progression and employability in the Life Sciences pathway at the Open University. eSTEeM Final Report

Collaborative leadership in a research group: what does it mean, how is it practised and what are its impacts on post-graduate students?

Ann Grand, Victoria Pearson, Iain Greenlees, Snezana Levic and Joanna Shelton, STEM Faculty

Tackling the complex, wide-ranging issues that face today's world is not something that can be done by researchers alone. Increasingly, research projects are engagements among multiple communities that bring with them a variety of values and aims. To equip and empower such engaged communities to achieve their objectives, rather than control and direct how they work together, requires collaborative working and importantly, collaborative leadership.

Collaborative leadership is a relatively new and uncommon leadership practice in academia. While there are different models of collaborative leadership, the common factor is that vision, accountabilities and responsibilities are shared, in contrast to co-operative leadership in which responsibilities are divided, or to top-down hierarchical leadership where responsibilities are delegated down a chain of command.

Our eSTEeM-funded project therefore sought to understand the qualities of collaborative leadership and the impacts of such leadership on post-graduate research students, the community that will become the next generation of research leaders.

The project had three objectives. Through a series of semi-structured interviews with students, post-graduate researchers, supervisors and researcher support colleagues, we first examined perceptions of collaborative leadership and the implications of collaborative leadership for post-graduate student supervision teams. Second, we investigated post-graduate research students' perceptions of collaborative leadership and its impacts on their experiences. Third, using these data, we designed a series of scenarios that illustrated ways the University could enhance the experience of future post-graduate research students supervised collaboratively, which we examined in workshops.

Our results show that participants' perceptions of collaborative leadership included that it supported productivity and personal development and deepened trust and respect among research communities. Participants mentioned constructive impacts including enhanced quality and quantity of research outputs and improved career development arising from quicker and easier access to the advice and support of a range of colleagues. It also promoted well-being and satisfaction, arising from the increased sense of personal autonomy in research. Research leaders also noted the positive well-being impacts of being able to share responsibility for strategic decisions.

However, participants also discussed barriers to implementing collaborative leadership, which is challenged by, and challenges, traditional disciplinary

cultures and institutional systems and practices. Moreover, we uncovered considerable conflation among participants between the concepts of collaboration and interdisciplinarity; something we hope to explore further in future.

Embedding research into teaching: practices, motivations and impacts

Sarah Davies, Cat Cowie, Philip Holden, Lorraine Hudson and Kadmiel Maseyk, STEM Faculty

Academics are often interested in using their own research in their teaching – as a valuable way of sharing their passion for their subject, connecting students with cutting-edge knowledge, and enabling them to experience authentic practices. The view that research and teaching in universities should be linked is widespread with suggestions of benefits for both academics and students (Boyer, 1998). However, the strength and focus of this research-teaching nexus is contested (Bak and Kim, 2015), with arguments that experiences of research and teaching are influenced by academic discipline epistemologies and institutional perspectives (Robertson, 2007), and that impacts on students are varied (Jenkins, 2004). From an OU perspective, Ngoasong, Beadle and Kodwani (2018) found that the OU's approach to module design and presentation required different approaches to the research-teaching nexus than in other universities and highlighted a strong drive to align with student needs.

OU science research is often embedded into OU science teaching: as knowledge or an information source (e.g., when students are directed to a

research paper), as authentic datasets (that students can analyse and interpret) and as authentic methodology (e.g., data collection through remote instruments) or research technique (e.g., a computer model that students operate). Recently, a lightbulb icon has been used in some modules to highlight OU research to students.

Focussing on environmental sciences, this project explores the practices and motivations for embedding research into teaching and the impacts on students and on staff through:

- a literature review of the research-teaching nexus in the environmental sciences
- a review of research-teaching links in core environmental science modules
- an investigation into the motivations and experiences of staff
- an exploration of the attitudes and experiences of students.

This project takes as one of its starting points the Healey and Jenkins (2009) framework of the nature of undergraduate research and inquiry which places learning activities within a space defined by level of participation (from student as audience to student as participant) and by type of learning (from content knowledge to research processes); this gives a frame for activities ranging from students learning about current research to students undertaking research themselves.

Project results indicate a high level of interest in the topic from students and indicated enthusiasm for research, understanding about the development of research involvement through a degree programme, different perspectives on the balance between learning about research content and research processes, and concern over practical considerations.

The project found disconnects in two areas: first, around awareness of the lightbulb icon and second, between ALs and OU research. We suggest that improving the highlighting of OU research in materials and linking ALs more closely to the research conducted in their departments would be benefit both students and the OU community.

In the environmental sciences, where urgent action and public engagement with rapidly changing science are important for issues such as the climate crisis and biodiversity loss, closer connections with cutting-edge environmental science research could be helpful for strengthening students' engagement with such issues.

References:

Bak, H. and Kim, D. (2015). Too much emphasis on research? An empirical examination of the relationship between research and teaching in multitasking environments. *Research in Higher Education*, 56(8), 843-860.

Boyer Commission on Educating Undergraduates in the Research University. (1998). *Reinventing undergraduate education: A blueprint for America's research universities.* Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.

Healey, M. and Jenkins, A. (2009). Developing Undergraduate Research and Inquiry. Higher Education Academy. https://www.advance-he.ac.uk/knowledge-hub/developing-undergraduate-research-and-inquiry

Jenkins A (2004) *A Guide to the Research Evidence on Teaching Research Relations*, York, Higher Education Academy

Ngoasong, M., Beadle, H. and Kodwani, D. (2018) 'Promoting the integration of research-teaching-external engagement linkages into the Open University Business School curriculum development: Exploratory research' Report on Scholarship Exchange

Robertson, J. (2007) Beyond the 'research/teaching nexus': exploring the complexity of academic experience *Studies in Higher Education*; Vol. 32, No. 5, October 2007, pp. 541–556

Parallel Session K

Online tutorials: addressing the challenges of active student participation

Karen Kear, Helen Donelan, Jon Rosewell, STEM Faculty

Active student engagement in online tutorials is important for students' progress and development, and yet it can be challenging to achieve (Butler et al., 2018, Gherheș et al., 2021). The Synchronous Online Learning (SOL) project was funded by the OU's Pan-university Scholarship fund to explore why students do or don't actively participate, and to investigate the approaches tutors use to encourage engagement.

The project employed two large-scale online surveys to investigate these issues. Over 600 students and almost 200 tutors from across the university responded to the surveys. The surveys were followed by 14 online focus groups (with students and with tutors). The surveys and focus groups provided quantitative and rich qualitative data that offered many insights into the issues being explored, and also raised others.

Anxiety and a lack of confidence were found to be important factors affecting student participation. Over a third of students indicated that they experience stress when expected to take part actively in online tutorials. An even higher proportion of tutors felt that this was an issue for students. Many students said they prefer to attend in a passive capacity, listening to the tutor, rather than speaking. Different Adobe Connect tools enable different levels and types of

participation: for example, the Chat tool is a popular way of interacting, as are polls and whiteboards. A common factor is that these tools enable a degree of anonymity for students.

We are keen to improve the experience of students and tutors in online tutorials, and we hope that the findings of our project can help achieve this. But we need colleagues' input in discussing our findings further and considering what changes might be needed to OU and Faculty policies and practice. This workshop will enable the time and space to discuss some important questions about online tutorials at the OU. For example:

- What training and development resources about online tutorials are available for tutors, students and module teams - and how might these be improved and promoted?
- What are our policies for online tutorials - and how well are they working for students?
- How can we encourage confidence among students (so that they are willing to participate more actively) but without adding further stress?

Workshop outline:

- Short presentation on the Synchronous Online Learning (SOL) project.
- Small group discussions (in the room and online breakout rooms) – sharing experiences in online sessions, considering challenges for students and tutors.
- Plenary discussion on how to improve policy and practice in online tutorials.

Learning outcomes for participants:

- Understanding issues around active student participation in online tutorials
- Understanding how to support tutors in running tutorials that encourage active student participation
- Understanding how to support students build confidence in participating more actively
- Contributing ideas towards policy changes around online tutorials

References:

Butler, D., Cook, L., Haley-Mirnar, V., Halliwell, C., & MacBrayne, L. (2018). Achieving student centred facilitation in online synchronous tutorials. In 10th EDEN Research Workshop (pp. 77–83). [online]. Barcelona. http://www.eden-online.org/wp-content/uploads/2018/11/RW10_2018_Barcelona_Proceedings_ISSN.pdf

Gherheș V, Șimon S, Para I. (2021) Analysing Students' Reasons for Keeping Their Webcams on or off during Online Classes. Sustainability 13(6):3203. https://doi.org/10.3390/su13063203

Parallel Session L

Rehearsing with the Mechanicals: convenience and conventions in distance learning group work

Silvia Varognolo, Alice Moncaster, Hedieh Jazaeri, Fiona Gleed and Jo Smedley, STEM Faculty

Projects and teamwork are the predominant context in which most engineers work. Providing supported learning experience of such contexts supports employability for our students. However, group projects are particularly problematic within the OU setting, both because the distance learning format makes group cohesion more difficult, and because we have a relatively high number of students who might be disadvantaged through such activity.

Meanwhile, inclusivity represents a critical issue for the engineering professions. While most of the UK engineering professionals are white, male, and able-bodied, recent publications have highlighted the relevance of understanding the needs and experiences of different groups in engineering design, and the positive impact that diverse teams can have. The OU has a critical role to play in supporting a more diverse engineering profession. However, to do so we need to make sure both that all our students are supported in their studies, and that they are aware of the importance of diversity and inclusivity.

Our scholarship project is about improving inclusivity for distance-learning group projects. The specific context is T229 Mechanical engineering: Heat and flow, a second level module that includes a group project. The scholarship also

aims to add to the wider knowledge base on inclusivity in similar STEM distance-learning group projects.

The initial stage reviewed the academic literature and the feedback from students and ALs on the T229 group project, to identify potential barriers to different student profiles. This helped us develop survey questions for OU Level 1 and 2 engineering students who have experience of participating in distance group projects, and ALs who delivered the T229 tuition. Some longer interviews with students and ALs were carried out to collect deeper insights.

The analysed data from the literature, surveys and interviews were triangulated to develop guidelines for the design and deliver of inclusive distance-learning group projects. These guidelines will form the basis of our proposed workshop, through which we aim at not only reporting our findings but also collecting further reflections and insights from the participants.

During the session, we will first briefly introduce our project and then ask participants to work in inclusive teams. Teams will be formed of 3-4 people, with parallel groups working in-person or connected remotely to achieve a short task related to sustainable design. In the final part of the session, participants will report on their experiences of working in a group, comparing and contrasting the on-line and in-person experiences to reflect on opportunities for enhancing inclusivity.

Poster Presentations

Writing retreats for level 1 students: a controlled study

Victoria Nicholas and Paul Collier, STEM Faculty

Students frequently cite time pressure as a challenge to successful study. This new eSTEeM project is underway to explore and evidence the impact of ringfenced writing time for students. Writing retreats are rarely used for undergraduate study but demonstrate positive outcomes for staff or postgraduate students. In addition to the usual planned tutorials and tutor support, tutors are offering mini writing retreats to provide ringfenced writing time in advance of TMA deadlines. To ensure a valid comparison we are conducting a stratified study across 4 Level 1 modules in STEM using control groups and comparing the resultant student outcomes.

We have used predictive analytics to determine which students have a 0-70% chance of passing their module and have split these into control and test groups. The test group are invited to attend from their choice of writing retreat times ahead of each TMA cut off. The control group are simply reminded by email to work on their TMAs in advance of the cut-off date. The control and test groups have been evenly distributed based on their demographic dimensions. The anticipated benefit of this approach is an expected increase in TMA submissions and TMA scores for those students involved. This contributes to retention, continuation, completion and further student success.

During this presentation we will describe the work to date and particularly focus on the approaches taken to conduct a large-scale study with valid control groups. We will also focus on the approach taken to include module teams and Associate Lecturers in the study. We will share the results of the early data analysis of the study which has been ongoing since October 2022.

See page 103 for poster.

Is Ownership an Emergent Property of Authentic Learning?

Christopher Wolfe, STEM Faculty

The feeling of ownership is a psychological phenomenon that we are all familiar with, from the items we own to the jobs we do. Ownership has been shown to play an essential role in aspects of both work and education (Van Dyne & Pierce, 2004; Cocieru, 2020). This PhD study seeks to understand the relationship between psychological ownership and authentic learning in undergraduate STEM education.

This study will examine ownership feelings in the Open University's undergraduate physics education programmes, emphasising the new module, S384 (Astrophysics of stars and exoplanets) and how it compares to other undergraduate physics and astrophysics modules. One of the main differences between the modality of practical work between modules like S384 and some of the other modules is whether students collect their own data, such as using the Open University's remote PIRATE telescope, or whether students are given existing data from authentic scientific sources to analyse. Building on an earlier study on remote learning labs (Kolb et al., 2018), the study will research the

differences in ownership feelings between the two modalities, should they exist, and investigate how these feelings relate to achievement outcomes.

The initial phase of the research, a literature review, has revealed a surprising depth to the ownership phenomenon and given tantalising clues that it may be linked to the authentic learning experience in unexpected ways. Further research is currently being conducted on authentic learning, and measurement instruments are in development. This digital poster presentation will deliver initial findings from the literature review on ownership and authentic learning and present the research questions that the study intends to investigate.

References:

Cocieru, O. C., Lyle, M. C. and McDonald, M. A. (2020) "An exploration of the dynamic nature of psychological ownership in a classroom-as-organization," Journal of Experiential Education, 44(3), pp. 293–307.

Kolb, U. et al. (2018) "A robotic telescope for university-level distance teaching," Robotic Telescopes, Student Research and Education Proceedings, Vol 1, No 1 [Preprint]. Available at: https://doi.org/10.32374/rtsre.2017.012

Van Dyne, L. and Pierce, J. L. (2004) "Psychological ownership and feelings of possession: Three field studies predicting employee attitudes and organizational citizenship behavior," Journal of Organizational Behavior, 25(4), pp. 439–459.

See page 104 for poster.

Postgraduate Project Management: An evaluation of student employability skills development

Kay Bromley, Joan Jackson, Jill Shaw and Mark Slaymaker, STEM Faculty

Background

M815 Project Management is a 30-credit postgraduate module, accredited by the APM (Association for Project Management). It is part of MSc Computing and an option within MScs in Technology Management, Environmental Management, Engineering, Systems Thinking in Practice or Space Science and Open MSc/MA.

M815 students may be aspiring project managers or seeking to improve their knowledge of project management whilst working on projects. Employability is a focus for this module, with explanations of how assessment relates to employability included in the assessment since 18E and the module guide since 19E. APM Five dimensions of professionalism are used to guide students in reflecting on CPD during the module.

Issues

This project is motivated by tutors' anecdotal observations of positive impact for some students' professional development which enables those students to make positive contributions to projects within their organisation. However, some TMA/EMA submissions suggest that employability skills/professional development within the module seem misunderstood; this also appears in the student forum.

Work so far

The project starts from the OU employability framework and the APM competence framework widening to look at academic literature and other employability frameworks which are applicable in technology sectors.

The poster will report progress so far and demonstrate the design of the questionnaire. The questionnaire will explore students' awareness, or lack of awareness, of employability/transferable skills within the module and seek examples of positive impact in the workplace resulting from study.

Future work

The project output will support employability skills development in future presentations of M815. Through the Postgraduate Computing Qualification Lead and the C&C Employability Lead the project will inform other modules and qualifications of our findings aiming to enhance employability skills, and student awareness of these skills.

See page 105 for poster.

What Can We Learn from a Free-Text Version of the Force Concept Inventory: Decoding the Elevator Problem

Ashutosh Kumar Pathak, Jonathan Nylk and Sally Jordan, STEM Faculty

The Force Concept Inventory (FCI) (Hestenes et al., 1992) has drawn the attention of researchers into physics education over the past three decades. It consists of 29 multiple choice questions which probe six Newtonian concepts.

Each question has five options; one of the options is true and four are closely related distractors. The purpose of the FCI is to probe alternate conceptions/ misconception in Newtonian mechanics. Although it receives a lot of criticism, it is commonly used for assessment and research.

The structure of each FCI item is such that it requires a forced choice between Newtonian concepts and common-sense alternatives. Incorrect answers/distractors provide more information about students' alternative beliefs. In order to investigate students' understating of Newtonian mechanics, each item needs to be given equal attention.

The FCI's item 18 is problem about an elevator, which assesses students' misconceptions related to Newton's first law. The poster will describe early research regarding students' true conceptual understanding of Newtonian mechanics using item 18 as an example. Questions have been reframed so as to require an answer in the form of an automatically marked phrase or sentence (using the Moodle Pattern Match question type), continuing the work of Mark Parker (2019).

Parker's work is broadened in several different ways, such as through the use of free-text sub-questions of the FCI. Students will have the option to provide factual or intuitive responses in the free-text version of these questions as opposed to MCQs where they are required to select one of the options. For instance, instead of writing "upward force" on the elevator, they may put "tension" or "pull by the cable."

References:

Hestenes, D., Wells, M., & Swackhamer, G. (1992). Force Concept Inventory. The Physics Teacher, 30(3), 141-158. DOI: 10.1119/1.2343497

Parker, M. (2020) "Establishing Physics Concept Inventories Using Free-Response Questions" (PhD Thesis) https://oro.open.ac.uk/73254/

See page 106 for poster.

Black student experience on S112: improving a level 1 STEM module

Louise MacBrayne, Jennie Bellamy, Elaine McPherson and Angela Richards, STEM Faculty

Data for the module S112, Science Concepts and Practice indicated that pass rates for Black students are much lower in comparison to white students and students from other ethnicities, despite completion rates closer to the rest of the cohort, leading to an awarding gap.

The poster will expand on the preliminary findings previously reported from focus group discussions in which former S112 Black students were invited to informally share their own experiences of studying S112. The poster will also present further findings from an intersectionality study performed to consider any relationships between ethnicity and other HEA descriptors such as gender, socio-economic status (Index of Multiple Deprivation, IMD), and being first in family to Higher Education with respect to module pass rate.

The poster will outline the recommendations of the project team for how these findings could be used to inform changes to module content and assessment

to increase Black student success and engagement on any module. Examples will include increased representation of Black scientists in module content and more inclusive tuition practice, including an awareness of financial challenges associated with the additional cost of equipment needed for home experiments.

See page 107 for poster.

Pair marking: Working together to improve our teaching

Nigel Gibson and Kate Sim, STEM Faculty

Tutors' marking feedback is the main way of delivering one-to-one tuition in our modules. Although feedback is individual to each student there are frequently opportunities to reuse feedback comments. Our project considers the value of experienced tutors sharing their marking feedback.

Broadbent (2018) talks of setting up marking processes for a large cohort of students/markers and giving feedback examples to help in the development of "marker expertise". Here we are asking tutors to create their own feedback, but to support their peers by sharing their feedback as examples. Morris (2020) describes this as a "check on judgements" and it allows tutors to validate their own work and pick up new ideas.

In the TM111 22D presentation, we engaged tutors with at least one previous presentations experience and split them into pairs. Each pair had access to a shared copy of the marking guide to which we added some seed comments as examples

Participants were encouraged to add their own comments to the marking guide and use both the seed and their partner's comments where appropriate. Participants did not have access to each other's scripts

We used questionnaires and structured focus groups to gain feedback from participants.

Although some participants previously kept a "comments bank" this was the first time that any had worked with a peer in this way. Participants commented on the value of seeing feedback written by peers; the opportunity to "calibrate" their own work against that of others. There was also some discussion about feeling able to adopt a different voice having seen how colleagues work. Most participants plan to continue working with a partner and one intends to adopt this way of working on another module.

References:

Broadbent, J (2018) 'Large class teaching: How does one go about the task of moderating large volumes of assessment?' Active Learning in Higher Education, 19 (2): 173-185

Morris, E (2002) 'Behind the marks: reviewing moderation and marking practices', in higher education in On Your Marks, On Your Marks: Learner-focused Feedback Practices and Feedback Literacy, Advance HE.

See page 108 for poster.

To evaluate the effectiveness of focused staff training in recruitment on specialised modules

David McDade, Anthony Johnston and Phil Hackett, STEM Faculty

Over recent years much has been said about the skills gap that exists within the cyber security workforce in the UK. During 2022, a significant proportion of businesses in the UK reported that they continued to lack staff with a range of fundamental cyber security skills (DCMS, 2022)

At the Open University, within the School of Computing and Communications, recent updates to the curriculum within areas of cyber security have also highlighted issues around skills gaps within the school and the impact this is having on tutor recruitment. Examples of this are the introduction of new modules TM256: Cyber Security and TM359: Systems Penetration Testing, both of which have been introduced as part of the new R60 BSc (Hons) Cyber Security qualification.

The School has sought recently to address this by offering training in specialist areas in a bid to increase the expertise of the AL community. This training has taken place through offering specialist computing 'vendor' training courses:

- Cisco Cyber Security Essentials
- Certified Ethical Hacker (CEH v11)

This has allowed tutors to upskill into areas of cyber security. It has allowed tutors to develop confidence in applying for cyber security related modules, whilst gaining an industry recognised professional certification. It has also allowed the school to meet (and extend) the quotas for high demand modules.

A significant portion of tutors that have completed these training schemes have gone on to become cyber security tutors on the R60 qualification.

The research is at an early stage and the poster displays the objectives and sets out the research questions. It highlights the research methods that will be used throughout the project to collect both qualitative and quantitative data and will conclude with the planned outputs of the project.

References:

DCMS (2022). Cyber security skills in the UK labour market: Findings report. Available at: https://tinyurl.com/23nn8mxu (Accessed 23 January 2023).

See page 109 for poster.

How should formative assessments be assessed? A study of S217 online quizzes

Jonathan Nylk and Andy Diament, STEM Faculty

Formative activities are integral for student learning and students that engage with formative activities are more likely to achieve success in formative assessments. However, formative activities are often seen as optional and uptake by a cohort can be low. Typically, some module credit is given as an incentive to engage with these activities, but care must be taken in implementing this or the focus can shift from learning to counting marks. How should such activities be incentivised?

S217 “Physics: from classical to quantum” is a 60 credit Level 2 core module. This course features online quizzes as a key formative activity for providing instantaneous feedback. However, the online quizzes do not contribute directly to the module assessment strategy. Instead, engagement with the online quizzes is encouraged by an item in formative tutor marked assignments which asks students to reflect on their performance in the quizzes.

Through the use of learning analytics data, student surveys and comparison with published literature, we are seeking to understand the effect of different assessment strategies on student engagement with formative activities. We will present an overview of the project, our methodology, and preliminary findings.

See page 110 for poster.

Investigating Student Perceptions of Some of the Key Learning Activities in T272 : Core Engineering B

Foroogh Hosseinzadeh[1], Anne-Marie Gallen[1], Maxim Lamirande[1], Helen Lockett[1], John Filimon[1] and Rafael Hidalgo[2], STEM Faculty[1], LDS[2]

In T272 – Core Engineering B – students take part in three activities that are designed to reflect practice and introduce them to content from future modules:

1) Finite Element Analysis (FEA): Students are introduced to an industry standard software called ANSYS. In the context of T272 it is used for stress analysis of simple engineering static structures. It provides a foundation

for students to further develop their skills using this industry standard software in later modules.

2) OpenEngineering Laboratory (OEL): In the OEL, students remotely run a real in-lab experiment. They perform the Pressure Vessel Experiment to collect real data and understand the nuances that separate theory and practice.
3) Maths: New topics in mathematics are introduced that are viewed as a major step up for students compared to the maths content in earlier modules. The maths topics covered in T272 is used in many engineering applications for example in thermodynamics and motion of an object and serve in further modules.

This project aims to understand student perceptions about the three activities outlined above and determine appropriate next steps to better support students.

Over two module presentations, Real Time Student Feedback (RTSF) questionnaires were used to collect data of their perception on these key activities. This was followed by interviewing students whom responded to the RTSF. The outcome of the in-depth analysis of the collected data used to define recommendations for potential changes to the module material and inform future module design.

The findings of this project have allowed the module team to make appropriate and effective improvements into the module materials, interaction with students and tuition strategy on the current module presentation with a view to improve student learning experience. Long-term impacts include insight into

improvements on the use of online tools in future module productions and deeper understanding through practical activities within remote learning.

See page 111 for poster.

Is the cost of home experiments a potential barrier to learning? Experiences from two level one science modules

Louise MacBrayne, Zoë Chapman and Eleanor Crabb, STEM Faculty

Practical work in the form of home experiments has always formed an integral part of the science curriculum for teaching and assessment. The move, however, from printed materials to online delivery has been accompanied by a change in the way students are supported in home experiments, with students no longer receiving a practical kit in the post, which would have contained the necessary materials and equipment required to perform any home experiments within their modules.

The current level one curriculum (S111 and S112), compulsory in some science qualifications, now has the expectation that students will be able to purchase and have ready access to equipment needed to perform experiments at home, contributing to core module content and assessment. Some of this equipment is relatively costly and may not be easily accessible to some students. Furthermore, there is an expectation that students will have ready access to certain items of household equipment such as fridges and freezers.

The poster will report preliminary findings from an eSTEeM funded project with two overarching research questions:

- Are financially impoverished students being disadvantaged by the expectation to use facilities assumed to be in the home (e.g., fridges and freezers) and the expectation to purchase additional equipment needed for home experiments in core level one science modules?
- Is the expectation to use facilities assumed to be in the home (e.g., fridges and freezers) and the expectation to purchase additional equipment a barrier to achieving the learning outcomes associated with practical work?

It is anticipated that key outputs will include information on issues faced by financially impoverished students on low incomes studying S111 and S112, with longer-term outcomes informing approaches for incorporating fully accessible and inclusive practical work within new module design.

See page 112 for poster.

Poster 1

Writing retreats for level 1 students: a controlled study

Paul Collier and Vic Nicholas

The Open University

Background

Students report that time management is a challenge for their studies. To support level 1 students in developing good time management skills we offered mini writing retreats to a controlled set of students.

Writing retreats are used successfully for staff but there has been little use of them in the sector for early undergraduate students. Offering 'Writing Time' enables students to ringfence the time for TMA preparation. By having a tutor present the risk of collusion is decreased. By providing the times in advance students are able to ringfence the time in their calendars and be accountable to themselves.

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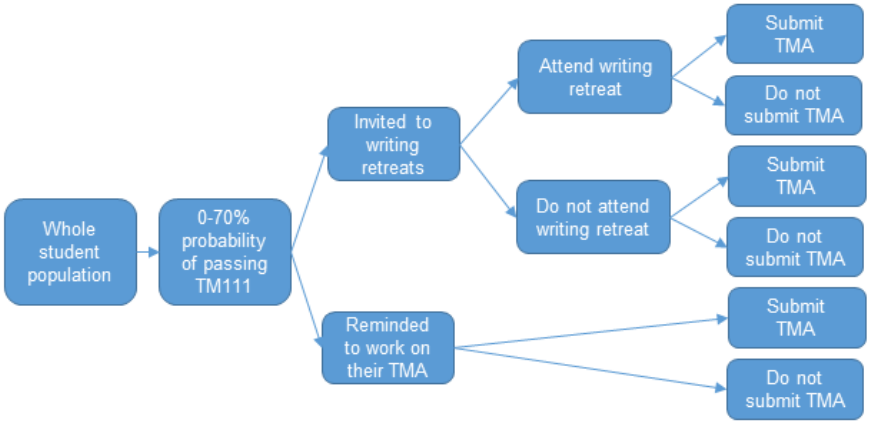
Methodology

Four entry level J presentation modules were included in this study: TM111, U116, S111 and MU123, covering a total population of 18,289 students. Using predictive analytics, students with 0-70% prediction of passing the module were selected. This group were divided into either those invited to the writing sessions and those who were simply reminded to submit their TMA. Each group was stratified to account for demographic characteristics. Submission rates and TMA scores were analysed for each group.



Preliminary results

Initially there was low take up of the writing retreats with 47 attendances from 9,300 invited students. The attendance rates improved throughout the study. Students who were invited and attended a session showed an average increased submission rate of 26% and increased score of 7% Submission rate and TMA score for those invited but did not attend was not significantly different from those not invited.

Second phase study

The second phase of our study also uses the B and D presentations of TM111, U116, S111 and MU123. The second phase has invited all 0-70% students, using those who do not attend as a control.

Poster 2

Is Ownership an Emergent Property of Authentic Learning? An Astrophysics Case Study

Christopher Wolfe, Ulrich Kolb, Mark Jones, Sally Jordan

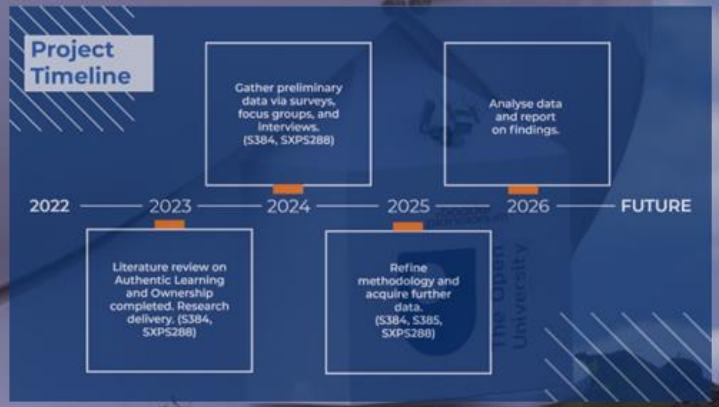
Context

Some modules allow students to access the PIRATE remotely operated telescope to collect data, whereas other modules provide data from existing astronomical databases.
This study investigates the relationship between the development of ownership feelings and the data acquisition modes.

Research Questions

- Do students develop ownership feelings toward activities that they believe are authentic?
- Does the mode of data acquisition affect the ownership feelings?
- Do ownership feelings correlate with course outcomes?

Project Timeline



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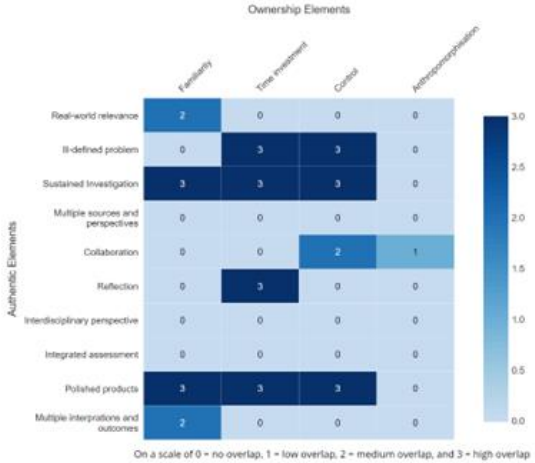
References:
- Coiceru, O. C., Lyle, M. C. and McDonald, M. A. (2020) "An exploration of the dynamic nature of psychological ownership in a classroom as organization," Journal of Experiential Education, 44(3), pp. 293–307.
- Kolb, U., Brodeur, M., Braithwaite, N. and Minocha, S. (2018) "A robotic telescope for university level distance teaching," Robotic Telescopes, Student Research and Education Proceedings, Vol 1, No 1.
- Lombardi, M. (2007) Authentic Learning for the 21st Century: An Overview. EDUCAUSE Learning Initiative, [online] Available from: https://library.educause.edu/resources/2007/1/authentic-learning-for-the-21st-century-an-overview (Accessed 12 December 2022).

Daniel Lopez, IAC.

The Open University

Overview of authentic elements and ownership



Analysis

The literature suggests overlap between the conditions which generate ownership feelings (Coiceru et al. 2020) and authentic learning environments and activities (Lombardi, 2007). Ownership could arise in any sufficiently authentic learning environment or authentic learning task. Heatmap figure shows overlap between concepts.

Contact:
Christopher.Wolfe@open.ac.uk

Poster 3

Postgraduate Project Management: An evaluation of student employability skills development

Joan Jackson, Kay Bromley, Jill Shaw, Mark Slaymaker

The Open University

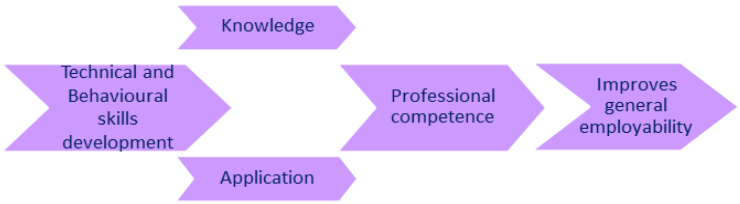
Project timescale
December 2022 – December 2023

Why?

- Motivated by tutors' observations of positive impact for some students' professional development
- In the EMA some students demonstrate positive contributions to organisational projects.
- Other TMA/EMA submissions suggest that employability skills/professional development within the module seem misunderstood.
- But, the module assessment explicitly highlights employability skills development.

What?

- M815 Project Management
  - 30-credit postgraduate module
- Accredited by Association for Project Management (APM).
- Part of MSc Computing
  - Option within MScs in Technology Management, Environmental Management, Engineering, Systems Thinking in Practice, Space Science and Open MSc/MA.
- APM Five dimensions of professionalism used to guide students' CPD reflection.



Frameworks compared

OU employability: generic
APM: Mainly technical competences
IPMA: Technical and behavioural competences
M815: Grade criteria related to postgraduate skills

Questionnaire design

- Assessment of technical and behavioural skills before and after module study in terms of both knowledge and application

Relies on

- Students relating skills in module to the framework may need some explanation/reminder
- Student perception of their own skills before and after the module
- Recognition that learning may be from the module or their experience on projects

Who?

- Students may be aspiring project managers
- Or project team members

How?

- Literature Review
- Comparison of Employability, APM and related frameworks.
- Thematic analysis of student forum
- Thematic analysis of TMA question(s) and of the EMA
- Questionnaire to investigate students' recognition of employability skills.

Project Team

- Have various current or past roles on the module
- Seeking student reviewers of questionnaire
- Will recruit another AL to work on thematic analysis

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The OU has an employability framework. The Association for Project Management has a competence framework.
This module was designed and written with both technical and behaviour skills in mind.
How do M815 students perceive their professional or employability skills development?

Poster 4

What Can We Learn from Free-Text Version of the Force Concept Inventory: Decoding the Elevator Problem

Ashutosh Kumar Pathak, Dr Jonathan Nylk, Prof Sally Jordan

The Open University

Introduction/Background:

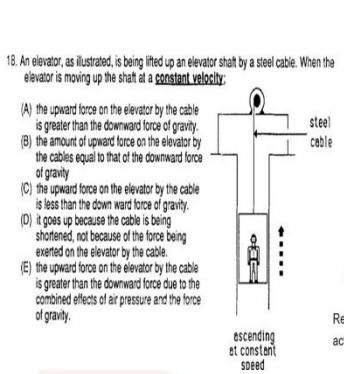
- The Force Concept Inventory (FCI) is a widely used standardized test designed to assess student understanding of basic mechanics concepts.
- It was developed in the 1992 by David Hestenes, Malcolm Wells, and Gregg Swackhamer.
- The FCI consists of 30 multiple-choice questions, each of which tests understanding of a specific physics concept. The questions are designed to assess students' qualitative understanding of mechanics concepts, rather than their ability to solve quantitative problems.

Research Statement:

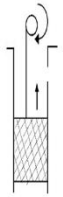
- In true sense, the FCI is an instrument to measure students' alternate conception rather than understanding about force and motion. The original elevator problem was reframed by Mark Parker (2019) in free-text version.
- Parker's work is broadened in several different ways, such as through the use of free-text sub-questions of the FCI. Students will have the option to provide factual or intuitive responses in the free-text version of these questions as opposed to MCQs where they are required to select one of the options.

Question in Focus

- **Q18 probes students' understanding of Newton's first law and law of gravitation.**



In the diagram below, an elevator is being hauled up a shaft at a constant speed by a steel cable. All frictional effects are negligible. Identify the forces acting on the elevator.

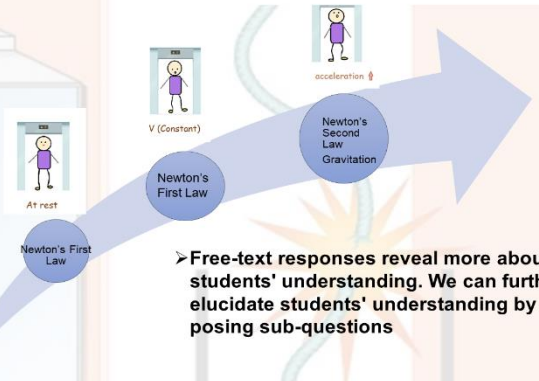


- **The free-text version of the same question was designed by Mark Parker and its discussed in the next section.**

Answer:

Recall that the lift is going up in the shaft at a constant speed. What does it tell you about the forces acting on the lift?

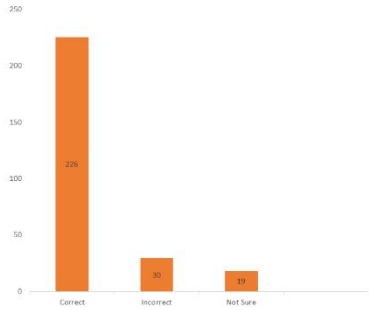
Answer:



- **Free-text responses reveal more about students' understanding. We can further elucidate students' understanding by posing sub-questions**

Result and Discussion:

- Free-text version forces students to think as options are not provided to them. Students frequently mistake tension for normal reaction force or energy, which cannot be measured using FCI's multiple-choice format.
- 49 Out of 275 students answered incorrectly and ***none of the responses matched to last three options of the MCQ version of the FCI.***
- With slight changes, free-text sub-questions can assess misconceptions related to the force and motion.



Reference

- Hestenes, D., Wells, M., & Swackhamer, G. (1992). *Force Concept Inventory*. The Physics Teacher, 30(3), 141-158. DOI: 10.1119/1.2343497
- Parker, M. (2020) *"Establishing Physics Concept Inventories Using Free-Response Questions"* (PhD Thesis) https://oro.open.ac.uk/73254/

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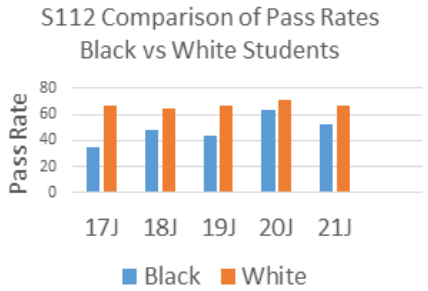
Poster 5

Black student experience on S112: improving a level 1 STEM module

Louise MacBrayne, Jennie Bellamy, Angela Richards, Elaine McPherson

There is an awarding gap for module pass rate for Black students vs White students on the Science module S112



Our research questions, originally prompted by the wide gaps for 17J – 19J were:

What are the needs of Black students in S112 and barriers in S112 to their study?

What could be influencing the experience and outcomes for Black students in S112?

This poster is reporting further new results from this project including interviews with former S112 Black students.

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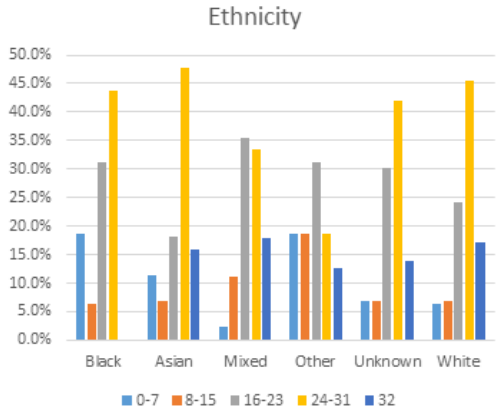
We previously reported evidence of an intersectional double disadvantage for pass rate across presentations for Black students in IMD1 but not for gender or those first in family in HE.

Black student Focus group themes led us to investigate TMA scores by ethnicity for TMA01 Q2, based on a practical activity with associated costs, and early collaboration with other students.



Black students score very poorly on TMA01 Q2. No Black students scored full marks (compared to 17% of White students).

Vertical Axis - % of students
Horizontal Axis – TMA score out of 32 by Ethnicity

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Five key themes were identified from focus groups and interviews with S112 Black students:

Representation
Being time poor
Belonging
Student costs
Motivations for study

"as a BME person you want to be inspired by your own"

"I feel like I was alone, I don't think there was a[nother] black student"

"the experiment it assumed that you had certain things in your house…it assumed that you had everything in your house and they don't support you"

"knowing that you have somebody similar to you doing the same thing, it is a big motivation"

"wake up at midnight and study for 3 hours!"

Interim recommendations include use of inclusive curriculum tool during module production to increase diversity, open availability of experiment alternative resources and facilitating Black student led communities/support group.

Poster 6


Pair marking: Working together to improve our teaching
Nigel Gibson (nigel.gibson@open.ac.uk) and Kate Sim (kate.sim@open.ac.uk)
Where we started
We have worked together to share feedback comments for more than a decade
This process grew organically to meet a need
This project was designed to determine whether other tutors might benefit from working in this way
What we do
Share feedback for each question on a shared marking guide (Dropbox)
Create a bank of feedback comments which can be used by either partner
Comments might be useful on later presentations
What we did
Recruited tutors to work with us through a full presentation (3 assignments)
Initial questionnaires to gauge practice
Split participants into pairs
Set up a space to share the marking guide
Provided "seeded" marking guide
Supported participants through the module
Questionnaires at the end of the presentation
Focus groups for qualitative feedback
What we found
Generally positive response
It "formalised" some existing practice
Sharing ideas
Increased confidence in giving feedback
Sense of voice
9/12 participants learnt something which they will use in future
9/12 will change how they work based on this project
For some the idea that there was "someone out there" was a benefit
Agreed that it might be a valuable addition to the mentoring process
What next
Most participants intend to continue
Informally moving to other modules
Perhaps used as part of mentoring arrangements
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Poster 7

To evaluate the effectiveness of focused staff training in recruitment on specialised modules

The Open University

David McDade, Phil Hackett, Anthony Johnston

Aim

To identify successful strategies in developing the capability of existing ALs to support students in specialist curriculum areas.

Objectives

To identify effective resource planning strategies when planning curriculum developments in specialist curriculum areas.
To answer the following research questions:

- To what extent is focused staff training effective in the recruitment of tutors for specialised modules at levels 2 and 3?
- What approaches are required to upskill tutors to successfully tutor in specialist curriculum areas?
- What resources are required to upskill tutors to successfully tutor in specialist curriculum areas?

Methods

Questionnaires to tutors that have engaged in and completed training
Interrogate existing data (tutors offered, tutors enrolled, tutors completed, tutors appointed)
Follow-up interviews

Outputs

The creation of an effective model for staff development
Methods to support the development of new (specialist) curriculum areas

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Recruitment on TM256 and TM359

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Cybersecurity
Systems penetration testing

How should formative assessments be assessed? A study of S217 online quizzes

Jonathan Nylk, Andy Diament
School of Physical Sciences, Faculty of Science, Technology, Engineering and Maths, Open University

Introduction

Formative activities are integral for student learning and students that engage with formative activities are more likely to achieve success in summative assessments (Jordan & Butcher, 2010). However, formative activities are often seen as optional and uptake by a cohort can be low. Typically, some module credit is given as an incentive to engage with these activities, but care must be taken in implementing this or the focus can shift from learning to counting marks. **How should such activities be incentivised?**

S217 *Physics: from classical to quantum* is a 60 credit Level 2 core module.

Through the use of learning analytics data, student surveys and comparison with published literature, we are seeking to understand the effect of incentivisation on student engagement with online quizzes

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Measuring student engagement

We will analyse learning analytics data on quiz engagement and reflections on the quizzes, part of tutor marked assignments (TMAs), to determine factors that contribute to student success (Fig. 1).

Early analysis of quiz use (Fig. 2) shows students are motivated to attempt quizzes when prompted by the TMA reflective question. This agrees with previous results (Norton, 2016).

Students appear to make effective use of repeating quizzes.

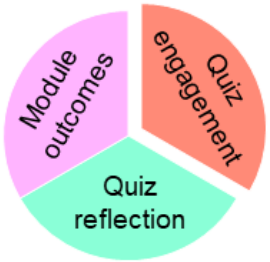

Figure 1: (Above) What factors contribute to student success?

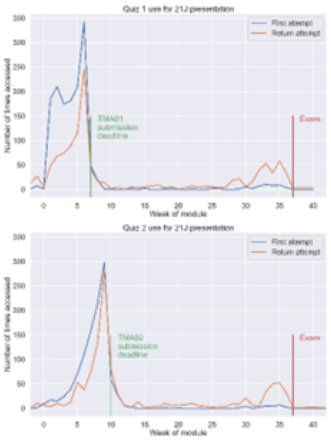

Figure 2: (right) Quiz use over the 21/22 academic year

Understanding student motivation

We will be using an online survey to ask students about their engagement with the quizzes. We want to know about their enjoyment of them. How do they respond to different styles of questions e.g. numerical, true false? What benefits do they perceive they get from the quizzes?

Quiz scores do not count directly to continuous assessment grades but we do ask the students to reflect on quizzes in TMAs, as well as feedback on previous TMAs. Are these tasks perceived to be useful to the students?

Outlook

We expect further analysis of quiz data and survey responses will help us understand how students use these online quizzes effectively for their study. This should inform our plans for the next version of the module.

References

S. Jordan and P. Butcher (2010), "Using e-assessment to support distance learners of science", in The GIREP-EPIC & PHEC 2009 International Conference, 17-21 Aug 2009, Leicester, UK

A. Norton (2016), "Assessment analytics of student engagement with, and performance on, S217 online quizzes", eSTEeM project

Poster 9

Investigating Student Perceptions of Some of the Key Learning Activities in T272 : Core Engineering B

F. Hosseinzadeh, A.M. Gallen, H. Lockett, M. Lamirande, R. Hidalgo, J. Filimon

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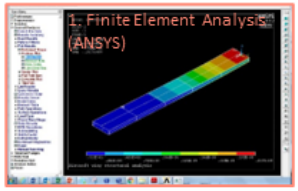
Aim and objectives: This project aims to understand student perceptions about the three online activities in T272 and determine appropriate next steps to better support students. Specifically, the data collected is analysed to:

- Determine if the activities help students form a *deeper* understanding about the subject.
- Determine whether students understand the activities and the *relevance* in the module.
- Identify any issues in current module presentation (or curriculum design) that *hinder* students from engaging with these activities.

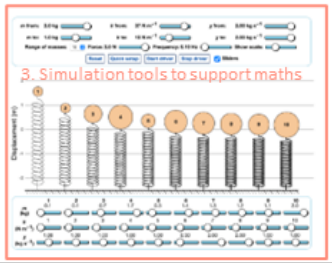
Phase 1 21D
2x RTSF Questionnaires
(Weeks 7-9 and 15-17)
Average response rate 37.6%)
Semi-Structured Interviews
Conducted within 3 weeks after EMA, *n=7*

Phase 2
Oct. 2021 – April 2022
Module Intervention
Additional Maths tutorials - particularly at start of module, before exam period and during part 2

Phase 3 22D
2x RTSF Questionnaires
(Week 7-9 and 15-17)
Average response rate 31.7%)
Semi-Structured Interviews
Conducted within 3 weeks after EMA, *n=9*



2. OpenEngineering Lab experiment (OEL)



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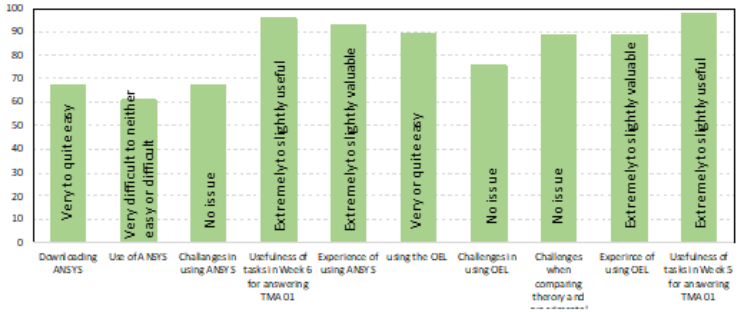
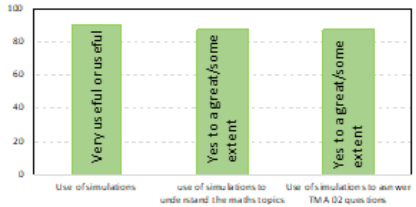
ANSYS & OEL - Real Time Student Feedback



Simulation tools - Real Time Student Feedback



Key findings: Support students through

1. **ANSYS:** providing clarity on the purpose of Finite element Analysis and and linking the exercises to their relevance as an introduction to upcoming modules.
2. **OEL:** providing clarity on the purpose of error analysis comparing experimental results with theory
3. **Maths:** Maths foundation revision that students had not acquired or forgotten.

Poster 10

Is the cost of home experiments a potential barrier to learning? Experiences from two level one science modules

Louise MacBrayne, Zoë Chapman, Eleanor Crabb

The Open University

Context

Preliminary data collected from a focus group for a previous S112 eSTEeM project suggests that the cost associated with home experiments could be a potential barrier to learning but also student success as many of these experiments contribute to assessment.

"the experiment it assumed that you had certain things in your house…it assumed that you had everything in your house and they don't support you"

Practical work in the form of home experiments has always formed an integral part of the science curriculum. However, the move from printed materials to online delivery has been accompanied by a change in the way students are supported in home experiments.

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The current level one curriculum (S111 and S112), compulsory in several science qualifications, has the expectation that students will be able to purchase, and have ready access to materials and facilities needed to perform experiments at home, contributing to core module content and assessment. Some of this equipment is relatively costly and may not be easily accessible to some students.

Figure 1. Examples of home experiment set ups currently required

Research Questions

- Are financially impoverished students being disadvantaged by the requirement to purchase additional equipment needed for home experiments in core level one science modules?
- Is the requirement to purchase equipment for home experiments a barrier to achieving the learning outcomes associated with practical work?
- Is cost the only barrier to achieving learning outcomes associated with practical work?

Proposed Methodology

Stage 1: Qualitative and quantitative data collection via JISC questionnaire (April '23)

Stage 2: Analysis and evaluation of data themes (TBC)

Stage 3: Potential development of suitable alternative resources and/or practical adjustments to support achievement of learning outcomes without additional cost


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