Innovations in Active Learning in Higher Education

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ACTIVE LEARNING NETWORK

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Contents

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Mark is skilled in both quantitative and qualitative research, using innovative and creative research design. He manages research

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Jane has responsibility for strategic educational development, as well as academic policy and quality management. Her early experiences as a history lecturer and in online learning evolved into a wider focus on learning and teaching innovation. This was realised in subsequent roles, including institutional lead for learning and teaching enhancement. Her current work in developing large-scale active learning sits alongside interests in learning technology, learning spaces and flexible curriculum models. In 2012, Jane led the first institutional, multi-disciplinary SCALE-UP project in the UK, and, in 2017, a collaborative active learning project with three universities, for the OfS 'Addressing Barriers to Student Success' programme.

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Michaela taught English to speakers of other languages in Japan and Indonesia amongst other countries before undertaking a PhD at the University of Leeds. Moving into HE, she worked as a Senior Lecturer at Northumbria University and led the MA Academic Practice at University of Warwick before taking up her current post. At NTU, Michaela leads educational development to develop inclusive curricula and pedagogies; the role of active collaborative learning in supporting inclusion has become an increasing focus of her work. Michaela's research interests include cultures and identities in learning and teaching and the dynamic interaction between the design of learning spaces and pedagogy.

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Rachel is part of a project funded by the UK Office for Students (OfS) 'Addressing Barriers to Student Success' programme. She works with colleagues to scale up the adoption of Team-Based Learning across the institution, and gathers data to evaluate the impact of this intervention. She is particularly interested in inclusive learning and teaching, and reducing disparities in Higher Education experienced by students from some backgrounds. Rachel's background is in bioscience with research interests in cancer cell fate.

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During 2011, Simon project managed the development of a new employer-informed, outcomes-based pharmacy curriculum, which is delivered predominantly by Team-Based Learning. Simon is the inaugural chair of the Board of the European Team-Based Learning Community and sits on the global Steering Committee of the Team-Based Learning Collaborative. Simon is a Principal Fellow of the Higher Education Academy, a Fellow of the Royal Pharmaceutical Society, and an accredited consultant-trainer in Team-Based Learning.

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Nicky is course leader for the foundation year on the extended medical science degrees. She has developed an interest in using active learning methods to improve engagement and academic success. She has recently designed a series of new modules on the undergraduate medical science course which use Team-Based Learning to foster interdisciplinary learning. Her research interests include developing innovative curricula which aim to enhance student motivation, collaboration and confidence through scenario-based learning with authentic assessment.

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National Teaching Fellow, De Montfort University.

Jo studied Biochemistry at the University of Leeds and then went

on to train and practise as a Chemistry teacher for three years. She became interested in inclusive pedagogy and returned to the University of Leeds to undertake a Wellcome Trust-funded PhD in Alzheimer's disease with the ultimate aim of lecturing. Jo started her first lecturing post at De Montfort University in 2014 and, since then, has championed an inclusive and active approach to teaching, learning and assessment in Higher Education. She was awarded her National Teaching Fellowship (NTF) in 2018 for her work around Universal Design for Learning (UDL).

Dr Graham Lawson

Honorary Senior Research Fellow, De Montfort University.

Graham's career (Industry-Defence-University) encompassed explaining the use of analytical chemistry in the protection of employers and the public from chemical hazards at work, in the home and hospital situations. This work always involves an element of detection and making study inclusive and relevant to the student's experience is a necessary part of developing the investigative process.

Unmesh Desai

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Following his Bachelors and Masters in Industrial Chemistry at Sardar Patel University (India) in 1999, Unmesh subsequently obtained a further Masters in Environmental Engineering and Science at Virginia Tech (USA) in 2002. After working as a Laboratory and Environmental Manager for four years, he returned to academia in 2006 as a Senior Technician. Unmesh has enjoyed 13 years of teaching graduate and post-graduate students in Pharmacy,

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Senior Analytical Technician, De Montfort University.

Nazmin studied Biochemistry at the University of Liverpool and subsequently worked as a Laboratory Analyst. Nazmin joined De Montfort University as a Chemistry Technician, progressing in 2005 to a Senior Technical role managing the main analytical teaching lab for the Faculty of Health & Life Sciences. She has accumulated a wealth of experience in many Analytical Operating Systems including GC/FID, HPLC, FTIR, Mass Spec and Atomic Absorption. Nazmin's pioneering project between Diabetes UK and De Montfort University enables students to be trained as Diabetes Champions, who raise awareness in their own communities.

Dr Abigail Moriarty

University Director of Teaching and Learning, De Montfort University.

Abi's background is a registered nurse specialising in gynaecology and women's health. Now an internationally-recognised leader of teaching and learning, who is still passionate about the NHS, Abi introduced Universal Design for Learning (UDL) at De Montfort University in 2015. She continues to talk widely across the UK Higher Education sector about UDL and was invited to speak at the UDL Symposium at Harvard University, Massachusetts (2018). Abi is a contributing author of 'Universal Design for Learning and Strategic Leadership: A Whole University Approach to Inclusive

Practice,' in the book 'Transforming Higher Education through Universal Design for Learning: An International Perspective'.

Paul Driver

Senior Learning Technologist at Anglia Ruskin University.

Paul specialises in immersive virtual scenario creation and holds an MA in Creative Media Practice in Education. He has 25 years of teaching experience and is an award-winning materials writer, a teacher trainer and a graphic designer. Paul has also been nominated for four English Teaching Innovation Awards and, in 2018, he received the national Learning Technologist of the Year award. Paul's research interests span across many fields, exploring the roles of technology, media, game design, play, and embodied cognition in the process of learning.

Dr Nicola Walshe

Head of School of Education and Social Care, Anglia Ruskin University.

Nicola gained a PhD in glaciology and taught and worked as Head of Geography in three secondary schools in the UK before leading the Geography PGCE course at the Faculty of Education, University of Cambridge. Nicola's recent research interests include environmental and sustainability education, arts-based approaches to supporting children's wellbeing in nature, and curriculum and pedagogy within teacher education more broadly.

Siân Shaw

Director of Learning, Teaching and Assessment, Anglia Ruskin University.

Siân studied nursing at St Bartholomew's Hospital before working in clinical practice for 17 years. In 2006 she graduated with a Masters in Clinical Governance and Post Graduate Certificate in Education from Cambridge University. Siân has been working at Anglia Ruskin University since 2004. Her research interests are in technology-enhanced learning and teaching with a particular focus on digital practice assessment of student nurses, Platform Simulation and the use of virtual reality to develop empathy and decision-making skills.

Dr Suzanne Hughes

After gaining her Social Work Masters at Anglia Ruskin, Sue was keen to use her research skills to explore, through an Anglia Ruskin funded PhD, older people's experiences of domiciliary care, paying particular attention to identity, autonomy and relationship. Sue engaged in lecturing on Social Work BA and MA programmes and, in her Doctoral role, has contributed to a range of research studies including systematic reviews, qualitative and mixed-method studies focusing on older people's services. Sue champions, through both research and education, the understanding and appreciation of service-user and patient experiences of health and social care situations.

Dr Mike Hobbs

Mike studied Chemistry at Exeter University and after four years

in the printing industry re-trained with a Masters then a PhD in Computer Science at Kent University. For the following three years he helped develop machine-learning algorithms at Essex University. In 1996, he returned to Kent as a lecturer in Applied Computing and also widened his experience by teaching with The Open University on distance learning courses. In 2000 he joined the Anglia Ruskin University Computing Department as a senior lecturer, with a particular interest in pedagogic research, becoming their Learning Lead in 2016.

Elaine Brown

Institutional Lead Personal Development Tutoring and Ruskin Modules, Anglia Ruskin University.

Elaine studied Biochemistry at the University of Bristol, and left industry to study an MSc in Computer Science at Anglia Ruskin. Elaine engaged large numbers of first year undergraduates with their feedback in a systems analysis and design module, for which she was awarded a University Teaching Fellowship. Elaine has also taught software interface design, and is undertaking a Professional Doctorate in Education applying the principles and practices of user experience design to make explicit the outcomes of lectures. Elaine's interest in the experience and design of learning means she is excited to be leading the development of interdisciplinary modules at ARU.

Susan Smith

Associate Dean (Education and Students), University of Sussex.

Susan is a Fellow of the Institute of Chartered Accountants in England and Wales with a LLB in Law from The University of

Edinburgh. Susan is an elected member of the ICAEW Council representing the South East and a member of the ICAEW Ethical Standards Committee placing her at the forefront of strategic decisions within the profession. She made the move from business into academia in 2013. Susan has focused on developing an active approach to her teaching.

Dr Auðbjörg Björnsdóttir

Director of the Centre of Teaching and Learning, University of Akureyri (UNAK), Iceland.

Auðbjörg has a PhD in Educational Psychology from the University of Minnesota. Her interest in active, online, cooperative and flexible learning, was sparked during her graduate studies, where she, among other things, taught statistics in an Active earning classroom. Later, she moved to Iceland where she helped establish and became the first Director of the Centre of Teaching and Learning at UNAK. In that work she continues to develop high quality teaching at the university level for example by offering teaching and assessment courses for academic staff, setting up an Active learning classroom and developing flexible learning further.

Ásta Margrét Ásmundsdóttir

Adjunct in the Department of Natural Resource Sciences, University of Akureyri, Iceland.

Ásta has an MSc in Chemistry from the University of Bologna in Italy, MBA from the University of Reykjavik, and Diploma in Education from University of Akureyri. She has been teaching the first year chemistry courses at the Department of Natural Resource Sciences at the University of Akureyri since 2013. She has been a

pioneer in finding and implementing new ways of teaching, such as Flipped classroom and Team-Based learning at the University. She has worked closely with the university's Centre of Teaching and Learning in developing an active learning environment in order to enhance students learning experience.

Dr Maria Kukhareva

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Maria's academic and professional background spans Education, Business, Social Sciences and Linguistics. In her current role, Maria leads on staff development and innovative pedagogical practice, which often occupies the space between disciplines. Her interdisciplinary work includes developing effective teaching approaches grounded in drama pedagogy, object-based learning and visual pedagogy. In 2014, Maria delivered a TEDx talk on human resilience, which was based on her doctoral research. Maria is chair of the Research and Development Working Group for the Association for Learning Development in Higher Education (ALDinHE).

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Anne studied History at Oxford Brookes, Postgraduate Information and Library Studies at the University of Aberystwyth, and obtained CILIP Chartership. Anne's library and archive expertise was developed in various organisations including the University of Oxford Bodleian Special Collections Department, University of Kent and the Oxfordshire Records Office. Her current research interests include Information and Digital Literacy,

innovative pedagogies and modern history. She has also lectured on the 'History of Female Librarianship at the Bodleian', utilising archives to bring the personal stories behind the pioneering women to life.

Katherine Koulle

Senior Teaching Fellow, Institute of Education Academic Writing Centre, University College London.

Katherine's background is in Applied Linguistics and Modern Foreign Languages. She has worked at a number of UK Higher Education Institutions in the fields of English for Academic Purposes, Academic Writing, and Learning Development. Katherine is a Fellow of the Higher Education Academy and a Steering Group member of the Association for Learning Development in Higher Education.

Andrew Middleton

Deputy Head of Anglia Learning & Teaching, Anglia Ruskin University.

Andrew is known for promoting academic innovation in support of developing a rewarding student-centred experience of the curriculum. His research reflects his commitment to developing understanding of spaces for supporting Active Learning. His wide-ranging interests include an ongoing analysis of studio-based pedagogies and cultures, the use of media-enhanced teaching and learning (METAL), non-formal learning space and the role of space in fostering student belonging and becoming. He is Chair of the UK Media-Enhanced Learning Special Interest Group.

Foreword

Active learning ought to be easy. It is what young children do when they play fantasy games, acquire language and develop social skills. Many older children are content to engage for hours in active learning by creating worlds in Minecraft or solving challenges in computer games. But as any teacher knows, putting active learning into practice in the classroom is hard work. Why should this be so?

When young children are active learners, they learn as *they* want, moving seamlessly between exploration, play, conversation and occasionally reflection. When they play together, the learning is incidental to the game. But active learning in formal education is different. At school, a shift of agency from the learner to the institution makes active learning difficult to implement. Students have to learn when, where and what the curriculum demands.

In universities, the design of teaching rooms and the demands of curriculum, timetable and exams conspire against active learning. They place demands on the university teacher not only to orchestrate a productive learning session but also to set up the classroom space to support small group learning, knowledge seeking and reflection.

In active learning, students have to think critically, solve problems and engage in guided inquiry. Most important, for active learning to work effectively they need to collaborate in groups, often of mixed ability, and overcome reluctance to share their thoughts and listen to the views of others. Students must learn from their peers and reflect on their performance. Still more, they may be required to prepare for the classroom activities by scheduling time in advance of the session to engage with teaching materials and take careful notes.

Nonetheless, active learning is effective. Active learning strategies help students work together on solving problems and designing shared solutions. Active learning promotes peer learning and shared

building of knowledge. It teaches a process of learning through cycles of experience and reflection. It can bring results of increased retention of students and enhanced performance in assessments.

One way to get students to engage with active learning is by making it more like a game. This is the idea behind development of simulation games, augmented reality and virtual reality for enhancing decision making and empathy. The latest virtual reality (VR) kit provides an immersive experience of 'being there' – in a hospital ward, a classroom, or an emergency situation. Unlike a real situation, the learner can break out of the immersion at any time and reflect on the experience or even restart the episode. Groups of students can interact to solve a shared problem. However, the technology is still immature and needs careful testing before setting students loose in the classroom with heads encased in VR helmets.

Another way is to build a carefully-designed curriculum from elements of traditional teaching and active learning, with the students always aware of when they should be active and what benefits this will bring to their learning. Programmes such as SCALE-UP, Team-Based Learning and Universal Design for Learning can offer scaffolding for learners, teachers and administrators, with clear guidance on how to enable effective learning, how to support students of all abilities, and how to design learning spaces for teamwork, reflection and group presentations.

This book shows how to put active learning into practice with large cohorts of students and how to grow that practice over many years. The authors come from a variety of institutions and discipline areas, including bioscience, pharmacy, medicine, nursing, chemistry, computing, design, accountancy, languages, history, geography, and social work. What they have in common is a desire to improve student engagement, experience and outcomes, through active learning approaches that work in practice and are scalable and sustainable. They have carried out a series of interventions that implement active learning based on best available theory and practice of how students learn, they test the effectiveness of their

innovations, and they improve the experience based on their findings.

Good examples of this persistent enhancement are SCALE-UP, a programme of active and collaborative learning combined supported by redesigned learning spaces, at Nottingham Trent University and Team-Based Learning at Anglia Ruskin University and the University of Bradford. SCALE-UP started at Nottingham Trent University in 2012, drawing on previous success in the US. The approach was reworked for UK higher education, with a pilot study across disciplines. This initiative produced generally high student satisfaction, but some negative reactions from the students, particularly towards group work. A collegiate process of re-design and enhancement over four years led to improvements in the method and the room design. Experiences were similar at Anglia Ruskin University and University of Bradford where Team-Based Learning was adopted over several years. Then, Government funding offered an opportunity to extend SCALE-UP and Team-Based Learning at the three universities. At each stage, the programme has built on previous findings about what works and has considered how to move beyond early adopters to support and develop staff at institutional level. Such long-term commitment to institutional research and enhancement of learning is rare when many universities are in a continual process of reorganisation and efficiency gains.

We see that there is no magic formula to engage students in active learning programmes. Instead, each institution has adopted a method that works for its students and setting but has also extracted common factors that lead to success. These include careful design of the learning spaces, a focus on helping students to engage with workplace problems, development of students' skills not only in problem solving and reflection but also empathy and collaboration, support for staff development, continual evaluation of student satisfaction and performance, and institutional commitment to principles and practices of active learning.

The editors from Anglia Ruskin University have not only a deep

knowledge of active learning theories and methods, but also experience of running active learning classes and team-based learning sessions. As a visiting Professor at ARU I have seen how this experience gets turned into practice through the university's commitment to enhancing teaching and learning and support for its Centre for Innovation in Higher Education. The book offers a carefully-edited collection of texts to help other institutions profit from this wealth of scholarship and practice.

Professor Mike Sharples
Open University

Preface

This book started life as an idea for publishing conference proceedings of the Active Learning Conference, held at Anglia Ruskin University (ARU), in 2017. The conference itself was part of a collaborative project between ARU, Nottingham Trent University, and the University of Bradford, who had been jointly awarded HEFCE Catalyst funding to evaluate their existing provision of Active Collaborative Learning, and expand it at their respective institutions. More details of the conference and the Catalyst Project are to be found in the contributions from the project collaborators.

Although the original idea for a collection of conference proceedings did not materialise, it provided the motivation for this collection of texts on Innovations in Active Learning in Higher Education. Indeed, some of the contributions are derived from the original conference.

The editors all work in Anglia Learning & Teaching (AL&T), the learning, teaching, and assessment development unit at Anglia Ruskin University. Simon is the Acting Director of the Centre for Innovation in Higher Education, whose mission includes promotion of active learning. Uwe is the ARU Lead Academic on the Catalyst Project, and ran the Active Learning Conference. Mark is AL&T's Research Fellow and co-organised the conference, and managed the review process for both the conference and this book.

Each chapter in this book is designed to be stand-alone and consequently we make no apologies for the repetition of terms, definitions, and explanations of acronyms, as this is inevitable if chapters are read out of sequence.

One thing we have found curious/interesting/challenging, is the use of the terms 'Course' and 'Programme'. At ARU, a course is a collection of modules that an undergraduate student follows from Level 4 to Level 6, to achieve a degree in a particular topic within their field of study. Other universities, however, refer to this as

a Programme. These terms appear, therefore, to be more or less interchangeable. In at least one chapter, however, both are used, although it is not clear what the distinction is between the two. We have, therefore, tried to remain consistent within each chapter, and remained faithful to the author(s)' original use, rather than imposing our institution's terminology.

We would like to thank the following people for their help in bringing this book together: The University of Sussex, all the authors, the reviewers, the Catalyst Project partners, the conference presenters and attendees.

Acknowledgements

We would like to thank Sharon Waller (Head of Anglia Learning & Teaching) for facilitating this book. We would also like to thank the Centre for Innovation in Higher Education, especially Cassie Fox, for performing administrative miracles. In addition, we are grateful to Rebecca Leam for her help in the final preparation of the book, particularly for proofreading the text and designing the cover. Finally we would like to thank Professor Mike Sharples for writing the foreword.

List of figures

List of abbreviations

ACL	Active Collaborative Learning
AL	Active Learning
AL&T	Anglia Learning & Teaching
ALC	Active Learning Classroom
UNAK	University of Akureyri, Iceland
ARU	Anglia Ruskin University
AV	Audio/Video
BTEC	Business and Technology Education Council
CIHE	Centre for Innovation in Higher Education
CPD	Continuing Professional Development
CV	Curriculum Vitae
DMU	De Montfort University
EBL	Enquiry-based Learning
HDMI	High-Definition Multimedia Interface
HE	Higher Education
HEFCE	Higher Education Funding Council for England
HEI	Higher Education Institution
IBL	Inquiry-based Learning
iRAT	Individual Readiness Assurance Test
IT	Information Technology
MEQ	Module Evaluation Questionnaire (aka MES)
MES	Module Evaluation Survey (aka MEQ)
NSS	National Student Survey
NTU	Nottingham Trent University
OfS	Office for Students
PBL	Problem-based Learning
POLAR	Participation of Local Areas
QAA	Quality Assurance Agency
RAP	Readiness Assurance Phase (TBL)
SCALE-UP	Student-Centred Active Learning Environment with Upside-down Pedagogies

SSLC	Student-Staff Liaison Committee
STEM	Science, Technology, Engineering, and Mathematics
SUP	Stand Up Pedagogy
TBL	Team-based Learning
TCTL	The Centre for Teaching and Learning, at UNAK
tRAT	team Readiness Assurance Test
UCAS	Universities and Colleges Admissions Service
UML	Unified Modelling Language
UDL	Universal Design for Learning
UK	United Kingdom
UML	Unified Modelling Language
UNAK	University of Akureyri
UoB	University of Bradford
US/USA	United States (of America)
VLE	Virtual Learning Environment
VR	Virtual Reality

Contents

Introduction

SIMON PRATT-ADAMS; UWE RICHTER; AND MARK WARNES

This book is primarily written for those involved in teaching or supporting learning in Higher Education (HE). It is also written for those who influence what goes on in higher education, and we are hopeful that the book will encourage and promote an awareness of the distinctiveness and value of Active Learning approaches. Furthermore, we hope that others with an interest in active, collaborative learning will find something of value in these chapters.

Active Learning

Active Learning is not a new approach. Approaches such as the Socratic method of teaching go back centuries. In the late 1980s, Principle 3 of Chickering and Gamson's (1987) *Seven Principles of Good Practice* states that students 'must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves' (1987: 4). Bonwell and Eison (1991) define active learning as learners having to

> read, write, discuss or be engaged in solving problems. Most important, to be actively involved, students must engage in such higher-order thinking tasks as analysis, synthesis and evaluation (1991: 5)

Similarly, Felder (2009) states, 'Active learning is anything course-related that all students in a class session are called upon to do other than simply watching, listening and taking notes' (2009: 2).

Active learning therefore requires students to engage actively

in construction knowledge, requiring higher order thinking. While reflecting on their own learning is part of the process, most activities in active learning involve engagement with others (Brame, 2016). Active learning is therefore rooted in constructivist and social constructivist learning theories and represent the move from instructivist or teacher-centred to more student centred teaching approaches.

Active learning has also gained prominence, especially in the English speaking world, where the HE landscape has become increasingly competitive and, in the case of the UK, is also measured and regulated by metrics including student satisfaction, employability, attainment, learning gains and added value.

The chapters in this book reflect the diversity of different active learning approaches and activities including team-based learning, SCALE-UP, flipped classroom, collaborate and cooperative, problem-based and inquiry-based learning, learning in virtual and informal spaces such simulations, virtual and augmented reality and game-based learning, to name a few (Prince, 2004; Brame, 2016).

Active Learning Conference 2017 and OfS Catalyst Project

The idea for this book, its themes and chapters were initiated by the Active Learning Conference, which took place on 11 and 12 September 2017 at Anglia Ruskin University in Cambridge, UK.

The conference was organised as part and start of the two year HEFCE (now Office for Students) funded Catalyst Project, *Scaling Up: Active Collaborative Learning for Student Success*, which involved three higher education institutions: Anglia Ruskin University (ARU), University of Bradford (UoB) and Nottingham Trent University (NTU) (project lead). The Catalyst Project is discussed in more detail in the chapters written by the project partners.

The conference presentations and workshops included a wide range of active learning approaches and experiences which is reflected in the book.

Centre for Innovation in Higher Education

Launched in 2018, the Centre for Innovation in Higher Education (CIHE) was established as a centre of applied research within Anglia Learning & Teaching (AL&T), ARU. AL&T supports and inspires all those engaged in learning, teaching, and assessment at the University through good teaching practice and innovation. CIHE drives and supports research-informed innovations in learning, teaching and assessment to improve student outcomes and to create and contribute to pedagogic research and scholarship across ARU and beyond.

CIHE aims to maximise the visibility and evidence of impact of our education initiatives in its three specialist areas of Active Learning, Digital Futures and Design Thinking Pedagogies in Higher Education. It provides impetus, guidance and collaborative support of scholarship and practice in these areas and this text brings together innovations in active learning pedagogies and pedagogic research.

Structure and Themes

The book is structured by topic with chapters grouped into three themes: Approaches to Active Collaborative Learning; Student Engagement and Retention; and Space and Resources. Each theme contains three or four chapters. However, each chapter can also be read as a stand-alone chapter in any particular order. In addition to chapters from colleagues at ARU, others are from a diverse range

of UK institutions, including project partners Nottingham Trent University and the University of Bradford, along with De Montfort University, University College London, the University of Bedfordshire, and the University of Sussex, plus one chapter from the University of Akureyri in Iceland.

Theme 1: Approaches to Active Collaborative Learning

SCALE-UP is an active, collaborative learning approach in which students engage in problem-solving and enquiry-based activities. Nottingham Trent University embarked on an institutional wide, multi-disciplinary project. Jane McNeil and Michaela Borg offer a fascinating insight into the reasons for the wide-scale adoption of SCALE-UP across their institution.

Uwe Richter and Rachel Berkson's chapter presents the positive outcomes of a large-scale research project at ARU into the adoption and impact of Team-Based Learning (TBL) that uses a flipped classroom approach and a structured process to motivate and support collaborative learning. Significantly, they found that the adoption of TBL increased student engagement, performance and attendance compared to traditional methods.

A powerful case for transitioning to active and collaborative learning is made by Simon Tweddell from University of Bradford. TBL was introduced on a final year module with the intention of enhancing engagement and the development of higher-level thinking skills. Compared with pre-TBL cohorts, results clearly demonstrated student preference for and satisfaction with TBL as well as developing accountability to their team. Performance in examinations was also higher among the TBL cohorts.

Theme 2: Student Engagement and Retention

In order to help address poor engagement and retention, Nicky Milner redesigned ARU's extended medical sciences degree to embed team-based learning as a method for providing formative feedback and introduced personal learning logs to monitor student academic progress in real-time during the teaching period. Here Nicky explores the pedagogy behind the curriculum development and considers the impact of mapping course and module learning outcomes, to ensure that learning and teaching material is constructively aligned, and that assessment has relevance.

Colleagues from the Faculty of Health and Life Sciences at De Montfort University applied a Universal Design for Learning (UDL) approach to re-designing the capstone assessment on a second year bioscience module studied by large cohorts of highly diverse students. The innovative approach required students to work actively in teams on a problem-solving task, drawing upon critical-thinking skills, and resulted in an overwhelmingly positive response from students.

As creating high-quality virtual reality (VR) simulations are becoming increasingly accessible and affordable, the question is shifting from if to how VR can be applied to facilitate learning. VR is a uniquely spatial medium capable of deeply immersing users within detailed, interactive, spatial simulations providing a powerful tool for grounding knowledge that bridges the gap between theory and practice while promoting active, lean-forward engagement with learning content. Drawing on examples from teacher education, social care and nursing, ARU colleagues discuss the findings of ongoing research, outline the theoretical motivations for using VR, and highlight the lessons learned.

Following a successful pilot project, ARU has been expanding its use of TBL as an Active Collaborative Learning method. In their chapter Rachel Berkson and Uwe Richter discuss the wide scale adoption of TBL. Drawing on the findings of an OfS funded project

discussed elsewhere in this volume, the authors identify both the barriers and solutions to 'scaling up' and reflect on the opportunities and challenges of adopting educational innovations at an institutional scale.

Colleagues at ARU, Mike Hobbs and Elaine Brown from the Faculty of Science and Engineering, used a structured set of 'feedback cycles' involving peer assessment, called the 1, 2, 3 Feedback Cycle. This improved both attendance, and the submission rate for assignments, the pass rate for which also increased. Students particularly enjoyed the interactivity and collaboration with peers, and improved assessment literacy.

Susan Smith from the University of Sussex introduced authentic teaching and assessment into their course. Students were required to operate in a professional environment to develop their skills, both professional and generic. Student reflections on their experience showed them to be much better prepared for the workplace.

Theme 3: Space and Resources

Auðbjörg Björnsdóttir and Asta Ásmundsdóttir from the University of Akureyri in Iceland present the results of an evaluation of the change from traditional classroom design to an active learning configuration. This transformation has led to the inclusion of telepresence robots to facilitate active learning for distance learning students.

'Layers of Interaction' is an approach that enables learners to be supported in actively driving their own inquiry, and deeper engagement with the subject. Colleagues from the University of Bedfordshire and University College London examine a series of object-based learning artefacts that support both individual and collaborative active learning through collaborative enquiry (interaction with peers); object-based learning (interaction with

artefacts); and knowledge construction (interaction with the topic, or discipline).

Presenting a series of vignettes from an autoethnographic perspective, Andrew Middleton describes a journey of active learning provision in which he adopts and adapts space to form innovative, active teaching and learning spaces. Redesigning existing classrooms into flexible, learner-centred teaching and learning spaces, involves collaboration and cooperation, and a blend of opportunity and strategy.

Conclusion

In the final, concluding chapter we bring together key themes and issues that have been discussed in previous chapter. We also offer some concluding remarks regarding the central concerns of 'Active Learning in Higher Education'. In this concluding chapter, we consider both the opportunities and challenges that Active Learning presents and give some reflections about the wider implications to pedagogic practices presented in the book.

We hope you enjoy reading this book and that you find inspiration from the stories shared by the authors.

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PART I

THEME 1: APPROACHES TO ACTIVE COLLABORATIVE LEARNING

1. SCALE-UP at Nottingham Trent University: The adoption at scale of an active learning approach for diverse cohorts

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Introduction

This chapter focuses on strategies to adopt Active Learning (AL) at institutional scale. There are several reasons why a strategic approach might be needed to expand the use of a highly regarded pedagogic approach, widely discussed, and with evidenced benefits (Freeman et al., 2014; Inge, 2018).

Firstly, AL is such a loosely-defined and widely-used term as to be rendered almost meaningless in terms of shared understanding of approach (Balz, 2018). This presents challenges for understanding its prevalence or assessing its benefits for students in any given context, and in addition, the rationale for its use is rendered opaque to students.

Secondly, AL techniques are observable at the level of classroom practice, but less so in terms of module and programme design. This tactical deployment might be unproblematic, except that it can present challenges in understanding how these pedagogies are supported within a programme team's repertoire. For example, how they are used across and between levels of study, how they can be assessed for efficacy beyond the immediate context, and how

their use relates to the overall learning, teaching, and assessment strategy of a programme.

Programme leaders comment that, for large cohorts of students, didactic approaches like lectures remain the dominant pedagogy, not because they are always preferred, but because of operational constraints and resourcing, which are often outside the programme team's control.

The interest in creating learning environments that enhance learning and teaching has been widely discussed (Bothwell, 2015; Cotterill, 2015; McNeil and Borg, 2018). Although this is often described as a shift away from tiered lecture theatres towards flexible spaces to support a range of uses for collaborative, active and enquiry-based learning (EBL) approaches, the reality is less straightforward. Institutions face challenges in predicting and providing an appropriate range of learning and teaching spaces, in the right proportion, at the right time and location.

These considerations mean that, without planning and support, achieving and sustaining changes in pedagogy is challenging, whether for a single programme team, or an entire institution. Educational developers often share stories of pedagogic 'lift and shift', where investment in flexible spaces, engenders disappointment when the expected change in practice does not follow (see Brown, 2012). Similarly, lecturers share stories of being unable to introduce innovative pedagogies, because of space or organisational constraints (see Chism, 2002).

These challenges can be addressed by an institutional, strategic approach to AL adoption. The case described in this chapter used a community-based, voluntary and inclusive approach. This is not the only approach to educational change at scale, but it works well where programme teams are also engaged in their usual activities and where other institutional developments need attention. It affords academics control over the context for adoption, which is highly desirable not only as a principle, but also important in terms of achieving deeper and more sustainable change.

Desirable characteristics of a pedagogy for a strategic approach

An important consideration for a strategic approach is the choice of AL pedagogy. Selecting a specific approach has several benefits: it can be described and named, engendering higher confidence in a shared understanding. A supporting community can be developed around this, generating institutional visibility which aids discussions about resources needed to support programme teams.

The AL approach should be well-matched to the reasons for adoption, to the means and ends, with student learning and outcomes at the forefront. It should also accord with institutional values, or, if change to these values is sought, at least not be so far away as to be rejected.

It is also useful if the approach is already well-defined and well-described. A comprehensive framework and detailed guidance help lecturers adapting the pedagogy for their own context. Additionally, specifics about the design and practice of a given pedagogy are important in assessing its benefits (McNeil and Borg, 2018). Prince (2004) comments that the many 'distinct approaches to [Problem-Based Learning] can have as many differences as they have elements in common' (2004: 224) which creates a challenge in knowing which features afford benefit in a given context, and therefore which to use. Published evaluations of the approach in several settings are also useful for adoption, preferably using factors related to student outcomes (rather than only student satisfaction) and the same measures for comparability.

In addition, many perfectly sound educational developments are never adopted beyond the original innovators because they are simply unfeasible outside that context, or at scale (Serdyukov, 2017; Taylor, et al., 2018). A degree of pragmatism is needed in assessing whether an approach can be adopted given factors such as staffing, estate, timetabling, and contact time, and what might need to change to accommodate an approach at scale. These considerations

should be evaluated alongside pedagogic efficacy when trialling approaches.

SCALE-UP

SCALE-UP (Student-Centred Active Learning Environment with Upside-down Pedagogies) is an AL approach pioneered by Professor Robert Beichner at North Carolina State University (NCSU, 2011). Originally developed in Physics for Engineering students, SCALE-UP has been adopted in many disciplines, by over 200 institutions worldwide (Beichner et al., 2007). It integrates educational approaches in a novel way and combines pedagogy with a distinctive learning space design. Teaching is flipped 'upside-down', with conceptual material encountered outside the classroom, and class time devoted to discovery and application of ideas. Students may be involved in teaching their peers while the lecturer facilitates, asking questions and sending one team of students to help another. Students receive frequent formative feedback from peers and the lecturer. The classroom space is designed with round tables, shared whiteboards and laptops to facilitate discussion and group activity.

SCALE-UP is described in scholarly literature (Beichner and Saul 2003; Beichner et al., 2007; Gaffney et al., 2008). Table 1.1 summarises those features documented in the literature using the authors' descriptive framework (McNeil and Borg, 2018).

It is therefore a highly accessible approach to adopt. There are also several published evaluations of the approach in different institutions (Prince, 2004; Dori and Belcher, 2005; Freeman et al., 2014; Foldnes, 2016) that use the same factors as Beichner et al. (2007), who found that students':

- Ability to solve problems was improved
- Conceptual understanding was increased
- Evidenced better attitudes to study

- Failure rates were reduced
- Benefits were sustained in subsequent programmes

Beichner et al. (2007) also found that use of SCALE-UP addressed unexplained disparities in attainment for students from disadvantaged backgrounds.

Overall, therefore, SCALE-UP is a good candidate for adoption, because it is a mature approach that is well-described, its benefits have been evaluated in different contexts, and a blueprint exists for space design and technology, as well as pedagogy.

Table 1.1 SCALE-UP features

A: Approach Overarching approach of the teacher or teaching team	A1 Draws on Physics Education Research, Workshop Physics, Studio Physics, Peer Instruction, Interactive Lecture Demonstrations. A2 Intention to 'facilitate active, collaborative learning in large classes' at two universities. A3 Agenda to improve outcomes for introductory, calculus-based physics for engineers, by making changes to curriculum, pedagogy and 'classroom environment'. Space and pedagogy redesigned together, over several iterations.
B: Design Planning decisions for learning and teaching	B1 Highly structured design begins with defining 'instructional goals' for each class (objectives/outcomes). This is contrasted with limiting plans to topic coverage. Class sizes of 50–100 students with 2–4 instructors (lecturers and teaching assistants). B2 Students undertake conceptual learning before class and the class itself is based on a series of 5–15 minute segments of activities, interspersed with short plenary discussions of findings. Typical activities are problem-solving and conceptual understanding. The design of the learning space is a characteristic feature of SCALE-UP. Students sit at large circular tables and work in groups of 2–4, with identified roles and sharing access to computers and equipment. Students show work to peers and seek and give feedback. Group composition is based on prior performance; each is comprised of a student from the top, middle and bottom third of assessment rankings. Students complete more challenging follow-up problems after class, to practice and to deepen their understanding. Detailed rubrics are used for grading lab reports.
C: Practice Tactics and strategies in the classroom	C1 Several *Classroom management procedures* appear significant in the success of the approach: Groups operate on contracts and there is a (rarely used) protocol for 'firing' members. Instructors find they get better at timing the tasks and managing the class with experience.

Introducing SCALE-UP at Nottingham Trent University

Nottingham Trent University (NTU) was the first UK university to

pilot SCALE-UP in an institutional, multi-disciplinary project, beginning in 2012/13. There were several motivations for this including developing use of AL across NTU. Active collaborative approaches offer benefits for development of employability-related attributes such as group working, and problem solving (Prince, 2004). Approaches related to EBL can share benefits associated with those pedagogies, such as encouraging curiosity and developing resilience. AL, therefore, aligns well with the goals of institutions like NTU, with its strong mission focus on access, social mobility and employability (NTU Strategic Plan). Thus promoting AL and supporting expertise is a major theme in educational development at NTU.

There were three main reasons why we decided to use SCALE-UP in a cross-institutional pilot study. First, the research underpinning the assertions of the benefits of SCALE-UP was persuasive. Beichner et al. (2007) presented data comparing the experience of 16,000 physics students at NCSU, and considered benefits in terms of learning outcomes, rather than simply student satisfaction. Further evaluations have been conducted in other institutions resulting in a convincing body of comparable evidence (Dori and Belcher, 2005; Beichner, 2008; Gaffney et al., 2008).

The second reason was the appeal of EBL. Many benefits have been reported for EBL approaches (Healey and Jenkins, 2009; Spronken-Smith and Walker, 2010), but, although EBL has a long history, for many lecturers and students it represents a new technique. SCALE-UP can function as an accessible introduction to EBL: assisting lecturers making a transition from didactic and discursive forms, and scaffolding students' enquiries. SCALE-UP can draw on a number of EBL modes, from closed problems to more open enquiry. However, under Levy's (2009) conceptual framework, SCALE-UP largely operates in the staff-led domains of *identifying* and *producing*. Nevertheless, the challenge of using EBL methods with large cohorts is that it can be expensive, whereas SCALE-UP can be used successfully in class sizes of around 100.

This potential of SCALE-UP for use in large classes presented

a third opportunity. In many HE institutions, lectures continue to dominate as the mode of large group teaching. NTU programme leaders frequently suggested that the substantial use of lectures was not always because it was the preferred way of teaching, but because spaces for large groups tended to be built to accommodate that type of teaching. SCALE-UP offered the opportunity to challenge the dominance of lectures, change the assumptions around space design for large groups, and, perhaps, to disrupt didactic modes of teaching.

Lecturers who volunteered for the pilot reported similar motivations, alongside other interests. The most frequent reasons cited in interviews included:

- Lectures were perceived to be ineffective
- Wishing to use technology in the classroom
- Attracted by the SCALE-UP rooms
- Opportunity to further develop EBL
- Student engagement
- Trying a new teaching approach
- Opportunity to teach the whole cohort

Hence SCALE-UP provided a focus for an institutional project around learning and teaching. From the start there was an ambitious and deliberate plan to pilot at scale and to use a strategic approach that included an extensive evaluation to build a case for further development.

Strategic pilot to wide-scale adoption

The appeal of the SCALE-UP approach was useful both in securing institutional agreement to pilot it, and the subsequent expansion.

Stage 1: Start up and pilot study, 2012/13

There are many ways to introduce a pedagogic development, with different degrees of formality, including sharing good practice and hoping for adoption, small-scale experiment and roll out, professional development programmes, and policy mandates. For SCALE-UP, we decided on a one-year pilot to test its benefits and to evaluate its feasibility in business terms. It was a highly visible project, working only with volunteers, with a goal of 30 lecturers from as wide a spread of disciplines as possible. We judged this would improve the chance of adoption spreading afterwards, and allow assessment of the approach in different disciplinary contexts. We were aware this approach carried increased risk and created challenges for evaluation. However, the limitation in more risk-averse approaches is that they often are not taken up, are not sustained, or fail to jump from initial development to wider adoption (Taylor et al., 2018). Our goal was to start a movement as well as trial a pedagogic approach.

In the event, we recruited academics on 37 modules, in Levels 4 to 7, across seven schools and 13 subjects: Art and Design, History, Education, Law, Sociology, Social Work, Criminology, Computer Sciences, Business Studies, Forensic Microbiology, Sports Science, Physics, and Academic Literacies.

We used a collegial approach to recruitment, development and evaluation, with town meetings to plan, agreements on data sharing and ethics, workshops to learn the approach, and support from educational developers throughout. The latter initially extended to in-room support. We also decided on an inclusive approach and support any way that a lecturer wanted to introduce SCALE-UP. Thus a variety of contexts and practices could be accommodated and it was hoped that this would encourage wider participation in the project, allowing colleagues to experiment with the approach to the extent that they deemed appropriate. This meant, for example, that while some pilots converted their whole module, others used SCALE-UP in selected sessions only.

Consequently, four classrooms were re-designed to create two SCALE-UP spaces, featuring large, round tables, which support collaborative working and create an egalitarian feel and a less formal atmosphere (Gaffney et al., 2008). Circulation space and lines of sight are also important, given that one lecturer works with up to 100 students. Each group was provided with laptops and portable whiteboards, and each room also had two or three displays with screen-casting facility (see Figure 1.1).

Figure 1.1 SCALE-UP room at NTU

Evaluation of the pilot

Given that many of the US studies focused on STEM subjects, the institution-wide evaluation assessed whether SCALE-UP would transfer to a UK context, and tested its efficacy across disciplines. The potential and feasibility for expansion of SCALE-UP were also assessed, along with the conditions needed for successful adoption,

such as teaching strategies, resources, equipment, rooming and scheduling.

Evaluation design decisions were influenced by the context of the pilot as generating data across so many modules required a high level of coordination, for example, despite a limited budget. Wherever possible, therefore, we used data which were generated for other purposes. Furthermore, the inclusive approach to recruitment meant that there were mixed approaches to the use of SCALE-UP. We therefore developed a typology to identify and group modules:

- 'SCALE-UP *lite*' indicated that the module tutor(s) adhered to the core principles of SCALE-UP and followed most, if not all, of the characteristics of the approach. All of the year-long modules were described in this way.
- 'SCALE-UP *hybrid*' denoted modules that adopted all the principles and most of the characteristics of SCALE-UP, but did not use the approach in all sessions; thus other principles of learning and teaching influenced teaching on the non-SCALE-UP sessions.

The half-year modules taking part in the project were quite evenly split between *SCALE-UP lite* and *SCALE-UP hybrid*. No modules in the first year of the project committed to full SCALE-UP throughout the entire module.

Overall, the findings were cautiously positive. Evidence suggested that *conceptual understanding* was improved through engagement with SCALE-UP, attributed to higher levels of interaction between peers, the opportunities to ask questions, and greater engagement with learning materials. Most pilot module leaders and students were positive about the impact of SCALE-UP on students' *problem solving* abilities. In contrast to US studies, which found that *attendance* averages were improved (Beichner, 2008), NTU attendance data did not indicate any difference from non-SCALE-UP modules. Module tutors judged that factors influencing

attendance (either positively or negatively) were largely similar for SCALE-UP and non-SCALE-UP modules.

Student satisfaction data for the SCALE-UP modules were positive with high module satisfaction ratings. However, in detailed feedback students reported mixed views of SCALE-UP, with strikingly polarised reactions, particularly to group-work.

For overall grades, a comparison suggests that SCALE-UP did have a positive effect on attainment. More than half of the modules saw a notable improvement in grades in comparison to the previous year. However, no conclusions for failure rates could be drawn from this study due to limited comparative data.

Module tutors reported that preparation for SCALE-UP teaching took longer than anticipated in many cases, as it required the rethinking of module content and redesign of activities and resources. Some colleagues felt this was a useful opportunity to reflect on their practice.

In general, the technology was used as envisaged, with each group of three students sharing a laptop to find information, view learning resources, create material, and present their work. Students also brought their own devices.

The pilots allowed identification and resolution of challenges associated with combining multiple technologies and multiple users, and the screen-casting system, for example, was refined over several iterations. SCALE-UP produced a noisy classroom environment and voice augmentation provided for lecturers was later extended to students.

Lecturers and students identified the rooms as one the greatest benefits of the project, describing them as inspiring spaces and highly useful for collaborative learning. The room layout, and the round tables, allowed lecturers to engage with students more easily than in traditional rooms. The small whiteboards were also considered very useful, and were used by students in creative and problem-solving activities, and for presenting to the class.

Some comments from module tutors included:

The main thing with SCALE-UP is capturing how students learn, because I think years and years of evidence have shown us that students don't learn the way we teach so what we need to do is start teaching the way they learn and that's what SCALE-UP does

[B]eing able to interact with students is better than just standing in front of them talking, and it did really reinforce that, particularly going back into the lecture theatre … I have been trying to keep some of the principles

I have turned the curriculum upside-down

And from students:

At first I did not like [it] but as time went on I enjoyed it and [it] always kept people engaged

I would have preferred to have a more traditional lecture

I like that I am not just spoken to for an hour and that's it

I feel more enthusiastic coming to these sessions

Stage 2: Expansion

The pilot was judged a success, not simply because the evaluation findings were sufficiently encouraging to gain institutional support to continue, but also because the project had generated widespread positive feeling about SCALE-UP. After the first year, adoption expanded quickly, and more SCALE-UP rooms were built, with demand often outstripping accommodation.

This success can be attributed to several factors:

1. The impetus started with the pedagogy: we selected one that was right for the institution at that time, and we confirmed academic colleagues' interest in it, before proceeding.
2. We were relentless in promoting the project: attending committees, sending newsletters, talking about SCALE-UP everywhere. As part of this drive, Robert Beichner was invited

to speak, and we invited academic and professional service decision-makers to meet him. He also hosted workshops for the project participants.
3. There was genuine support from senior leaders, the Library, Estates, Information Services, Timetabling and Academic Administration.
4. We changed both business process and pedagogy.
5. We evaluated both operational feasibility and educational outcomes and ensured the evaluation report was circulated to all stakeholders.
6. We provided considerable support for academics.
7. We used a community approach, with voluntary participation, and many opportunities to share ideas. This created a peer support network for SCALE-UP and also established good conditions for sustainable educational change.

These factors are very similar to those identified in a review of 21 successful SCALE-UP implementations in the US (Foote et al., 2016). These authors reported 'enabling factors' including administrative support; being able to evidence success; funding for room modification, teaching resources and staffing costs; interacting with and visiting other, more experienced SCALE-UP users; a start-up team with multiple members; a culture that supports active teaching; enthusiastic champions; and, educational development support.

The evaluation identified pedagogic and operational considerations for expansion. For example, further guidance for new adopters was developed, initially around preparing students for SCALE-UP, group management and assessment design, which was then developed into a full handbook (McNeil et al., 2017). Operational adaptations were made, particularly regarding room and technology specifications, and academic workload planning.

A significant benefit of the project has been developing the dialogue between different support departments around learning spaces, and a general raising of the level of understanding about

how teaching rooms shape and influence pedagogy. This has inspired a major change to the assumptions for planning the estate, and what Fisher and Newton (2014) described as 'next generation learning environments', are now routine features of teaching and study spaces. There has also been a marked increase in interest in related pedagogies such as flipped learning and enquiry approaches. To develop this interest, we supported an institution-wide project encouraging staff to increase student interaction in lectures.

This project aimed at influencing 'mainstream' practice for large group teaching and capitalised on the success and enthusiasm for pedagogic innovation that followed in the wake of SCALE-UP. In managing the growth in SCALE-UP alongside the development of suitable estate, we experimented with the use of SCALE-UP teaching strategies in non-SCALE-UP rooms, and the use of 'pop-up' SCALE-UP rooms (i.e., hybrid spaces which are set up to mimic a SCALE-UP space on some days of the week). These tactics and their wider benefits are reflected in Knaub et al.'s (2016) discussion of variations in space design in SCALE-UP in US classrooms, which they term 'productive customisation' (2016: 20). Similarly, Soneral and Wyse (2017) compare the impact on student grades and satisfaction of a classic room with a 'mock up' or low-tech version, finding little difference.

Scaling up even further

For the four years following the initial pilot (i.e. 2013/17), adoption of SCALE-UP at NTU increased organically year-on-year. We maintained a high profile and invited interested colleagues to contact us. An opportunity for a more strategic approach to growth arose in 2017 from a government-funded project to adopt at scale approaches which smaller studies had shown to address barriers to student success. With partners University of Bradford and Anglia

Ruskin University, the *Scaling Up Active Collaborative Learning project* (2017/19) undertook further expansion of SCALE-UP alongside an evaluation of the efficacy of the approach to address unexplained disparities in student progression. The strategy for wider adoption focused on programme-level adoption. The rationale was based on our experience that the most successful SCALE-UP work occurred when a course team worked together to plan and implement the approach on several modules (rather than in isolation), as part of a programme-wide learning and teaching strategy. There were several challenges in our existing, collegial approach to expansion of SCALE-UP. From the beginning, we suspected that SCALE-UP adopters tended to be those innovative colleagues, who had a good understanding of pedagogy, and were already receiving positive feedback from students. As adoption expands, individual lecturers might need more support. Increasing demand on support that wider adoption requires is a significant consideration and required a move from a bespoke approach, to creating workflows and an end-to-end process that is more manageable at scale. This change represents a considerable cultural shift for educational developers.

Andrews et al. (2011) investigated the impact of AL when used by 'typical instructors' rather than education specialists, and reported that it cannot be assumed that the use of AL is itself going to result in learning gain as some practice may be ineffective. Our 2012/13 pilot found that colleagues' use of SCALE-UP showed considerable variation. Currently we are investigating the impact of the 'breadth' and 'depth' of adoption, and the influence of practitioner experience. So, for example, we are analysing the extent to which a set of identified SCALE-UP components is used in a module, and the number of SCALE-UP sessions used across a module. Together with student feedback, these data should help us to gain a nuanced picture of SCALE-UP use.

Characterised from the beginning by a strategic approach to recruitment and awareness-raising and a collegial approach to development and engagement, SCALE-UP at NTU has grown

substantially from a pilot of 37 modules to large-scale adoption, whereby around fifty per cent of programmes use an element of the approach.

Pedagogic innovation: factors in widespread adoption

The SCALE-UP project at NTU is different from many educational development projects in two main ways:

1. It has been institution-wide from the start: many developments around pedagogy never make it beyond one or two subject areas
2. There are lots of examples of universities developing new spaces for learning and teaching, but not seeing changes in teaching practice subsequently

Figure 1.2 shows the model we used for the wide-scale adoption of a SCALE-UP at NTU.

It is crucial to develop a community of staff and students around the innovation, and while it is easier to engage colleagues if the approach is inclusive, it is important to understand how it is being adopted and adapted in different disciplines. A typology of use can help both dialogue around educational development support and evaluation. Evaluation is crucial and must address business feasibility as well as educational benefits of use, to engage colleagues from different areas of the university, and different levels of seniority. Evaluation is central to building a case for the impact, and to getting the message out into the broader university community. This engagement should be expansive, and include academic colleagues, the Students Union, colleagues in Estates, Timetabling, and Information Systems, for example, and, as SCALE-

UP has a particular classroom design, early engagement of colleagues in Estates is crucial.

Figure 1.2 Model for wide-scale adoption of a pedagogy: SCALE-UP room, NTU (McNeil, 2018)

An important element of maintaining momentum and achieving widespread adoption of SCALE-UP is to continually expand and recruit new lecturers. At NTU, this involved working with Timetabling to create a process around identifying colleagues who might want to do SCALE-UP and then getting them into the right room. As we have grown, we have also worked with tutors to adapt SCALE-UP to work in a wider range of contexts and spaces. This helps community building and balancing estate development need versus availability. In addition, we have generated spin-off projects including using AL in lecture rooms with over 100 participants. In other words we have been both strategic *and* opportunistic in developing SCALE-UP at NTU.

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2. Increasing student engagement in their learning through active collaborative learning

UWE RICHTER AND RACHEL BERKSON

Introduction

This chapter provides an overview of scaling up and evaluating Team-Based Learning (TBL) as an active collaborative learning approach at Anglia Ruskin University (ARU) over three academic years (2015 to 2018). After an introduction to the institutional and UK Higher Education context and the rationale for introducing TBL at ARU, the chapter discusses the evaluation as part of an Office for Student (OfS) Catalyst Project, including methodology, results and concluding with recommendations.

What is TBL?

According to Sweet (2010), TBL is a

> special form of small group learning using a specific sequence of individual work, group work, and immediate feedback to create a motivational framework in which students increasingly hold each other accountable for coming to class prepared and contributing to discussion (2010: 6)

TBL is an active learning methodology suitable for a range of disciplines, and one, which can readily be understood and adopted by teachers (Morris, 2016). It provides a flexible framework into which other pedagogies can be incorporated, such as problem-based learning, enquiry-based learning, for example. It offers rich formative feedback throughout a course (called programme elsewhere), from peers within each team and across teams, as well as from tutors.

TBL is a structured approach, which combines flipped or inverted learning with team-based in-class activities. Materials are provided to guide independent pre-class learning, covering the core concepts, theories and models for the topic. Pre-class learning is assessed via the Readiness Assurance Process, which involves both individual (iRAT) and team (tRAT) multiple choice tests followed by tutor feedback to address gaps and misconceptions identified by the tests. Teams then carry out activities in which they apply concepts and theories to practice (Application Exercises). These activities use what is called the 4S approach where the activity tackles a *Significant* problem; teams work on the *Same* problem; make a *Specific* choice; and report their results *Simultaneously*. The tutor strategically assigns students to teams at the beginning of a module or programme which remain constant throughout the semester/year.

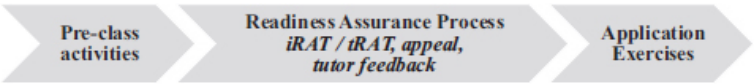

Figure 2.1 Team-based learning process

TBL was initially developed by Larry Michaelsen in the late 1970s as a response to the need to move from small to large group teaching. TBL became more established in the 1990s and spread worldwide as well as from predominately business-related disciplines and medical and related areas to other subjects (Michaelsen et al., 2002).

TBL caters for ARU's mission to support a diverse student body and increase attendance, participation and engagement. It does this

through the accountability to teams, the use of frequent summative tests of pre-class learning (i.e. iRAT/tRAT), followed by authentic learning activities supporting active and deep learning (Michaelsen and Sweet, 2009).

In the past 20 years research into the effectiveness of TBL has increased, demonstrating improved educational outcomes (Haidet et al., 2014). However most studies focused on pilots or case studies and there is little research evidence about the routine or institutional use of TBL (Sisk, 2011; Burgess et al., 2014; Dearnley et al., 2018).

Institutional and UK Higher Education context

ARU is a modern university having received university status in 1992. It has four main campuses and a number of regional partners located in the East of England as well as international partners serving a diverse population of approximately 39,000 students. ARU has 'invested heavily in recruiting and supporting a student body that draws students from a wide range of backgrounds. As a result, ARU has one of the most equitable mixes of undergraduate students of all UK universities' (ARU, 2018: 1).

ARU's University Strategy, *Designing our Future 2017–2026*, includes commitments to 'provide an inclusive, stimulating and innovative curriculum which supports our diverse student population [and to] attract, engage, challenge and empower students from a wide range of academic and societal backgrounds to reach their full potential' (ARU, 2017: 3). Consequently, the university promotes staff development that is 'focused directly on our students' educational experience' (ARU, 2018: 2). Among other measures, staff development has focused on active collaborative learning practices, and an institution-wide drive to shift the balance of feedback away from summative and towards formative feedback and feed forward at an earlier stage. The learning and teaching

provision at ARU aims to ensure success in measures such as student attainment, retention and employability to successfully compete in the UK Higher Education landscape.

Active Collaborative Learning: TBL

As part of improving student performance, attendance, satisfaction, and ultimately retention and employability, ARU has introduced a number of active learning approaches into the curriculum. One of these approaches, TBL, was introduced to ARU staff through staff development led by Professor Larry Michaelsen (University of Central Missouri) and Dr Simon Tweddell (University of Bradford) in the 2014/15 academic year, which was followed by a number of pilots in 2015/16. Staff development continued to be provided internally and more staff were encouraged to adopt TBL across all disciplines in a push to scale-up active collaborative learning. There was strong senior management support, which is reflected in institutional policies and strategies as well as investment.

Based on the success of the TBL implementation, funding was secured in 2017 from the OfS Catalyst Project, *Scaling up Active Collaborative Learning for Student Success* (NTU, 2019), with two other universities, Nottingham Trent University (NTU), which was the lead institution, and the University of Bradford (UoB), to scale-up active collaborative learning activities. This meant TBL at ARU and UoB, and SCALE-UP (Student-Centred Active Learning Environment with Upside-down Pedagogies) at NTU (NTU, n.d.) and evaluate their impact with a specific focus on students from groups that frequently underperform in higher education.

Methodology

Starting in 2015/16, we evaluated our TBL pilots using a mixed methods approach of student and staff surveys (Semester 1, 2015 and 2016), and semi-structured staff interviews (Semester 2, 2016).

As part of the OfS Project, we evaluated TBL more widely at ARU in conjunction with our two project partners using student and staff surveys and student data on attendance, engagement, satisfaction and performance for each module and course. We compared TBL modules with non-TBL modules in courses including at least one TBL module. Starting from our initial research, we also identified barriers to scaling up TBL at ARU and identified and developed solutions to address these challenges (see Chapter 7). This was an ongoing piece of research whereby the original list of barriers was updated when new barriers were identified and/or solutions found.

Adoption was evaluated in the 2017/18 academic year against a typology of constituent elements of TBL to identify various combinations (Berkson and Richter, 2018). While most adoptions followed the original TBL approach, there were variants in the elements used (e.g. the classroom may not have been flipped or iRATs/tRATs were only used formatively). A further variation was the duration, with a small number of modules only applying TBL in some sessions and not throughout a module.

Results

In the following sections, we summarise the main ARU results from the different student and staff evaluations of the OfS project. There were a number of common results across different methods of evaluation, so we have combined these findings. The majority of questions in the two student questionnaires in 2015 and 2018 were similar, while some questions in the 2018 version were included to

accommodate the different active collaborative learning approaches and environments of our project partners. The questionnaire results provided differentiated and deeper insights into the student experience with TBL. The 2018 staff survey focused on defining the variations of TBL based on a typology but also included some qualitative questions relating to the experience of staff with TBL.

The biggest set of data was the comparison of TBL against non-TBL modules within a course looking at TBL modules alongside non-TBL within a year and across three years (2015 to 2018) for student performance (i.e. module marks, course completion rates, and pass marks), attendance and satisfaction (based on Module Evaluation Surveys (MES)) as well as engagement by modules (based on a combination of attendance, library and virtual learning environment use). The numerical data also allowed us to drill down to results by groups of students defined by gender, age (i.e. under and over 21 years), POLAR data (i.e. postcode), minority groups, and disabled students.

Extent of Adoption of TBL across ARU

To identify modules using TBL across the institution, we used a combination of timetabling information (i.e. use of Active Learning rooms), reports from faculty Directors of Learning and Teaching and TBL Leads, and sometimes anecdotal information. Confirming an accurate number of TBL modules proved to be a challenge as teaching methods are not coded on any university systems, which meant reliance on personal contact, and often chasing information to establish the real extent of TBL adoption in each of the faculties. To identify the number of courses including TBL modules, we used a data extract from the student administration system and filtered by undergraduate courses with TBL modules delivered on ARU's main campuses. Over the past three years (i.e. 2015–18), ARU has seen a steady increase of TBL at module level from an initial 25 modules

in 2015/16, mainly in Business and Sciences, to 32 in 2016/17 (+28 per cent), and 38 modules in 2017/18 (+18.8 per cent) across different disciplines.

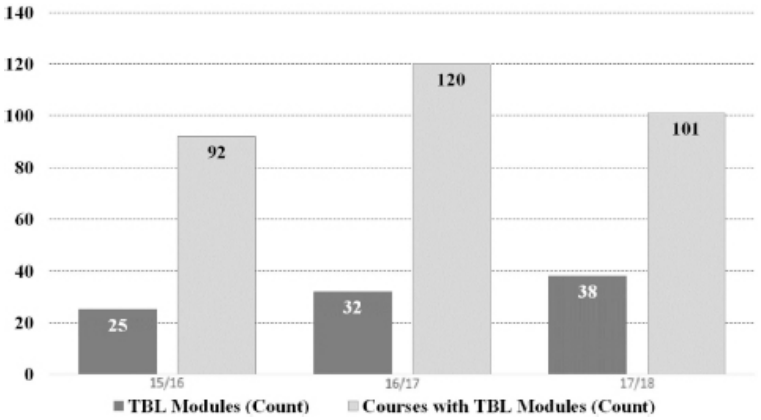

Figure 2.2 TBL adoption by module and degree course

Adoption by course increased between 2015/16 and 2016/2017 but dropped in the following year. However a number of large modules are shared across several courses. Some of these modules stopped using TBL in 2016/2017, which explains the reduction in the number of courses in that year, while the number of modules increased (see Figure 2.2). Discontinuation of TBL can be attributed to a number of different causes, ranging from discontinuation of the module altogether, to a change of module leader or tutors, and sometimes as a result of changes in the re-approval process.

Quality of Adoption against the TBL Typology

We sent a survey to 28 module leaders, who were identified as running TBL modules in 2016/17 and received 19 responses (68 per cent) regarding 30 modules (some module leaders ran multiple TBL modules with similar approaches). The survey focused on

identifying the format of TBL taken by the different modules using a TBL typology based on a maturity model with higher maturity attributed to higher levels of student-centred and independent learning. The spider diagram in Figure 2.3 illustrates the adoption across all 19 responses.

Most tutors use TBL-type application exercises and broadly adopt a 4S approach. There are, however, variations between different modules with many lecturers not truly flipping the lecture, but instead using a lecture or just reading in place of pre-work, or mixing TBL with other active learning approaches. Another frequent variation is a mix of formative and summative TBL assessments.

Another variation concerned how TBL was adopted in modules with the emergence of 'occasional' TBL as new phenomenon. In these instances, module leaders adopted TBL only for a few sessions rather than across the whole delivery, which meant that the positive effects of forming permanent teams was limited. The figures in Figure 2.4 below illustrate how three categories of variations we identified performed for attendance and module mark. The term 'Half-TBL' described modules with either a mix of TBL with other approaches, or elements of TBL such as application exercises were used, but the lecture was not flipped. Figure 2.4 also shows how a particular TBL variation performs on module marks with a full(er) adoption performing better than the other two against the average module mark of non-TBL modules. Students tend to perform worse in modules where some elements of TBL were not adopted. This suggests that the limited or occasional adoption of TBL during a few weeks in a module is unlikely to have a significant effect on module performance as performance is based on the dominant approach used to teach these modules.

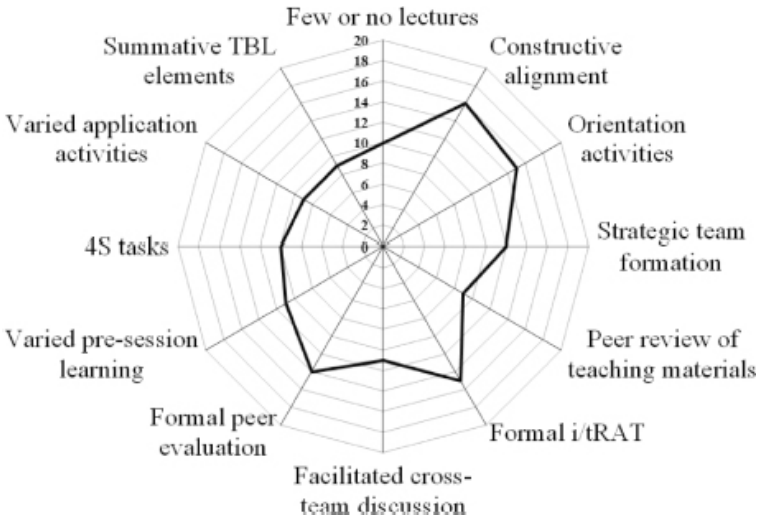

Figure 2.3 TBL elements in use at ARU (n=19)

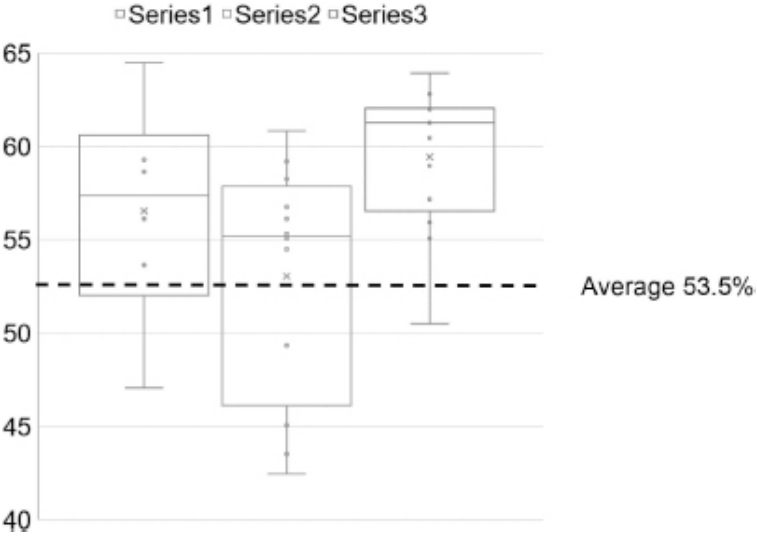

Figure 2.4 Module marks performance by TBL adoption variation

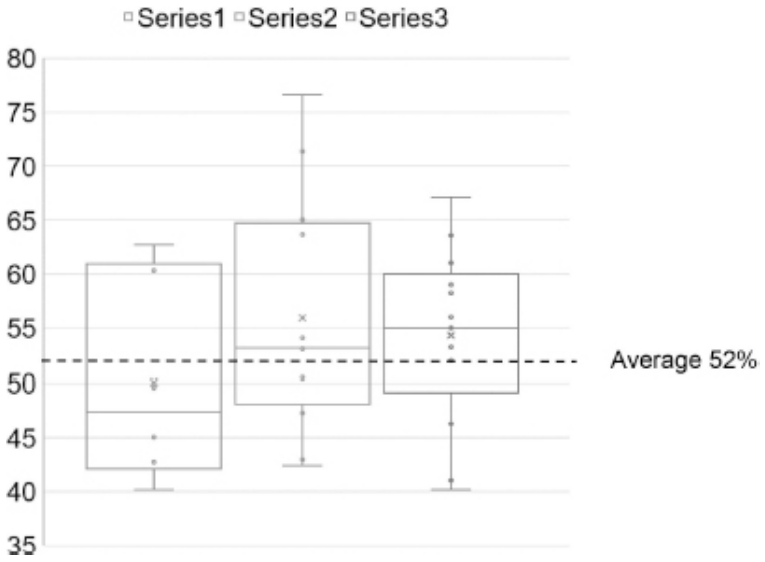

Figure 2.5 Module attendance performance by TBL adoption variation

Figure 2.5 illustrates how the adoption of TBL influences attendance. While those modules being mostly or fully TBL have above average attendance against the average attendance of non-TBL modules, the other two categories perform similarly, with the attendance figures for occasional TBL showing significant variation in itself. The higher attendance in mostly or fully TBL modules suggests that cohesion and positive group dynamics develops in teams. The accountability of individual team members for the team performance can result in higher attendance.

Student Satisfaction

For the student satisfaction questionnaire 2018, we approached all students taught using TBL in the 2017/18 and 2018/19 academic years with a request to participate in an online questionnaire to evaluate their experience with TBL. Module leaders were also asked

to encourage students to respond to the questionnaire, for example via announcements on the Virtual Learning Environment and allowing class time for completion.

A total of 327 responses were received from 231 students on 34 modules (some students were taught TBL on more than one module) across four of the five faculties, which is the equivalent of a 6 per cent response rate. The number of responses for each TBL module varied from low (n=1) to high on two modules (n=111 and n=118). The majority of responses (n=229) came from two large nursing modules.

The survey included 24 blocks of questions, most of which were closed 5-point Likert-style questions, asking students to state the extent to which they agreed with various statements (i.e. strongly agree, agree, undecided, disagree, strongly disagree), one question asked for satisfaction (i.e. very satisfied, satisfied, neutral, dissatisfied, very dissatisfied), and a few for applicability (i.e. yes, yes/no). The latter often linked to an open question to elicit more details. The questionnaire also included two general open questions at the end.

A two-thirds majority of respondents was satisfied with their TBL experience and agreed that the different aspects of TBL have a number of benefits and advantages over other learning approaches. For instance, students agreed that TBL promotes employability and is a more inclusive way of learning. However, between one-fifth and one-quarter (depending on the question) were either neutral or critical about TBL. While there were always critical comments, the number has increased from the 2015/16 evaluation reflecting the change from pioneers to early adopters in scaling up TBL. Recurring themes were students' preference to work independently rather than engage in teamwork, the need for a clear induction into TBL, clear instructions and communication, as well as scaffolding, which also relates to constructive alignment (Biggs, 2014) between the different elements of TBL (i.e. pre-learning, iRAT/tRAT, and application exercises) and assessment. Aspects of delivery such as consistency between tutor teams in co-taught modules, and time

requirements for pre-learning being considered across a course rather than at module level also have scope for improvement.

TBL versus non-TBL modules: Attendance, Engagement and Satisfaction

As part of the project, we analysed data extracts from the student administration and other systems to compare TBL and non-TBL modules and courses including TBL modules over three academic years. This allowed us to investigate the performance of students on TBL modules as opposed to non-TBL modules within an academic year, and modules and courses across three years.

We found that attendance on TBL modules was higher over the three-year period than on related non-TBL modules, where 'related modules' refers to non-TBL modules in a course with at least one TBL module. The engagement score improved when students took a single TBL module, and TBL did result in measurable increases in satisfaction scores. However, the latter is not unexpected as the questions in the MES are not specific for TBL, and we did not have access to the free text comments. From the previous evaluation, we found that these comments were supportive of TBL.

Figure 2.6 illustrates the improvement of module attendance we found over the three years. Engagement, which is predominantly based on attendance (60 per cent), also improved over the three years (see Figure 2.7).

Both the attendance and engagement figures show less of a difference in 2015/16 which was most likely due to a mix of manual capture, such as registers, and a newly installed automated 'tap-in' system, neither of which produce reliable results.

TBL versus non-TBL modules: Marks

Over all three years of the study, students achieved slightly higher (2–5 per cent) marks in TBL modules than non-TBL modules (see Figure 2.8). The improvement in average marks for the TBL cohorts was matched by an improvement in the pass rate for the modules, with 1–5 per cent more students passing their TBL modules than non-TBL modules (see Figure 2.9). This fits with evidence in the literature (Koles et al., 2010) showing that lower performing students benefit from implementing TBL.

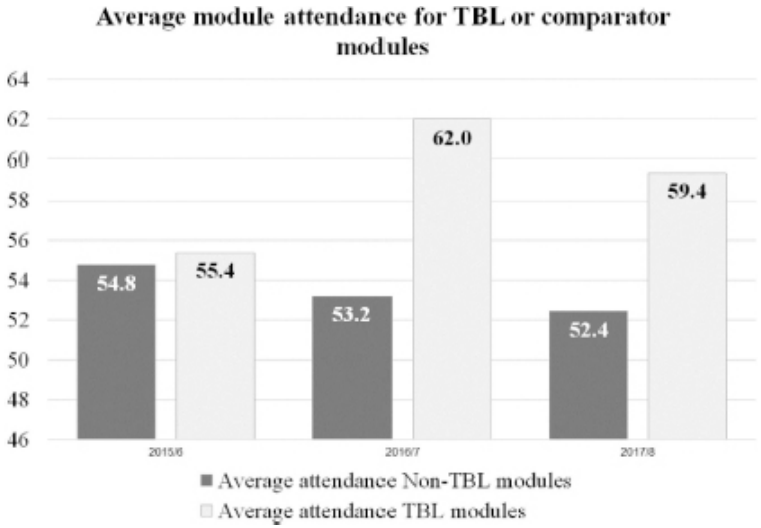

Figure 2.6 Average attendance TBL versus non-TBL modules 2015 to 2018

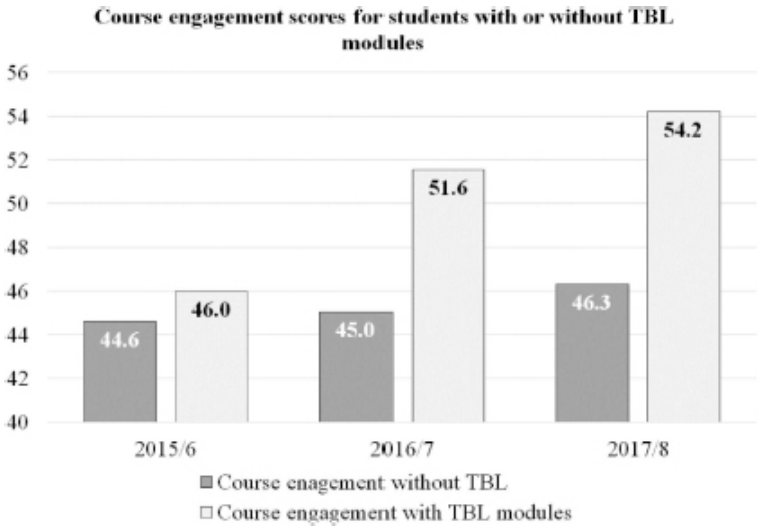

Figure 2.7 Mean engagement TBL versus non-TBL modules 2015 to 2018

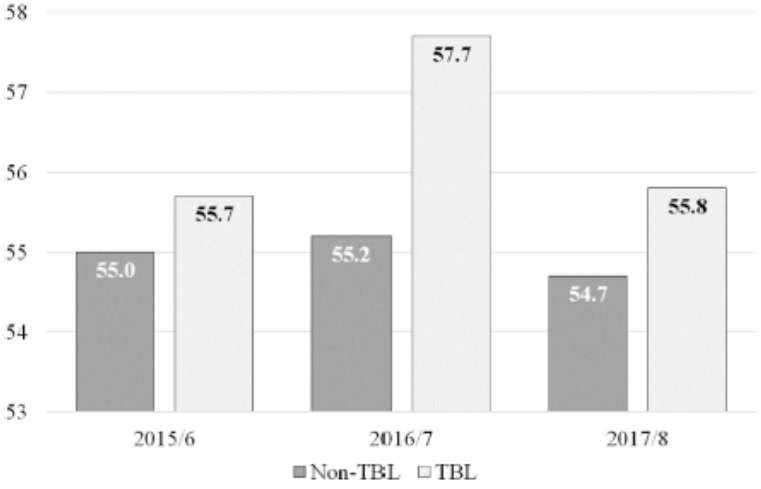

Figure 2.8Mean module mark TBL versus non-TBL modules 2015 to 2018

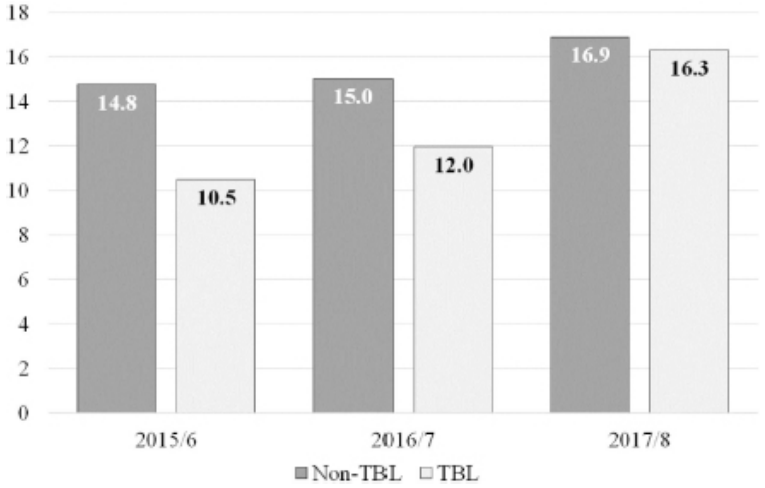

Figure 2.9 Proportion not *passing TBL versus non-TBL modules 2015 to 2018*

Conclusion

Overall, the results of this research clearly demonstrate that the introduction of TBL at ARU had a positive effect on students' learning behaviour and outcomes. As with any adoption and scaling-up of a new learning and teaching approach there are barriers to overcome to progress from the enthusiastic pioneers to early adopters and late adopters. The barriers and the solutions are discussed in Chapter 7.

A number of recommendations can be drawn specifically from the student satisfaction questionnaire:

- We need to acknowledge that variations in adoption of TBL influence outcomes. TBL is often not used out of context but tends to be used in combination with other active learning approaches. To scale up active collaborative learning and TBL it is recommended to take a course level approach.

- Consistency of delivery across modules, which are co-taught by different tutors, is important not just for TBL to ensure students get an equivalent learning experience.
- When teams are formed ensure that they are balanced as the strength of a team is in the diversity of its members.
- It is important that different team members contribute equally to team activities. It is worth considering getting team members to agree expectations for their team at the beginning (Eberly Center, 2016; Riordan and O'Brien, 2012).
- Often a 'managed' change of learning culture is required to motivate students to become team players rather than competitive individuals.
- Pre-learning, application exercises, and assessment need to be well constructed and scaffolded to gain the full attention of learners and avoid distraction.
- Pre-learning activities and application exercises need to be varied to cater for a wide range of learning preferences and patterns.
- Pre-learning, iRATs/tRATs, application exercises, and peer assessment need to be constructively aligned to each other and to the assessment.
- The time allocated for pre-learning tasks needs to be realistic and related to the workload of students across their courses as well as taking into account that many students have competing demands on their time (such as working, child care, caring for relatives).

Active learning is here to stay, and as an institution ARU has made significant inroads into changing the culture of learning and teaching. We have identified a number of challenges and are working to overcome these to continue scaling up TBL and other active learning approaches.

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3. What's wrong with traditional teaching? A case for transitioning to active and collaborative learning

SIMON TWEDELL

Introduction

The University of Bradford has offered an undergraduate pharmacy programme for many years. The programme became modular in 1992, with each module situated within one of four disciplines, taught wholly by academics from these disciplines. The programme was delivered by an equal combination of large lectures and small-group classes. Subject content was delivered by lectures and applied in workshops, which were replicated for delivery to six cohorts. However, there was variable attendance in lectures (typically 50 per cent), and little preparation for the applied workshop activities, which were often used to redeliver content. Part of the problem was the *way* lectures were delivered; students were predominately passively listening and sometimes taking notes. If the subject content was not engaging or perceived as relevant or interesting, then some students were more likely to engage in side conversations with peers. Arguably, university policy to provide lecture notes to students in advance compounded the problem. Furthermore, the *size* of the cohort was an issue, it is easy to be anonymous in a crowd of 150–200 students. The final problem was the way in which content was used, with subject knowledge often taught in isolation, for example without effective alignment with

programme outcomes. Subject content was chosen by individual academics, often without providing the context. In effect we were not motivating students to fully engage in their studies.

Learners are often motivated by personal connection to tasks (Oyler et al., 2016). When learning activities are embedded in meaningful contexts, personalised, or when learners are offered a choice of aspects of their learning contexts, then this increases learner motivation, engagement and the depth of learning (Cordova and Lepper, 1996). The programme team decided to optimise engagement through curriculum design, motivating students to study by using subject content that inspired them, captivated their interest, and ensuring they understood how this learning was important to both their programme and future careers.

What is engagement?

Fredricks et al. (2004), identify three dimensions of student engagement, albeit in school children:

1. Behavioural engagement: students comply with behavioural norms, attend classes, follow the rules, and are not disruptive. Students contribute towards class discussions and participate in learning and academic activities.
2. Emotional engagement: discernible affective reactions such as demonstrating interest, happiness, enjoyment, or a sense of belonging.
3. Cognitive engagement: students are invested in their learning, go the extra mile, and seek out and enjoy challenges.

Trowler (2010) suggests engagement is a continuum, with positive behaviours that are productive or constructive at one end, and negative behaviours that can be disruptive, obstructive or counter-productive at the other. Trowler argues that between these poles

could be a range or gulf of 'non-engagement' such as withdrawal or apathy (see Table 3.1).

Positive engagement with educationally purposeful activities, whether in-class or self-directed out-of-class, has been shown to lead to learning (Coates, 2005). Attendance research shows a negative correlation between the numbers of hours of missed classes and student performance, with low performers significantly more likely to believe classes did not benefit them, suggesting disengaged students (Hidayat et al., 2012).

Trowler's (2010) continuum for individual learner engagement commences with '*student attention*', where they are focused on the teacher or the task in hand. This moves to '*student interest in learning*', students are now curious and connected with the subject. '*Student involvement in learning*' is next; here students choose to become actively involved, perhaps through note-taking, or through peer discussion, suggesting a degree of ownership of their learning. The penultimate point is '*student active participation in learning*' which could manifest as asking or answering questions, seeking further information or clarification, or constructing links with previous learning. Finally, '*student-centredness*' may involve students in the design, delivery, and assessment of their learning, for example co-creating learning resources or assessment criteria. It may also involve giving students a choice of what or how to learn, for example providing electives or choice of assessments. Trowler is not advocating that all programmes should aim to be completely student-centred, only that this approach might be beneficial in engaging or empowering some students in parts of the curriculum.

Table 3.1 Examples of Positive, Negative and Non-Engagement in Students (Trowler, 2010: 6)

	Positive engagement	*Non-engagement*	*Negative engagement*
Behavioural	Attends classes and participates with enthusiasm	Skips classes with no good reason or excuses	Boycotts or actively disrupts classes
Emotional	Interest	Boredom	Rejection
Cognitive	Meets or exceeds assignment requirements	Assignments late, rushed or absent	Redefines parameters for assignments

Rather than using large lectures and multiple repeated workshops, we sought a learning and teaching strategy that created order by engaging students in active learning in the classroom. The strategy needed to retain the benefits of small-group teaching, but be scaled for a large cohort of students, hence removing the need for multiple repetitive classes. This change would require a shift in our thinking as academics, from delivering 'teacher-centred content', to facilitating 'student centred-learning'. Weimer (2002) sums up our belief at that time that learning was an 'inevitable outcome of good teaching, and so we focused on developing our teaching skills' (2002: xi). Staff development had tended to focus on skills for delivery rather than approaches to learning.

For the existing learning and teaching strategy to be effective, students had to assimilate knowledge from lectures before it was applied in workshops. However, students did not always have the time or motivation for this, and many of our lectures at the time were passive and content-heavy. Historically, we dealt with negative behaviours by trying to make lectures more engaging, for example by using audio-visual aids and technology. Others have used techniques such as 'Peer Instruction' to encourage and make use of peer-to-peer interactions during lectures. In this technique questions are embedded into lecture presentations for students to

answer, increasing participation, dialogue and active involvement. Peer instruction has resulted in positive outcomes (Crouch and Mazur, 2001; Fagen et al., 2002; Lasryet al., 2008). However, it still requires students to attend class, be motivated to study content prior to the class, and actively engage in discussions with peers in the session. Gauci et al. (2009) found that active participation increased students' motivation and engagement and that those who answered questions posed in class achieved better results than those who chose not to. In the learner-centred classroom, the role of the teacher shifts significantly from the knowledge expert who talks from the front of the classroom to one who enables and encourages students to explore, discuss and engage with subject content through well-designed exercises and assignments. However, it may be empowering for the teacher to encourage discussion and debate, or disempowering as they may feel they have less control, status or autonomy.

Blouin et al. (2008) call for a renaissance in education, arguing that didactic approaches are not effective because students are not held sufficiently accountable for their pre-class learning. They contend that because students do not read, study or learn the foundational facts sufficiently out-of-class, then too much class time is dedicated to content delivery rather than application. Whilst didactic approaches can be an efficient method of knowledge transfer, arguably they do not teach students to critically assess information to solve problems. Students may know a plethora of facts but Blouin et al. (2008) assert that graduates are ill equipped with the skills to use these facts to solve 'practice-based problems'. In a follow-up paper, Blouin et al. (2009) make three recommendations for reform: rejecting the majority use of class time for factual transmission of information; challenging students to think critically, communicating effectively and developing skills in problem-solving; and designing curricula based on sound, evidence-based educational principles, (cf. Chickering and Gamson, 1999; Bransford and Ebrary, 2000).

van der Vleuten and Driessen (2014) argue that educational practice and educational research are misaligned and current

practice relies heavily on content transmission. They suggest that curriculum designers should consider adopting evidence-based learning strategies that include elaboration, cooperative learning, feedback, mentoring and the flipped classroom.

We conducted a small study in 2011 to explore the experiences of educators and students using more traditional forms of teaching to inform the development of a new curriculum. The following describes the research question, methods, findings and conclusions from this study.

Methods

Research Question

What are educator and student experiences of using traditional methods of learning and teaching?

We chose to use qualitative research methods using a phenomenological approach to the design of the study to capture the lived experiences of academics and students as they engaged in traditional teaching methods. Following ethical approval, academic staff who had been delivering the Bradford MPharm programme for at least two years were invited to take part in a semi-structured interview. Semi-structured interviews allow for a set of questions to be asked of all participants with the researcher free to ask supplementary follow-up questions to probe deeper, clarify meaning, or to pursue an interesting or relevant line of enquiry (Robson, 2011). Sixteen of the 18 eligible members of staff participated. Following a piloted interview guide, the researcher explored academics' experiences of traditional teaching to try to understand their successes and frustrations in engaging students in learning activities.

For the student view, nine fourth-year students took part in a

focus group to explore their experiences of lectures and small group classes. The interviews and focus groups took place in a private room, lasted approximately 30 minutes, and were audio recorded to capture the words and paralanguage used.

The recordings were transcribed by the researcher and analysed inductively, with NVivo, using Thematic Analysis (Creswell, 2009). The themes were then interpreted and represented in the context of published work and presented with reflexive insight, as the researcher was an experienced academic, external to the programme but familiar with it.

Findings

The Staff View

The themes that emerged from the area of enquiry were *student engagement* and *student learning*.

Student engagement

When asked about their experiences of teaching most participants spoke of their struggles in engaging students in large classes, particularly lectures. The issues ranged from poor attendance and passivity through to noise and active disruption in lectures.

Issues worsened when lectures were used predominantly for content delivery. Cohort size and disruption were linked: as cohort size reduced, so did disruption. The question remains whether pedagogy or group size is the most important variable. Lectures used to be optional, and attendance during this time was often less than half, suggesting a high degree of disengagement. Students who

did attend were positively engaged and there was little disruption. Those that choose not to attend presumably studied independently. It was only when lectures were made compulsory and attendance monitored that disruption increased.

Lectures are an efficient means of transferring knowledge to large groups and can stimulate interest, explain concepts, and direct learning. However, lectures are not particularly effective at teaching skills, changing attitudes, or encouraging higher order thinking. Large lectures encourage passivity with little opportunity to process and critically appraise new knowledge (Cantillon, 2003). Perceived relevance of content was also deemed an important factor in engaging students. Students needed to see the value in engaging with course concepts and understand the context of why they are learning particular subjects and its relevance to their future careers.

Some participants focused on classroom control to maintain order (Gibbs and Jenkins, 1992), this is what Biggs (1999) calls the first stage of teacher growth which focuses on '*what the student is*' with blame of a poor lecture experience often placed on the students. My own early experiences were similar. I found that if the lecture was pure content delivery of a subject that was not particularly interesting, or to which students were unable to directly relate, they soon became bored and sometimes disruptive. Most participants did discuss strategies to increase engagement in lectures, usually by including some kind of activity.

Teachers who introduce interactivity into classes are moving into 'Stage Two' of teacher growth focusing on '*what the teacher does*' with a clear focus on improving the process of teaching delivery, by embedding a video clip into a lecture, for example.

Audio-visual technology has been proposed to increase interactivity and enliven lectures. However, Fink (2004) argues that this strategy fails to address two major problems associated with large lectures: anonymity and passivity. Nonetheless, students may not always be actively thinking in a lecture, but they might learn the content after the lecture on their own, or revisit it in a future

tutorial, or when preparing an essay or written assessment. When questioned about large group lectures most of the participants believed that they had limitations in terms of learning.

While most of the participants were not in favour of lectures there was no unanimous consensus. Two participants did enjoy lecturing on their subject:

I enjoy lecturing because I've been doing it for 25 years and I used to have 150 and that number wasn't a problem for me (Participant 1)

Well I enjoy talking to the students, being the person who leads the lecture rather than having to facilitate (Participant 13)

The performance role of the teacher, holding an audience by telling them how much you know about your subject, can be very enjoyable for the teacher. Penson (2012), for example, argues that the ability to captivate the audience using humour and animations and breaking up the monologue with activities to reduce passivity can be an enjoyable experience for students and teachers.

My own journey as an academic took me through all three phases referred to by Biggs (1999). I initially designed my modules so that they were predominantly delivered by lectures and practicals. Essentially, lectures covered content and practicals focused on application and problem-solving. However, I found lectures turgid and passive for learners so I introduced activities and problems into lectures to engage them and show context. I later moved the entire content into student study guides that included reading, web-resources and activities that eventually replaced lectures allowing more time to apply knowledge in practical classes. Although I was unaware of the terminology at the time, I had effectively 'flipped' the learning. My problem at this time was motivating students to engage in pre-class study.

As programme leader, I presided over a programme with growing student numbers. The learning and teaching strategy for a programme of 70–80 students per year was less effective with 200 students. Lectures to 200 students became problematic as staff struggled to maintain order and create an effective learning

environment. Small group workshops and practical classes became larger and required numerous repetitions, putting a strain on staff, rooms and timetables. It was time to stop trying to 'impose order' in the classroom and try and 'create order' with a new strategy.

Most participants expressed a preference for small group teaching arguing that attendance and engagement was greater, however small cohorts required multiple repetitions.

Two participants pointed out that lectures should have been for content delivery and workshops and practical classes for application. However, as students were not attending lectures, then workshops were increasingly being used for content delivery, which was ineffective and inefficient.

I'd always preferred the smaller group teaching to lectures. I always preferred to facilitate rather than just talking at them. However, students would come into tutorials still expecting to be taught, they expected you to deliver content to them rather than coming prepared with questions. And we had to repeat this six times (Participant 9)

One participant reported more success with taking a flipped approach to teaching.

What I did like were workshops where they had the topics in advance, they did a bit of work on the topics and we then had some sort of dialogue in the workshop. That seemed to engage them quite well and most of them were motivated to take part (Participant 6)

However, another participant commented that they forced the students to prepare in advance by checking their work and asking those that had not prepared for the classroom to leave. This is really another example of attempts to enforce order rather than create it.

Student Learning

The second theme focused around student learning and how effective traditional methods were: is it students' responsibility to engage with the lecture content, or is it academia's responsibility to create the optimal conditions for learning to occur? Perhaps creating the right conditions will help students better engage with course content and lead to improved learning.

The majority of staff participants did not perceive that students gained sufficient understanding of the content from lectures in order to apply this effectively in subsequent small group classes, although there were contrasting views:

I don't think they learned anything in a lecture, they never came prepared, even if you asked them to they'd never do it, well maybe a few keen ones would. The majority wouldn't have a clue what was in the last lecture. You can tell that when you ask questions from the week before. I wouldn't assume that they are reading anything after the lectures either (Participant 13)

I think learning definitely takes place in a lecture. I covered some knowledge-based topics that were hard for them to follow and put in a lot of time and research to focus on the difficult point they would not understand … My lecture notes were fully comprehensive and understandable to people who didn't attend my lectures … Lectures do the job and are definitely the most efficient way of doing it (Participant 14)

Two teachers did manage to engage their students in lectures and created comprehensive notes for them to read afterwards, possibly to try to compensate for poor lecture attendance, although arguably this could contribute to poor attendance. One teacher, however, saw it as their role to provide opportunities for students to learn in lectures and that is where their responsibility ended. Students were then free to choose to attend or not. Their argument was that it was not their role to provide multiple opportunities for students to

learn based on their individual learning preferences. The following participant sums up one of the problems with this approach:

Looking at the exam answers, I think a lot of students took notes in lectures but didn't do much with them until the time of the exam so learning did look as if it was a bit superficial (Participant 8)

In my experience, lectures can be used to provide context to explain the relevance and importance of concepts and content to future learning and future roles beyond graduation and correct any misunderstandings or answer questions. However, they should involve activities and peer discussion, be interactive, engaging, interesting and include dialogue and discussion between students and between students and teachers. My most successful and engaging lectures in a traditional curriculum came at the end of the module. Here students were not given any new content, instead they applied their learning from the module to solve authentic problems in pairs, and this was followed by discussion of the answers or solutions provided.

The Student View

The fourth-year students had experienced numerous lectures and were able to reflect on their experiences. From a student perspective the experiences of lectures were mixed. Some benefited from them, others did not. The general consensus was that they wanted a blended approach with some lectures, particularly where there were difficult concepts, and perhaps some podcasts to refer back to. Some students did identify that lectures did not motivate them to study the material again until close to the exams, however others were sufficiently motivated to pick up a book afterwards.

In response to staff and student feedback, we introduced a new learning and teaching strategy for the MPharm programme that

focused on active and collaborative learning, and was scalable to reduce the need for multiple, repetitive small group workshops.

The innovation

In 2012 we introduced a new MPharm programme delivered predominantly by Team-Based Learning (TBL), a structured approach to the flipped classroom with an incentivisation framework to optimise individual pre-class preparation and in-class engagement, discussion and decision-making.

Sibley et al. (2014) described TBL as:

a special form of collaborative learning using a special sequence of individual work, group work and immediate feedback to create a motivational framework in which students increasingly hold each other accountable for coming to class prepared and contributing to discussion (2014: 6)

TBL shifts the focus of classroom time from conveying course concepts by the teacher to the application of course concepts by student learning teams (Michaelsen et al., 2002). TBL is made up of a number of phases.

Team Formation

At the start of the semester, teachers allocate students to permanent teams of five to seven students, with diverse resources, who work together for the entire semester or year. Bruffee (1993) suggests an optimal group size for collaborative decision-making is five or six. Teams may lack the intellectual resources with fewer than five and more than seven may results in sub-teams forming and a reduction in functional coherence.

Social cohesion supports learning because group members bond together through regular interaction, and consequently want both team and individuals to succeed. Furthermore, Slavin (1996) argues that learner interactions increase achievement through cognitive processing:

Students will learn from one another because in their discussions of the content, cognitive conflicts will arise, inadequate reasoning will be exposed, disequilibration will occur, and higher quality understandings will emerge (1996: 49)

Cognitive psychology suggests that for knowledge to be retained and related to previous learning, it needs to be restructured or elaborated (Wittrock, 1986). Similarly Fosnot (1996) describes learning as requiring 'invention and self-organisation on the part of the learner' (1996: 29). Slavin (1996) goes on to suggest that 'one of the most effective means of elaboration is explaining the material to someone else' (1996: 50).

Preparation Phase

Students prepare for class by individually studying course content in advance. This may include learning resources and activities created by the teacher, or signposting students to other sources such as textbooks, podcasts, video clips, and web resources. Most often it is a combination of both original and curated content. Preparatory work should be contextualised to show the relevance of the learning to the degree and to future roles beyond graduation.

Readiness Assurance Phase

Engaging with the preparatory work is incentivised by the

Readiness Assurance Process (RAP). Students initially take a short, graded but low stakes individual Readiness Assurance Test (iRAT) on their learning from the Preparation Phase. This is immediately followed by an identical team-Readiness Assurance Test (tRAT) whereby students repeat the test again as a team and receive immediate feedback. Teams are actively engaged in discussion during the tRAT, often learning from each other and sometimes competing with other teams. Results are available to teachers to facilitate an informed discussion on any key concepts with which students may have struggled. Teams can also challenge a question or answer, and are encouraged to do so, with the aim of revisiting content and further developing their critical thinking skills.

The purpose of the RAP is that assessment drives learning. Assessment shouldn't only be used to measure student learning at the end of a course or module but should be used during it to support the learning process. Assessment-as-learning (Schmitz, 1994) includes six essential criteria which form part of the TBL RAP. Maddux (2000) suggests that using assessment-as-learning as an on-going iterative process can be of benefit when using the following six criteria. These are:

- The inclusion of clear learning outcomes
- Allowing multiple performances
- Having explicit criteria
- Use of expert judgment
- Providing productive feedback
- Use of self/peer assessment

Application Phase

Teams are now ready to apply their new knowledge to solve authentic and challenging problems. Problems should be authentic and relevant to the learner, with fellow learners and teachers

providing guidance to scaffold learning (Davies, 2000). Applications are designed to create discussion and make a team decision, which they publically defend. Teams are asked to justify and elaborate on their answers in a teacher-facilitated debate. Application exercises follow the '4S' design criteria (Sibley et al., 2014). Learners work on '*significant*' and authentic challenging problems relevant to their discipline; all teams work on the '*same*' problem so go through the same learning experiences, which makes later class discussion richer. Teams are forced to make a '*specific choice*' or collaborative decision, which they later justify by presenting their argument and rationale. Finally all teams '*simultaneously*' reveal their decision at the same time to publicly commit to their decision; this further motivates task engagement and prevents answer drift. Learners engage in regular team and class discussions, to enable deeper understanding of course content.

Since the implementation of TBL in 2012, we have evaluated our deliveries which provided us with conclusive evidence that TBL as active learning approach addresses the challenges we encountered in the previous lecture-focused deliveries of the MPharm programme (cf. Nation, Tweddell & Rutter, 2016; Nelson & Tweddell, 2017; Tweddell, Clark, D. and Nelson, 2016; Active Collaborative Learning, 2019).

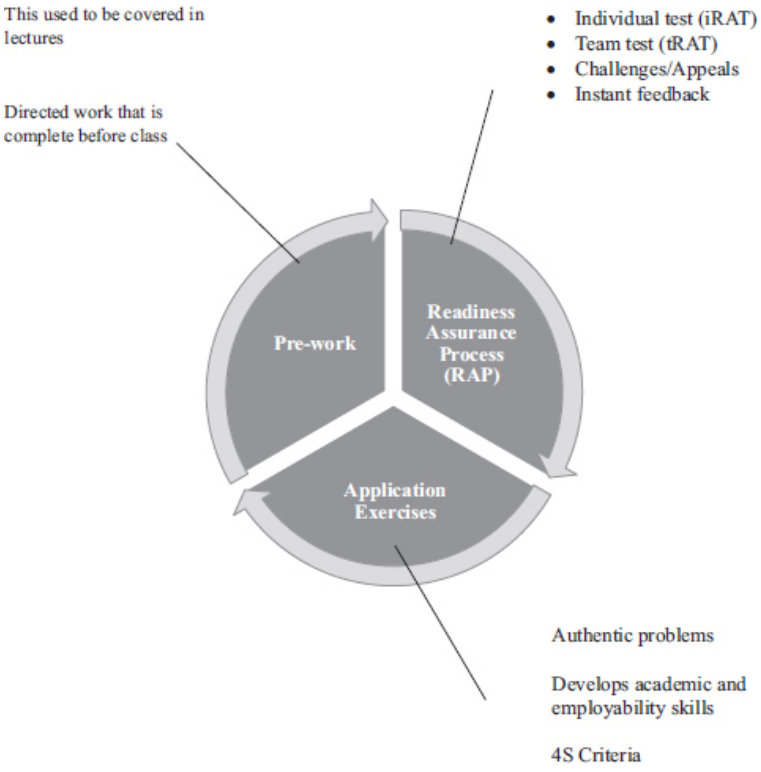

Figure 3.1TBL Unit Diagram

Conclusion

This research has shown that most of the educators in the study had experienced Trowler's (2010) characteristics of non-engagement and negative engagement when lecturing to large numbers of students. This seemed to be more problematic when lectures were used to deliver one-way content and was exacerbated by growing student numbers, and the introduction of compulsory attendance. Some educators experienced some success in enhancing positive engagement in lectures through the use of interactive tasks and

technology. However, lectures were mostly being used to provide content to be applied in subsequent small group workshops. For this to work effectively, learners must revisit the content between the lecture and the workshop and this was not happening, so workshops were being used for content delivery. Students did see the benefit of having some lectures, particularly when the concepts were difficult to grasp. A small minority claimed to be motivated to study after a lecture, although most were not.

As a result of the findings, a blended approach was proposed; this could include some non-compulsory lectures for those that benefited from them which, if recorded, could be accessed on demand. Some focused lectures do probably still have a place in undergraduate education as they are a useful tool to set the context for the subject content, revisit previously learned concepts that may be important to new learning, and provide an opportunity for students to hear from a subject expert. The lecture experience for students and staff is improved when the student numbers are smaller and when there is some form of interactivity between student and teacher and between students, and therefore involving some form of active learning. Arguably, lectures should not be compulsory and if students wish to watch a recorded lecture at a time of their convenience, or independently self-study the content, then this may develop their skills as independent learners. However the learning that takes place in lectures is not always optimal and data from the focus groups suggests most students are not sufficiently intrinsically motivated to self-study or prepare for subsequent classes designed for application, higher-level thinking and problem solving.

As a result of these findings, TBL was introduced as the main learning and teaching strategy. Staff reported better attendance, attainment, engagement and interaction in classes with mostly positive feedback from staff and students about their experiences.

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PART II

THEME 2: STUDENT ENGAGEMENT AND RETENTION

4. Developing an Active Learning curriculum aimed at improving engagement and retention in foundation year students on an extended degree

NICKY MILNER

Introduction

To address poor engagement and retention in the foundation year of the extended medical sciences degree programme at Anglia Ruskin University (ARU), the curriculum has been redesigned to embed an active learning approach, Team-Based Learning (TBL), to provide formative feedback.

The work presented in this chapter forms part of an ongoing action research study, exploring the phenomenon of student engagement of students registered on a foundation year course which is shared with three separate awards. Starting in Semester 1 of the 2016/17 academic year, five successive interventions have been introduced at the start of each semester. Student feedback, collected from module evaluation surveys (MES) and course performance reviews have informed each subsequent intervention.

Themes emerging from MES collected prior to the first intervention identified a number of issues contributing to poor engagement and retention of students, such as a lack of formative

assessment, and the need for personalised tutorial support. One intervention included the creation of a clearly structured online learning environment, which embeds regular team-based formative assessments that are aligned to the summative assessment. This enabled individual performance data to be obtained following completion of short individual tasks. A later intervention built on this through the creation of a Personalised Learning Log, which is completed by students and identifies areas where performance falls below the pass mark. The most recent intervention, introduced in Semester 2 of the 2018/19 academic year, is focussing on developing a strong sense of belonging through interdisciplinary learning and development of ownership of learning through student-led focus groups.

This chapter explores the pedagogy behind this curriculum redevelopment and considers the impact of mapping course and module learning outcomes to ensure that learning and teaching material is constructively aligned and that assessment has relevance.

Student feedback received from MES and student-focused committees, often identify concerns with factors include clarity and relevance of teaching material, teaching methods, and the layout and timely availability of course content on the university's Learning Management System, *Canvas*.

In addition, student feedback from module evaluation surveys highlighted the lack of clear preparation for the summative assessments as an area that they wanted to be improved. This issue is particularly challenging in a course where students are registered on one of three different medical science courses.

The Foundation Year

For this chapter, the term 'foundation year' is used to describe a generic preparatory year in a four-year, extended degree

programme, shared by three awards offered by the Faculty of Health, Education, Medicine and Social Care (HEMS): BSc (Hons) Medical Science, BSc (Hons) Pharmaceutical Science, and BSc (Hons) Applied Nutritional Science.

The foundation year, importantly, is not a Foundation Degree, which the QAA (2015) define as a combination of academic and vocational learning and require either 'top up' or entry to the remaining elements of the course to graduate with an honours degree. Nor is the foundation year a separate course to the three-year degree as, following successful completion of the foundation year, students seamlessly progress onto one of the three-year courses.

Students on the foundation year are often accepted with lower grades (i.e. 48 UCAS Tariff points – one A Level or equivalent) than the standard intake (i.e. 96 UCAS Tariff points). This results in the common problem of maintaining motivation in students with a range of different levels of academic ability. Personal support is needed to provide regular detailed, and often repetitive, academic support to weaker students, while stronger students frequently work at a quicker rate and get bored quickly.

Aims

The overall aim was to create a sustainable, inclusive learning environment with space for students to practice in preparation for their summative assessments, where learning activities are clearly aligned with the intended learning outcomes of each module and the course.

The purpose of the redesigned curriculum was also to create space in the timetabled sessions for consolidation of knowledge and exploration of topics being taught through additional practice and personalised academic support through greater interaction with students on a one to one basis.

A further aim of the curriculum redesign is to provide a learning environment which is flexible and accommodates students from across the spectrum of academic ability.

Thematic analysis of MES free-text comments collected after introducing more regular team-based formative activities, indicated that student experience was enhanced as a result of introducing more interactive activities where one to one academic support was provided. Examples of positive comments relating to increased motivation and use of a variety of formats for learning, such as online quizzes, crosswords and debates. Students requested more activities for practice when asked to identify areas for improvement. Overall, student feedback suggested that they were responding positively to the interventions.

In addition, the foundation year has a low retention rate caused by students withdrawing early due to poor academic performance. It was anticipated that the implementation of an active learning style curriculum would also address this issue.

According to student attendance data and anecdotal evidence from delivering sessions, attendance in class is poor in the foundation year. Gaining an insight into how students engage with their learning journey, particularly outside the classroom, will help influence the design of an effective curriculum to help students maximise their academic performance through enhanced engagement and support.

Literature review

Student engagement has been widely covered in the literature (Kuh, 2001; Mann, 2001; Healey, Flint and Harrington, 2014). Thomas (2012), in particular, reports on some interventions which promote the need to develop a sense of belonging through inclusive and participative engagement. Successful interventions which achieved this, such as active learning which provides prompt feedback,

interactions between students and staff and collaborative activities, help improve retention and success in the early stages of a course. This highlights the importance of the design of the course to help students become more engaged learners so they are effective and successful beyond their studies into employment.

Many students do not always understand the value of attending class and often prefer to be selective about when they attend campus to study. Newman-Ford et al. (2008) listed some reasons for absenteeism including 'assessment pressures, poor lecturing, inconvenient timing of the lecture … poor quality of [the] lecture … low motivation, stress … work overload … [and] work commitments' (p.700). Kuh, Gonyea and Palmer (2001) also list increased travel costs to university, a reduction in the number of students living on campus, the need to support families and cope with living costs, as contributory factors to non-attendance.

Another factor which has an impact on retention is the students' sense of belonging, as this has been shown to improve student motivation, engagement and promote active collaboration which all help foster creativity through sharing knowledge and ideas within peer groups. Building a sense of belonging and partnership through the creation of an active community with clear identity are therefore important factors in improving student engagement (Thomas, 2012).

Both the academic curriculum and the wider environment within the academic institution must provide an environment designed to support an effective learning journey for students, and reinforce the need to continue learning outside the classroom. To successfully engage with their course, students must also be motivated, able to attend university, and actively participate in their studies (Fredricks, Blumenfeld and Paris, 2004).

These students may still engage with their studies, however, through learning from lecture material at home, albeit with limited, or no, interaction with academic staff or peers. However, much of the valuable learning occurs during participation in class activities where new knowledge can be created and academic staff can ensure

that students adequately understand key topics. Non-attending students also lose the opportunity to develop graduate attributes and employability skills such as networking, digital literacy, team working, and oral communication skills.

Poor engagement can result in early withdrawal, and student retention is a critical issue in Higher Education (HE). The Higher Education Academy (2015) *Framework for student access, retention, attainment and progression in higher education* clearly states that 'Students cannot learn or progress unless they are engaged' (2015: 1), highlighting engagement as a phenomenon which underpins student success.

Students who engage with an effective active learning environment have an additional opportunity to engage in meaningful dialogue with academic staff and their peers, which helps encourage engagement with a learning task and promotes regular attendance through an enhanced experience (Zhao and Kuh, 2004).

Active learning is a pedagogically sound teaching approach and is now used widely across various subjects in the HE sector. Research has shown that active learning can improve engagement and academic performance (Prince, 2004; Gibbs, 2018). Here, timetabled classroom sessions offer lecturers an opportunity to enhance their style of teaching so that the time is used to clarify knowledge, provide feedback and create meaningful discussion.

As Prince (2004) explains:

> Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing (2004: 223)

Modern active learning pedagogies have been developed around student-led participative learning, rather than the over reliance on more passive methods such as 'sage on the stage' lectures with minimal student involvement in learning activities.

One active learning method which has been shown to improve

academic performance and engagement is TBL (Michaelson, 2001; Koles et al., 2010). TBL was designed to address these issues specifically and utilises the positive aspects of peer-assessment and accountability (Michaelson and Sweet, 2008). TBL has been shown to be effective across a range of subjects including microbial physiology (McInerney and Fink, 2003), pharmacology (Zgheib, Simaan and Sabra, 2010) and engineering (Najdanovic, 2017).

A key element in TBL is team activities which poses a challenge for academic staff since student feedback traditionally reflects a negative approach to group work (Moraes, Michaelidou and Canning, 2016) particularly when linked directly to summative assessment (Willcoxson, 2006; Chapman et al., 2010; Cilliers, Schuwirth and Adendorff, 2010; Crossaud, 2012). Nevertheless, TBL has been shown to improve student satisfaction with learning in groups (Clark et al., 2008).

One of the challenges of TBL is the time required to produce relevant active learning material for each session. Creating meaningful, constructively aligned, active learning exercises is time consuming, but this has been shown to enhance engagement and academic performance. Failure to do so can result in reduced student engagement, which negatively impacts student attendance, confidence and motivation (Enfield, 2013; Arnold-Garza, 2014; Tolks et al., 2016).

Flipped learning is an approach which requires students at arrive at class having completed a pre-session activity. During the class, students engage with interactive problem-based activities within their group (e.g. TBL team). To work effectively, students must prepare for the session beforehand (Michaelsen, Knight and Fink, 2004).

TBL is designed to follow a set process where students complete a short individual Readiness Assurance Test (iRAT), where scores are collected. This is immediately followed with a team Readiness Assurance Test (tRAT), which generates debate, discussion and competitive environment, which demonstrably showcases the

students' learning behaviour and understanding of key topics related to the module.

To provide students with a supportive and engaging environment conducive to success, assessment needs to be constructively aligned to the module and course learning outcomes (Biggs, 2003). This constructivist approach to learning underpins active learning strategies. When the learning activities are designed using this approach, students have been shown to engage more deeply with their studies (Biggs, 2003).

A constructivist approach was, therefore, selected for the curriculum design to create a learning environment, which allowed space for students to obtain formative feedback, engage with one-to-one discussion with an academic tutor, and to identify the relevance of the teaching to the assessment. The need to emphasise learning as a journey was considered when designing the underlying curriculum structure. The result of this was to embed pre-session and post-session activities into the curriculum.

Methodology

An action research approach was selected for this study. Student feedback was obtained through routine course evaluation data, on a semester basis. This feedback was used to help inform the next development. A natural, cyclic process was in place because of the structure of the academic year (semester-based course) and related feedback mechanisms. Curriculum focus groups are in the process of being implemented. The aims of these groups will be used to create space for staff and students to discuss their experiences with the foundation year curriculum, which will support the design and development of each academic year in their four year course.

Course content is delivered face-to-face, on a semester-based model, with a total of six modules, which are two 30-credit modules (one per semester) and four 15-credit modules (two per semester).

Consequently, there are six MES responses for each academic year. In addition, student representatives present a report at Student-Staff Liaison Committee (SSLC) meetings (held each semester), on what they want to keep, change, and stop or start doing on the course. These data are used to inform curriculum enhancement for the next delivery.

SSLC data is qualitative, and staff engage with the student representatives and other academic and support staff, at the meetings. MES data provides mixed data, with module satisfaction measured using Likert scales and free-text comments. The free-text section enables students to provide feedback, allowing them to expand on their quantitative responses. When combined with analytical data from the Student Engagement Dashboard, this information was used to inform the development of an effective curriculum which supports improvements in engagement and retention through developing student ownership of the course, which leads to academic success, and progression towards the final award.

Student feedback from these key points in the academic year, provided qualitative data, which was used to inform each intervention (see Table 4.1).

Intervention 1

In response to student feedback from MES in Semester 1 of 2016/17, Intervention 1 focused on improvements to the structure of the course material on the Virtual Learning Environment (VLE). This involved the introduction of short pre- and post-session learning activities for each timetabled session, such as videos and articles relating to the topic being covered. Weekly sessions for each module were clearly identified on the VLE and the topics related to the summative assessment criteria. In class, students worked in

teams on shared problem-based activities and practice questions for assessments.

Table 4.1 Timeline of Interventions

Academic Year	*Semester*	*Intervention*	*Description*
2016/17	1		
	2	1	Introduction of short pre- and post-session learning activities
2017/18	1	2	Introduction of Topic Block Model
	2	3	Introduction of discussion groups and writing workshops
2018/19	1	4	Introduction of Personalised Learning Log
	2	5	Introduction of interdisciplinary learning, and student-led focus groups

Qualitative data derived from the 2016/17, Semester 2 (Intervention 1) MES was largely positive, with students commenting that "group work was interesting and challenging", and the space being created through regular team-based activities meant that the "pace of [the] course fits all learning styles and is engaging for people that are both struggling and people that are advanced". However, students wanted more "one to one tutorials", "more practice" and "more group work".

Intervention 2

This feedback led to the creation of the *Topic Block Model*

(Intervention 2) (Semester 1, 2017/18). Regular short *Canvas* quizzes were introduced to test knowledge of, and engagement with, pre-session learning activities. It was clear from active participation in class that many students were engaging with the preparatory material. More one-to-one discussions were provided through fortnightly team-based formative assessment tasks (Week 2 of each repeating unit in the Topic Block Model).

The Topic Block Model – A novel active learning curriculum

The first stage of the project was to redesign the foundation year curriculum of the extended medical sciences degree programme. The new design includes adapted elements of TBL to help address poor engagement and retention. A novel course structure, the Topic Block Model, was created to provide flexible delivery content using active learning methods. Six topics are identified in each module which form the focus for learning activities over a two-week period called a Topic Block (see Figure 4.1). The advantages of this design are that it helps with consolidation and extension of knowledge and understanding through the creation of space. The interactive sessions within the Topic Blocks allow for peer instruction to occur. Course content is reinforced through active learning methods, particularly in Week 2 of the Topic Block.

The timetabled sessions are varied according to the module and usually have a mixture of lecture and practical sessions supported by workshops, seminars and tutorials. Each timetabled session is reinforced using a short post-session learning activity, such as an online quiz to check understanding of concepts relating to the topic covered in the session. The motivation for designing this format was to improve student engagement by highlighting the learning journey as being a continuous thread of activities in which all students should immerse themselves to maximise their chances of success.

Feedback from the MES indicates that students are engaging with their assessments early, which is also shown by an improvement in

assignment submission rates. It was noted that in the 2017/18 and 2018/19 academic years, first time submission rates for assessments in all foundation year modules was higher than the previous year (>95 per cent, *n*=18; and >90 per cent, *n*=16 respectively), suggesting that students were engaging with their assessments earlier and obtaining feedback through engagement with regular formative activities. This phenomenon will be explored in more depth at a later stage.

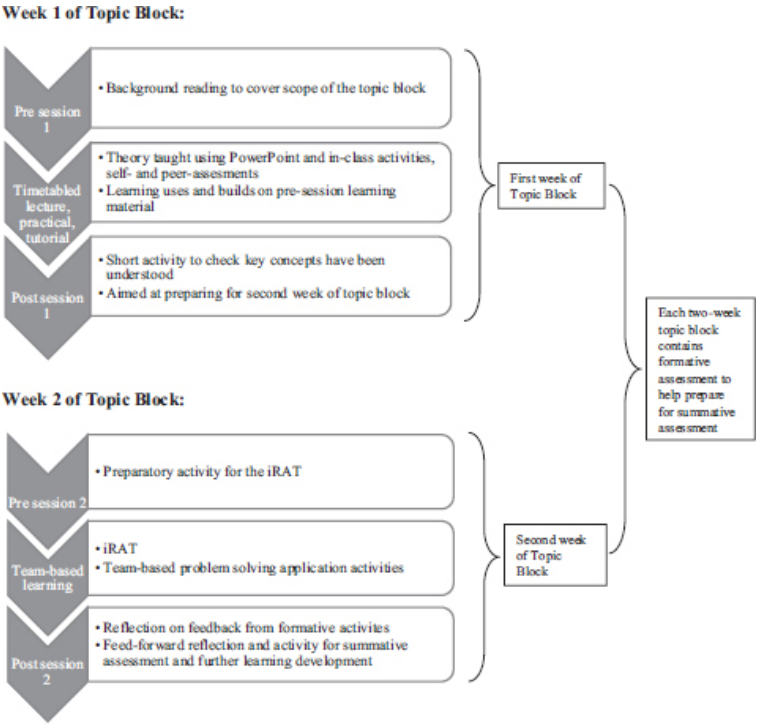

Figure 4.1 The Topic Block Model

Student feedback indicated that while the amount of one-to-one tutorial support was good, several students wanted to "go into more depth when talking about topics" and wanted to explore more topics.

Intervention 3

To create a space in which to stretch students, so they could explore a greater range of topics and maintain motivation, extra-curricular activities were implemented as part of Intervention 3 (Semester 2, 2017/18). These included discussion groups and writing workshops, where students could expand their knowledge and gain more one-to-one support with academic writing and understanding of course topics.

Semester 2 MES data demonstrated that students who engaged with these activities found them beneficial, with comments including "excellent and well structured", and "Great tutorial support for the essay writing workshop".

Intervention 4

The second focus of the project involved identifying those students at risk of failing module assessments or being withdrawn from their course due to academic failure. Students and academic staff have access to the university's Student Engagement Dashboard which collates engagement data in three key areas: access to *Canvas*; 'tap-in' data for attendance in class, and; use of the University Library. These data help academic staff and students gain a perspective on how an individual student is engaging with various aspects of their studies. Whilst these metrics are useful general indicators of engagement, they do not provide data on personal academic performance during the teaching period (and before summative assessments are completed). This data, when combined with the general engagement data, offers a greater opportunity to intervene positively, with students who are at risk of failing module assessments or being withdrawn from their course due to academic failure.

Intervention 4 (Semester 1 2018/19), therefore, concentrated on implementing tools which helped students take greater ownership of their learning and academic progress. Using regular in-class formative tests for each topic provided a structure for recording the performance of an individual in a system which enabled students to easily identify whether they needed to seek additional academic support in real-time. The Personalised Learning Logs were created and students were encouraged to make use of them.

The aim of the logs is to provide bespoke support in 'real-time' through self-assessment of personal academic performance, and to alert staff to the possibility of academic failure.

Students record their iRAT scores from Week 2 of the Topic Block in their log. Figure 4.2 shows an example Learning Log for a student who has achieved a satisfactory level of understanding of Topics 2 and 3, is encouraged to request some help with Topics 4 and 5, and must seek assistance with Topics 1 and 6.

Student ID:

Module code: Semester: Date:

My iRAT Score /10	Topic 1: Atomic Structure iRAT 1	Topic 2: Periodic Table iRAT 2	Topic 3: Chemical bonding iRAT 3	Topic 4: Moles and concentrations iRAT 4	Topic 5: Organic chemistry iRAT 5	Topic 6: Balancing equations iRAT 6
10						
9						
8						
7						
6						
5						
4						
3						
2						
1						
0						

KEY:

	A score of 0–4: Student *must* attend a tutorial dedicated to the topic covered by the iRAT
	A score of 5–8: Student is *strongly encouraged* to attend a tutorial dedicated to the topic covered by the iRAT
	A score of 9–10: Student is encouraged to attend a tutorial dedicated to the topic covered by the iRAT and act as a topic lead for group discussions (peer instruction enhances student confidence and provides a deeper level of understanding of a topic).

Figure 4.2 Example Personalised Learning Log

The Personal Learning Logs highlighted those students who needed individual (personalised) tutorial support to address topics where they have performed below expectation.

Take up of the logs was challenging when student attendance was poor and as a result, we are working with students through curriculum focus groups to identify how we can utilise them in future personal tutorial sessions.

Intervention 5

Intervention 5 (Semester 2, 2018/19) built on Intervention 4 and explored ways that students want to use the Personalised Learning Logs. In addition to academic performance, confidence was also measured through the iRAT and tRAT process. This was designed to improve engagement with learning through building greater awareness of retention of knowledge through deeper learning practice.

With in-class activities constructively aligned to the module assessment, teaching staff had the opportunity to provide regular formative feedback through dialogue with the students in the classroom. This created the opportunity for feedback to be provided, in the session, in the form of whole-class (e.g. mini-clarification lecture), team-based (e.g. discussion around an activity) and individual feedback (e.g. directed reading to support an area of additional academic support).

Working in teams reinforced the requirement for students to be accountable for their learning, and encouraged them to improve their engagement outside the classroom (i.e. engaging with pre-session learning and peer-led activities). Student feedback from MESs administered following Interventions 2 and 3 reflected an improvement in student motivation and evidence for a greater level of independent study. MES comments included, "I found this module to be challenging which is what I felt I needed to engage my mind and also to push me to find what my limits are" and "concentrate on one topic at a time," and "helps me understand more". Evidence suggested that students were feeling motivated to research outside the classroom more, with comments such as, "I enjoyed this module as it was very research based. I enjoyed finding out about different diseases".

To strengthen engagement generally, monthly student-led interdisciplinary discussion groups and writing workshops were introduced. The discussion groups enabled students to explore the

wider curriculum through topical discussions, and to meet other students from public health, medical and science courses from across the faculty.

These sessions also support students to build self-confidence through active participation in discussions and debates. The writing workshops provide an opportunity for students to access additional assessment support through engagement with their assessments early in the semester. The sessions are facilitated by a course tutor and students work independently on an activity of their choice, for example, a draft summative assignment or a formative activity, such as writing an abstract. Student attendance and engagement in the discussion groups has increased with time and consequently these have been continued and now form part of the structure of the curriculum through the introduction of a site on *Canvas*. There are currently 44 participants registered on the new site, which has increased from an average of six students in 2017/18.

Conclusion

This study explores the phenomenon of learning behaviour in students registered on a shared foundation year in three extended medical sciences degrees. Student retention, attainment, and attendance in foundation years across ARU have been highlighted as areas where improvement is needed. To address these issues, an active learning curriculum was developed through successive interventions, introduced on a semester basis.

Student feedback from module evaluation data helped inform each intervention. Throughout the study, student feedback demonstrated improvements in their engagement had been made to the curriculum. These included a Topic Block Model which enabled regular formative team-based assessments to be used to support academic performance. A more personal, timely system of

identifying at risk students has been introduced through the design of Personalised Learning Logs.

Next steps and planning

The interventions introduced in this study have drawn on aspects of TBL, such as iRAT and tRAT, collaboration with a shared problem, and generation of active discussion, and following evaluation, aims to formally introduce TBL modules into the curriculum in the 2019/20 academic year. The next step of this study is to set up curriculum focus groups, where students will work in partnership with course leaders, to evaluate the effectiveness of the teaching methods and the value of using Personalised Learning Logs as a tool for monitoring student engagement and success. This will result in the creation of a toolkit to provide guidance for academic staff who wish to design active learning curricula to improve engagement and retention in other courses.

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5. A novel bioscience 'capstudy' assessment based on Universal Design for Learning (UDL)

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Introduction

Almost half (49 per cent) of young people in the UK are now going to university (Ford, 2017). The growing student numbers accessing Higher Education (HE) from increasingly diverse backgrounds mean that traditional teaching, learning and assessment methods require a more inclusive approach. At De Montfort University (DMU), the number of students on the Biomedical Science (BSc) course has more than doubled from approximately 90 to 200 students in the last four years. Similarly, the Medical Science (BMedSci) course has grown from 21 students in 2014 to 50 in 2018.

Concomitant with the increase in students has been the diversification of students' academic qualifications, demographics and personal characteristics. DMU was named as the 2018 University of the Year for Social Inclusion by *The Sunday Times Good University Guide*, due to the success of its diverse student population in exams and graduate job prospects. We are extremely proud that, compared to the rest of the university sector, we welcome significantly higher proportions of students from ethnic

minorities, disadvantaged backgrounds and mature students. Approximately one in five DMU students also declares a disability.

The BSc and BMedSci students represent a large and highly diverse cohort. The majority come from non-A level routes, such as Business and Technology Education Council (BTEC) Level 3 diplomas, and Access to Higher Education courses. The student population is mainly comprised of Black, Asian and Minority Ethnic students, and over 20 different nationalities are represented. Approximately 60 per cent are female, and a large number are from Widening Participation backgrounds, often the first in their family to attend university. A significant number of students declare a disability or specific learning disability, including dyslexia, autism, hearing and visual impairments, and mental health difficulties.

Despite increasing diversification of the student body, the sector has been slow to respond to their learning needs and preferences (Capp, 2017). The challenge for lecturers who teach large, diverse cohorts is to engage and provide appropriate individual learning support, and to ensure that each student has an equitable opportunity to demonstrate their learning through appropriate and flexible assessment methodology. This presents an opportunity for universities to introduce innovative approaches to learning, teaching and assessment.

Universal Design for Learning

Universal Design for Learning (UDL) is an educational framework based on decades of pedagogic and neuroscience research. UDL provides flexibility and options that afford every student an equitable opportunity to learn, and to demonstrate their learning, in ways that suit their individual learning preferences and needs. This is achieved by giving students multiple means of representation, engagement, and expression of ideas and knowledge (Rose et al., 2006; Rose and Strangman, 2007).

Although UDL has been most widely applied to school classrooms, it is now gaining recognition for its benefits in HE (Capp, 2017). Rose et al. (2006) applied UDL principles to a post-graduate Education module undertaken by 93 students at the Harvard Graduate School of Education. Their approach provided a range of learning resources, including lecture recordings, alternate sensory modalities, graphics to support text, multimedia learning resources, and shared student notes. Flexible ways to learn included discussion groups, and options for face-to-face or online engagement. The assessment provided a range of means by which students could demonstrate their knowledge; being a website, this could include text, images, videos, and other resources. This UDL approach for teaching large groups of diverse university students has been shown to impact positively on student learning. Dean et al. (2016) at the University of Kentucky used a combination of four tools (i.e. PowerPoint, lecture notes, clickers (hand-held interactive voting devices), and *MindTap* (an internet-based multimedia learning platform) to provide classes of over 600 marketing students with multiple means of content presentation, engagement, and learning expression. Students reported that all of these tools were highly useful for learning, and that tool usage enhanced student satisfaction. Thus, UDL is a very broad and versatile concept that can be adapted and applied from small-scale up to institution wide.

UDL was introduced at DMU in 2015 and, rather than its traditional use as a deficit model targeted at levelling the playing field for disabled students (Rose et al., 2006), was launched as an innovative learning, teaching and assessment framework, designed to embed flexibility into our teaching and curricula that would provide equitable and personalised learning experiences. Since then, UDL has served as a catalyst to radically transform our teaching, learning and assessment practices, thereby benefitting every student, and producing more creative and pedagogically skilled lecturers. At DMU, the principles of UDL are to provide students with:

1. Flexible learning resources
2. Flexible ways to learn
3. Flexible ways to demonstrate their learning

This framework encourages mastery-oriented pedagogy, which pushes each student to excel and exceed their goals.

UDL as a framework for transforming assessment

Assessment is the area with which students are least satisfied worldwide (Medland, 2016), illustrated by National Student Survey (NSS) data. Assessment was the joint lowest-rated category in the 2018 NSS, achieving only 73 per cent student satisfaction, compared to 83 per cent overall satisfaction nationally (HEFCE, 2017).

A key problem with assessment is an over-emphasis upon summative assessment, with formative assessment and timely feedback lacking. Over-focusing on the final grade promotes surface learning, and prevents students from reflecting critically and assimilating concepts from across their programme of study. Whilst formative assessment is critical to student learning, it is often side-lined due to various factors, including pressure felt by academics to focus on summative assessments, and increasing student numbers which challenge the ability of lecturers to provide formative assessment (Yorke, 2003). Assessment for learning should be placed at the heart of the curriculum, with assessment integrated holistically, allowing students to gradually enhance and embed their learning through integrated 'capstone' assessments (Boud, 2010).

Couch et al. (2015) devised a capstone assessment for a large cohort of molecular biology students from across seven institutions, which allowed students to apply their knowledge and understanding from the course to contextualised novel scenarios. This approach highlighted some key misconceptions not previously identified by in-course assessments. A carefully constructed

capstone assessment can demand that students use higher-order skills such as application of knowledge, critical evaluation and synthesis, which are often overlooked in bioscience course assessments in favour of more basic recall of knowledge (Krathwohl, 2002). Lecturers can achieve this by guiding students through inquiry-based learning, rather than covering discrete topics that students can simply memorise (Lord and Baviskar, 2007).

Assessments should also respond better to the diversity of the student body (Boud, 2010). The majority of assessments in Biochemistry are still closed-book examinations which, by their nature, largely test factual recall. The stressful nature of a timed examination disadvantages most students, in particular those with specific learning disabilities that may affect speed of writing or typing, memory recall or organising information.

A key principle of UDL is to provide students with flexible ways to demonstrate their knowledge and understanding. UDL encourages assessment for learning, along with the opportunity to apply knowledge to 'real-life' problems in which the learners see their diversity reflected. Could UDL offer a way to address the current issues surrounding assessment in HE, by providing flexible assessments built for diverse learners?

Using UDL to create a novel 'capstudy' assessment: What happened to Ashley Tailor?

We applied a UDL approach to redesign the assessment regime in a Level 5 (Year 2, undergraduate) 30-credit module, *Research and Diagnostic Techniques*, which is taught jointly to BSc and BMedSci students at DMU. The number of students enrolled on this module has grown from 84 students in 2014 to 204 students in 2018.

Previously, the module included five assessed laboratory reports linked to only one part of the lecture content. Students did not easily connect the practical and theoretical aspects of the module.

The examination tested recall of some of the practical methodology, but did not stretch students to use higher-level skills such as problem solving, analysis, synthesis and critical evaluation. Formative assessment of knowledge and skills was lacking.

Using UDL as a framework, we redeveloped the module by centring the teaching, learning and assessment on the 'Ashley Tailor' case study. This is a fictitious student, designed to be ambiguous in terms of gender and ethnicity, to be relatable to all students. As far as we know, this is the first UDL case study of its kind. At the start of the module, students receive news that Ashley has been found unconscious and it is their task to find out why. The final coursework element of the new module requires students to analyse, interpret and integrate information about Ashley, using their knowledge and skills from practical classes, lectures and other clues from social media. We have termed this a 'capstudy' assessment, as it combines a case study-based approach with a capstone assessment.

The new module plan involves four laboratory practicals; the first three teach students how to use the equipment, obtain and analyse data, and to write up their findings in the style of a journal article. Alongside the practical classes, students have five blocks of lectures on different topics. Each lecturer provides a problem-based learning (PBL) exercise for students to solve, which links their topic to the Ashley Tailor case study.

Integrating information based on theory and practicals from the entire module, the new capstudy assessment allows students more time to analyse and integrate information from various sources. Similar to Houston and Thompson (2017), we hoped to blend formative and summative assessment through our capstone assessment, to provide students with richer guidance and dialogue about enhancing their knowledge and skills. We also hoped that a case study-based approach would promote deeper learning and encourage students to develop their scientific and employability skills in problem solving, lateral thinking, communication, and team working. Using case studies in bioscience teaching is an active

learning approach which increases student learning gains and improves performance in assessments (Bonney, 2015; Yadav and Beckerman, 2018). Students also move away from surface learning and towards deeper learning, and demonstrate a better grasp of the underpinning scientific principles (Kulak and Newton, 2015). Solving case studies promotes higher-level thinking skills, such as application of knowledge, evaluation of information, and synthesis of a conclusion based upon multiple sources.

The novel pedagogic aspects of our approach included:

1. Employing UDL to create a capstudy assessment; learners work flexibly to integrate information and skills from across the module (see Table 5.1)
2. A case study where the ethnicity and gender of the subject are ambiguous, to make the subject relatable for all learners
3. A blended learning approach using social media (i.e. Twitter)
4. Co-creation of the new assessment regime by technical staff and academics

Table 5.1The Ashley Tailor capstudy reflects the three UDL principles employed at DMU

UDL Principle 1 Flexible study resources	UDL Principle 2 Flexible ways to learn	UDL Principle 3 Flexible ways to show learning
√ Modifiable resources provided in advance √ Mixture of images, text and practical resources √ Lectures recorded allowing students to revise and review concepts √ Activity is scaffolded with drop-in sessions for students to ask questions and check learning	√ Group- and individual work √ Blended learning including social media, online resources and lab practicals √ Ashley Tailor has ambiguous gender and ethnicity, allowing all learners to relate √ Discussion board online allows students to share ideas	√ Group and individual work √ Flexible submission of the final report (e.g. hand-written or typed) √ Marks available for analysis of clues which might not be correct √ Formative practical assessment with feedback √ Real-life problem solving

Methodology

Curriculum redesign and constructive alignment

The curriculum, learning outcomes and assessments were reviewed and aligned together, in accordance with the principles of constructive alignment (Biggs, 2014). We used Bloom's Taxonomy to bring in higher-order skills through students evaluating data and synthesising their own conclusions, rather than the prior focus upon learning content (Krathwohl, 2002). Formative and summative assessments were integrated into the practical sessions and linked to lecture content (see Table 5.2). All of this was co-created by the technical staff and academic staff working closely together. Using

constructive alignment ensures that learners cannot merely pass the module by memorising facts, but they have to construct their own meaning from the carefully interwoven learning activities. The module staff, both academic and technical, are able to offer more useful formative feedback knowing that the learning activities are better aligned to the final assessment.

Table 5.2 Constructive alignment of the practical sessions, learning outcomes and assessments

Practical session	*Broad learning outcomes*	*Associated assessment*
1. Gas chromatography (GC)	• Determine ethanol content in different beverages using GC • Interpret GC spectra • Link theory with practical	Summative MCQ test (5% of module) based on the theoretical lecture content associated with the practical
2. High Performance Liquid Chromatography (HPLC)	• Determine caffeine content in different beverages using HPLC (students could bring their own samples) • Interpret HPLC spectra • Link theory with practical • Write up experiment as a journal article	Formative lab report in the style of a journal article (template supplied) Students mark this later with staff guidance and marking rubric
3. Spectroscopy (UV/Vis and ATR/FTIR experiments; LC-MS demonstration)	• Apply Beer-Lambert law to determine drug concentrations • Construct and utilise calibration curves • Identify molecules such as paracetamol, aspirin and caffeine • Identify unknown substances, tablet type and active ingredient • Link theory with practical	Summative lab report (10% of module) in the style of a journal article
4. Analytical lab challenge: What happened to Ashley Tailor? (Dry practical)	• Critically evaluate the evidence and propose hypothesis • Analyse clinical data and draw conclusions to test hypothesis • Construct scientific report to explain what happened	Summative capstudy report (15% of module)

Abbreviations: MCQ – Multiple-Choice Question; UV – Ultra-Violet;

Vis – Visible Spectrum; ATR – Attenuated Total Reflection; FTIR – Fourier-Transform Infra-Red Spectroscopy; LC-MS – Liquid Chromatography-Mass Spectrometry.

The Ashley Tailor case study

Students received the following information about the fictitious student 'Ashley Tailor':

Name: Ashley Tailor | **D.O.B.:** 27.03.95 | **Height:** 171 cm | **Weight:** 73 kg

The height and weight give a healthy Body Mass Index for a male or female. The name chosen is deliberately ambiguous; a Google image search for 'Ashley Tailor' returned images of females and males from diverse ethnic backgrounds. A fictitious newspaper article was included in the module handbook (see Figure 5.1A). The teaching staff created the Twitter profile @ashley_tailor, which contains a brief timeline of tweets and photographs which provide some clues and some 'red herrings' (see Figure 5.1B). Students also received a photograph of Ashley's cupboard contents (see Figure 5.1C) along with copies of the corresponding patient information leaflets.

Problem-based learning (PBL) clues

Each lecturer was asked to provide a PBL clue to solve, which linked their teaching to the case study. Examples included Ashley's blood glucose reading, which required conversion into appropriate units and comparison against normal range (it is at the low end of normal); genetic sequencing to look for mutations that might cause sudden cardiac death syndrome (although Ashley has a point mutation in a relevant gene, this is not deleterious); and histopathology and immunofluorescence microscopy images of

Ashley's liver cells, showing molecular signs of damage. Interpretation of these clues encouraged students to review their lecture topics and to link the taught material with the practical sessions.

Figure 5.1 Examples of student resources

Clinical data

Students were provided with reference clinical data and simulated values for Ashley in the capstone laboratory session, which required correct analysis to allow valid conclusions to be drawn. This included Ashley's plasma paracetamol level, which the students had to derive as being in the toxic range; Ashley's blood-alcohol level, which is moderately high but not dangerous; Ashley's plasma caffeine level, which is high but in the non-toxic range; and analysis of the loose, unlabelled tablets reveals the unexpected presence of paracetamol in several different sources.

The capstudy assessment: Putting it all together

Students worked in self-determined groups of four to complete the practical work. In the final dry practical session, students performed analysis and interpretation of the simulated clinical data. The students then had to compile and submit their final report, containing results of data analysis, a wider discussion of the results and a final conclusion of what happened to Ashley Tailor, and the implications. The conclusion should include findings to indicate that Ashley's paracetamol level was in the toxic range, and therefore the most probable reason for Ashley's state of unconsciousness was a paracetamol overdose. The conclusion should, hopefully, discuss the unexpected sources of paracetamol. The calibration data given to the different groups of students were subtly different, to avoid plagiarism, but gave the same dose effect response such that all groups derived the paracetamol overdose situation.

Results and discussion

The end-of-module feedback survey deployed through the e-learning portal Blackboard revealed that all students who completed the survey (*n*=33) agreed with the statement, 'The Ashley Tailor case study was an interesting and useful component of the module' (see Figure 5.2). This was noteworthy, as some students had initially found the exercise very challenging because it relied upon problem-solving and lateral thinking, as opposed to factual recall. We were pleased to see that, by the end of the module, the learners appreciated the pedagogic benefits of the capstudy. However, only 21 per cent of the cohort completed the survey, and therefore not all learners' viewpoints were captured. A low response rate is a common problem encountered in student surveys, particularly those deployed electronically, and non-response is more common among Black and Minority Ethnic students, and students from lower socio-economic backgrounds (Porter and Whitcomb, 2005).

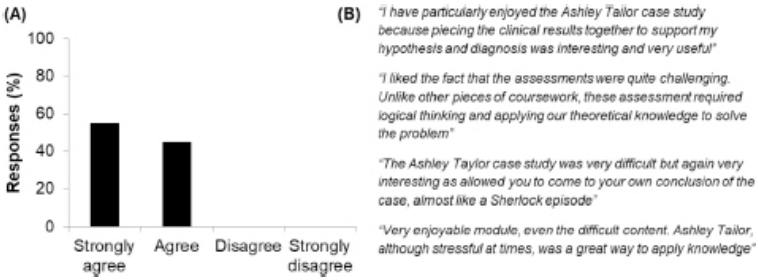

Figure 5.2 Student feedback on the Ashley Tailor case study

(A) All students who completed the module survey (n=33) agreed with the statement, 'The Ashley Tailor case study was an interesting and useful component of the module' (B) Free text comments.

We were concerned that our capstudy assessment, being much more challenging than the previous assessment, requiring higher-order cognitive skills, might decrease the module pass rate and average mark. However, these measures (88 and 52 per cent,

respectively) remained comparable with the other two Level 5 modules taught to the same cohort (pass rate 82/89 per cent, mean average 49/55 per cent, respectively). This was a very positive result, in light of the more challenging nature of the new module assessment and the diversification of the student cohort.

Informal comments from students and colleagues indicated that Ashley Tailor was highly relatable to different individuals. Interestingly, people often aligned Ashley's identity with some aspect of their own; typically gender and/or ethnicity. One female staff member commented, "I just know that she has curly hair." One male student commented, "I think Ali is an Asian male", whereas a female student said, "When I think of Ashley Tailor, I think of an Afro-Caribbean woman". In terms of being accessible to all students, we noticed that students with declared disabilities were equally able to succeed and did not require reasonable adjustments, extensions or deferrals.

The capstudy yielded several unexpected benefits. First, many students became interested in their own habits concerning ingestion of caffeine and paracetamol, and conducted research during the final session which compared Ashley's results to their own habits. Some students also expressed their surprise at finding paracetamol in so many different sources and commented that they would pay more attention in future to the frequent occurrence of paracetamol in over-the-counter medications. Second, students fully embraced the opportunity to conduct their investigation as a group. Many groups allocated sub-team leaders and delegated different tasks to different team members, thereby developing valuable transferrable skills around project management and team working. Finally, students expressed that this capstudy had actually increased their resilience when faced with a challenge, and many felt more confident about approaching final year modules and dissertation projects as a result. Students enjoyed the realistic nature of the assignment and felt that it related well to their potential career options.

The social media aspect of the case study was very popular and

many students created professional Twitter profiles as a result of engaging with the @ashleytailor account. The limited time frame for developing the module meant that the Twitter profile was less in-depth than we would have liked. In future, we would recommend creating a more in-depth social media profile across multiple platforms including Twitter, Instagram and Facebook.

One issue was the variable engagement from the module team. Most staff bought into the Ashley Tailor capstudy and gladly supplied PBL exercises that linked their lecture content to the assignment. However, some staff were reticent to engage, citing a lack of time to prepare a PBL task. Consequently the module leader had to prepare some clues for the teaching team. We felt that some staff were nervous about this new approach. Now that this approach has been embedded into the programme, other modules are now adopting similar approaches and staff feel more confident to engage.

Verbal feedback during a post-module evaluation meeting revealed that the technical team found the capstudy approach highly beneficial, as students were more attentive, inquisitive and asked more questions during the practical sessions. The technicians also felt more involved in the module from the outset; being part of the module team and planning the practicals and assignment with the academics was a great improvement. Likewise, the academics benefitted greatly from taking more time to listen to the technical team's expertise. However, the capstudy approach did increase the technicians' workload and more time was needed for the practical classes. The large cohort size meant that the laboratory classes of 40 students were limited by the availability of equipment. In future, a 'three-ring circus' setup might be better, in which the chromatography and spectroscopy equipment could also be available in the same practical session, to avoid groups of students waiting to use equipment; however, this would be more labour intensive from a staffing point of view. The large cohort size also played a part in deciding to mark the final assignment as a piece of group work. An individual assessment may provide a more

personalised experience; this could be peer-marked to make this time efficient.

Conclusion

The Ashley Tailor capstudy was a novel and effective way to engage and challenge a diverse cohort of students, in a way that allowed them to utilise higher-order thinking skills to develop a range of scientific and transferrable skills.

Since we designed the Ashley Tailor capstudy in 2015, the principles of UDL have been applied to other undergraduate science programmes. A UDL approach introduced by a chemistry faculty at Ball State University (Indiana, USA) encouraged open-mindedness, supportive communication and analysis of the laboratory curriculum to minimise students' stress in laboratory practical classes (Miller and Lang, 2016). However, UDL is still at the very early stages of permeating into HE curricula and teaching. Scanlon *et al.* (2018) reviewed three post-secondary chemistry curricula and found that certain aspects of UDL were well represented; flexible ways of illustrating and displaying information, vocabulary and symbols.

Moreover, UDL is still widely considered to be a deficit approach that is associated with providing additional support for disabled students. King-Sears et al. (2015) looked at the potential benefits of using this 'traditional' UDL approach to secondary school chemistry students, with and without disabilities. Surprisingly the UDL approach seemed only to benefit students with disabilities, whilst having a negative impact on non-disabled students, which may reflect the nature of the UDL approach taken; if UDL was used to supply additional materials which all students were required to employ, then this might have slowed the learning pace for non-disabled students. At DMU, we advocate the opposite use of UDL; to

provide extra challenge for all students by allowing them to choose the way in which they engage with, and demonstrate, their learning.

The use of social media in teaching, learning and assessment is slowly gaining momentum. The University of Plymouth asked 450 nursing students to create and use a Twitter account as an assessed component of their first year. Here, the focus was more on developing the students' 'digital professionalism' and facilitating connections with the wider community, which most students found useful (Jones et al., 2016). At Monash University (Melbourne), 297 first-year biomedical science students completing a public health module were asked to use Twitter to post relevant comments and resources related to their module learning. Those students who completed the Twitter-based assignment scored higher overall grades, and felt that Twitter was a useful curriculum tool which facilitated peer collaboration and public health promotion (Diug et al., 2016). Nonetheless, the authors point out that only 13 per cent of their students were already Twitter users, highlighting the need for students to be trained in social media platforms and for academics not to assume that all 'Generation-Y' students are digitally literate.

Future Perspectives

To further improve the capstudy, we would recommend:

1. Broadening the subject's social media presence to integrate clues from Instagram and Facebook
2. Employing final year student interns as co-creators to build the case study
3. Using a crime scene house to mock up Ashley Tailor's bedroom
4. Providing a guide book for technical and academic staff as well as a workshop on asking effective questions, to ensure that staff can encourage inquiry-based learning without giving away answers (Vale, 2013)

5. Introducing a mini-capstudy in Year 1 to familiarise students with the approach

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6. Exploring virtual reality for teacher training, materials development and student engagement

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Introduction

Though it might be said that virtual reality has now 'arrived', in the popular sense, its evolution can be traced back through time as a constant struggle to create more visually immersive experiences. From the panoramic paintings of the nineteenth century and early experiments in stereoscopic photography, the history of immersive media has been a steady march towards the goal of creating convincing simulacra that commandeer our perceptual systems, persuading us that what we are seeing is real. Virtual reality (VR) embodies the current stage in the evolution of this process.

VR has made a remarkable recovery from the premature technology, disappointing results and over-hyped promises of its previous incarnations. The global VR market is expected to reach 49.7 billion US dollars by 2023, a dramatic rise from 3.13 billion in 2017 (Orbis Research, 2018), and VR appears to be on the brink of widespread public acceptance. However, although VR technology has advanced considerably, the heavy, uncomfortable and often expensive headsets required for an immersive experience (Laurell et al., 2019), are likely to delay widespread adoption in the short

term. Currently, VR seems best suited for specialised use cases, with education and training being two primary examples.

VR is being increasingly deployed in educational settings, especially in the Higher Education sector. Its use is now well established across the fields of science, engineering and medicine. Early barriers to adoption, such as the prohibitively high cost of the technology, are rapidly diminishing, and VR, is now becoming a viable tool to support teaching and learning. However, as an emerging technology that has only recently begun to gain popular traction, the study of the potential benefits of VR is still in its infancy.

The aim of this chapter is to contribute to the understanding of the potential of VR in teacher training and nurse education by providing examples, outlining theoretical considerations, and forging a methodological and technical path to guide others undertaking similar work. In addition, the authors apply VR to tackle immediate barriers to learning and teaching. In nursing, these barriers are a shortage of placements and the limited access trainee nurses have to skills labs for hands-on training. In teacher education, the primary challenge is the need to develop trainee teachers' ability to reflect on their practice and raise their awareness of the in-situ pedagogical decision-making demonstrated by skilled and experienced teachers. As a highly immersive technology, VR can make a positive contribution towards overcoming these issues. However, more empirical data is required to avoid the pitfalls of technological determinism and inform more nuanced, context-specific applications.

What is 'Virtual Reality'?

Virtual reality is not a single, easy-to-describe concept, and there is no single universal definition. VR is comprised of 360-degree images and video. 360-degree video uses a camera with multiple

lenses to capture a full view of a scene. Images from each lens are then 'stitched' together, and presented as a coherent 360-degree environment. These are two-dimensional media projected onto a digital sphere. When the viewer is placed at the centre of this sphere, wearing a VR head-mounted display (HMD) gives the impression of being inside the simulated environment. This form of VR affords what is known in the industry as 'three degrees of freedom'. This refers to the number of directions that the viewer can 'move' through three-dimensional space, which means that viewers can tilt and turn their heads left, right, up and down, and this orientation will be tracked and matched by the environment being viewed. Looking left inside a virtual room, for example, will cause the view inside the headset to display the left side of the room. Looking up reveals the ceiling, and so on. The position (but not the orientation) of the virtual viewpoint is fixed.

The level of realism and authenticity that can be achieved through using real images and video makes VR a practical and powerful tool for creating immersive, interactive learning content. VR is now relatively cheap and fast to produce using this method, as it draws upon real-world places and people to construct digital environments. It is also comparatively easy to share; in the context of education this makes it practical to take content beyond research and integrate immersive VR experiences across a faculty. However, the major drawback to this approach is the low level of user agency. There are, however, several ways in which this disadvantage can be ameliorated. We will return to this point later.

At the technological high end, we have what is often, somewhat controversially, described as 'True VR' which affords six degrees of freedom. This means that the headset not only tracks the orientation of the user's gaze but also their location as they physically move through the virtual environment. This form of VR enables (relatively) free and natural movement in the virtual environment that closely replicates how we perceive the real world. Objects can be viewed from different angles and users can walk over

to them, look behind them, and even pick them up with the use of hand tracking technology or handheld controllers.

In the HE context, however, the high cost and technical complexity are largely responsible for hindering the impact of this high-end form of VR on everyday teaching and learning. For these reasons, ARU has opted to use interactive 360-degree images and video rather than computer-generated VR. This aligns well with our institutional active learning strategy, and all efforts in our Faculty have been directed either towards improving teaching and learning, or researching ways to do so in the future. While interested and active in researching the higher-end configurations of VR, our priority is to democratise the technology through widespread integration into courses which will benefit our students.

VR and Learning

The examples that follow describe the use of VR in teacher training and nursing are illustrations of how it can be used for educational purposes. Consequently, these examples of applied VR are explored primarily through a pedagogical lens.

The exploratory objectives of these ongoing projects centre around three primary goals:

1. Identify the core pedagogical affordances of VR
2. Locate areas within the curricula that can potentially benefit from VR
3. Use well-grounded learning design principles to build content or procedures that exploit the potential of VR

In contrast to more passive forms of media, such as text, images and video, VR can be used to create immersive, interactive simulations that provide users with a degree of choice and agency. One of the primary affordances of VR is its power to situate the student

at the ontological centre of the learning experience (Gibson, 1977). The digital world, quite literally, revolves around the viewer, fully appropriating their visual, auditory and spatial perception, which generates a spatially immersive experience. The degree of sensory appropriation, in combination with the placement of the viewer as the locus of the experience, can facilitate a compelling feeling of presence (Schuemie et al., 2001).

Most people who have experienced VR report feeling a strong sense of *being there*, in the digital environment. While this feeling of 'telepresence' (Mantovani et al., 1999) is highly subjective, approaches to analysing the phenomenon typically distinguish two components from which immersion is an emergent property:

1. Spatial presence, or the sense of being in a place
2. Involvement, in the sense of focusing attention on the virtual environment (Shubert, 2009)

To illustrate interrelation between these factors, imagine a student in a crowded lecture theatre. The student is physically, spatially present in the environment, but with attention completely absorbed in a social media exchange on their phone. In this context, although physically present, it would be hard to claim the student is immersed in the learning environment. It is clear, therefore, that spatial presence must be combined with attentional focus in order to fully achieve the psychological state of immersion.

For those involved in the deliberate construction of digital environments, it is important to understand which aspects of physical spaces can elicit a strong sense of presence, and how attention and engagement can be intentionally designed into these environments. If immersion plays an important role in learning, the interplay between spatial presence and attentional focus would appear to be a dynamic that can, through informed design, be leveraged for training and educational purposes. Skills involving spatial understanding, observation and recall of visual information are obvious areas to which VR can make a positive impact. There is

also a growing body of research supporting the use of VR to train affective skills through cognitive behavioural therapy (Botella et al., 2015; Zinzow et al., 2018), with popular examples including stress management, and treatment of post-traumatic stress disorder and depression. However, the role of immersion in learning, especially with VR, requires further study and the complex interplay between immersion, spatial presence, engagement, motivation and learning, is still being mapped.

The feeling of spatial presence, in tandem with the egocentric frame of reference, and photorealistic imagery derived from authentic settings, creates a compelling opportunity to contextualise and situate learning. The principles of situated learning theory (Brown, 1982; Lave and Wenger, 2002) frame learning as inseparable from doing. Knowledge gains meaning when it is grounded in context, developing as a dynamic relationship between an individual and his/her situation. These ideas are now fairly uncontroversial in the field of education and have profound implications for the planning, design, creation and integration of learning objects based on interactive virtual settings.

To construct more authentic, situated and active learning experiences (as opposed to experiences designed to promote the retention of information), teachers need to shift from merely distributing information to using context as a framework for actively constructing and grounding knowledge. Tasks and assessments need to be aligned with their real-world equivalents. However, intentionally designing context, especially within the physical limitations of traditional educational settings, can be extremely challenging. The contextual affordances of brick and mortar learning spaces are, usually, literally quite static. Conversely, VR offers tools that enable the sculpting of a simulated environment, but these tools need to be used in an informed way to design a contextualised cognitive and emotional experience that is as multifaceted and authentic as possible.

For both instructional and investigative purposes, the hypothetical realities created through the use of VR can provide

a higher degree of ecological validity to students, educators and researchers. Traditionally, in both contexts, while the content or stimuli can be tightly controlled, the fixed constraints of the surrounding environment pre-exist. VR can help to bridge the gap between the real and the constructed, affording the opportunity to study more complex in-situ behaviour that would otherwise be logistically impractical. The advantage of improving ecological validity through the use of VR is that the insights gained may prove to be more transferable to the real world.

These are all issues to which we seek to find answers through our research and practice. The following examples foreground different aspects of this journey.

Example 1: Teacher training

In the first example of applied VR, the design complexity was minimised while retaining a high degree of authenticity. When constructing a VR scenario, there are two main design stages: the first involves the planning and filming of the scene(s) using 360-degree cameras; the second is the addition of a digital overlay. This overlay typically comprises navigation options to enable simulated movement between or within scenes and a series of 'tags' or 'hotspots' that provide additional functionality and information. Hotspots range from descriptive text and labels to spatial audio narration, images, slides, object markers, multiple choice questions and traditional 'flat' 2D video. The use of digital overlays can restore some of the meaningful user agency that it is typically lacking with this type of VR. They are also a primary tool for focusing attention and increasing engagement.

The project outlined below builds on an earlier pilot study (Walshe and Driver, 2018), which took the form of filming inexperienced trainee primary teachers in the classroom using 360-degree video technology and then asking them to re-watch the video using virtual reality headsets. The results of this study led to several

significant observations that reinforced the idea that VR can produce highly embodied, spatially situated experiences that promote learning. For example, most of the trainee teachers felt they were re-visiting rather than just re-watching their lessons, revealing a strong feeling of presence and a shift in temporal as well as spatial perspective. Trainee teachers were also able to produce markedly more nuanced reflections on their and their students' behaviour. However, the need to better scaffold the development of trainee teacher's reflective practice and an opportunity to raise their awareness of in-situ pedagogical decision-making was also noted (Walshe et al., 2019). To achieve this goal, a follow-up interpretive case study was initiated involving 23 Year 3 students on the BA Primary Education Studies course. We adopted Stake's (1995) instrumental case study approach using the examination of a particular context to facilitate wider understanding. After receiving ethical approval, written parental consent on behalf of the pupils, and verbal agreement from students, we began filming highly experienced teachers in practice.

Beginning with English and Maths lessons, we followed a similar process to that taken in the earlier pilot study. The experienced teachers were asked to 're-visit' the VR captures of their lessons and verbally reflect on their teaching using 'think-aloud protocol' to articulate their thoughts and observations. These reflections were recorded in both audio and standard video.

We recorded a real lesson, delivered in real time, with real students, in a single space (the classroom), which streamlined the post-production workflow. The production was also considerably simplified through the use of fixed (stationary) cameras to capture the lesson. One camera was placed at desk-level in the middle of the classroom space and the other attached to the overhead projector to provide a panoptic overhead view. Each camera was controlled remotely from outside the classroom, using mobile devices to monitor live feeds, minimizing the disturbance of the classroom dynamic that our presence may have otherwise caused.

Stage 2 involved the creation of the digital overlay using the

recorded audio and video clips of the experienced teachers commenting on their lessons. As these comments were extensive, they were edited down to a curated range of observations to highlight different skills. We paid particular attention to commentary that unveiled non-obvious, tacit pedagogical decisions.

The digital overlay used timed narration to synchronise comments with events taking place in the lesson. A navigation hotspot was also created to allow viewers to move from the desk-level viewpoint to the overhead panoptic view. The video was edited with the intention of increasing the salience of important moments as they unfolded in the classroom. In these instances, a circle would appear around the area of interest. The area outside this circle would darken and blur and the area inside would brighten and magnify. One such instance showed a pupil who appeared to be excluded from working in a group, before the synchronised teacher narration provided an explanation of what was actually taking place and her reasoning to allow this to happen. This may seem like a trivial piece of video editing. However, it is important to remember that a VR user wearing a headset is free to look in *any* direction. In such a dynamically evolving scenario as a primary school classroom, there are multiple simultaneous events competing for the viewers' attention. With traditional 'flat' video, the agency to choose where to look is limited to the single rectangular frame the director has preselected. While still experimental, the use of this toolbox of techniques (e.g. zoom, blur, highlight and magnify) seems to achieve the desired effect of capturing and directing viewers' attention so that they do not miss fleeting but significant events.

This is an ongoing project in its early stages. As such, the insights and conclusions drawn from this research will be shared in future publications. Nevertheless, there have already been several unexpected points to emerge that are of interest from both theoretical and practical perspectives.

One example was observed when a trainee teacher participant was wearing the VR headset and progressing through the classroom

scenario. When she navigated to the second camera (suspended from the ceiling projector), she became visibly disconnected from the feeling of immersion. She verbally expressed surprise and discomfort at the shift in perspective. While the first camera had been providing a viewpoint of the classroom that roughly corresponded to the participant's seated height and position, the top-down panoptic view of the suspended camera had created a jarring proprioceptive mismatch by forcing a perspective that was not coherent with her internal body schema (Lakoff and Johnson, 1999). This had the effect of breaking immersion, abruptly 'snapping' the participant out of the constructed reality and reminding her that she was, in fact, sitting in an empty room and engaging with a simulation.

Example 2: Nurse education

In this section, we describe how we approached the design, production and deployment of an immersive community care scenario for second-year students on the undergraduate nursing course. This core material is set in the home of an elderly service-user and is being used to assess the potential benefits of applying VR in this context.

While this is currently an academic study, the desired outcome is that this research will inform the future widespread integration of VR technology across the faculty, including nursing, midwifery and social care courses. Students highly value the time spent within our skills labs and have shown great interest in finding further opportunities to develop their practical skills before entering placements. As these skills labs are already operating at full capacity, and clinical placements are in limited supply, VR could help to bridge this gap through the creation of virtual labs and placements based on authentic locations and realistic scenarios. One of the major benefits of this approach is the scalability and repeatability

afforded by VR, allowing students to revisit scenarios multiple times and proceed at their own pace.

In this mixed method study, we were investigating and evaluating the affordances of VR to support the development of empathy, compassion and decision-making skills. This differed significantly from the previous study in that we were comparing three distinct groups of learners to assess the relative benefits and drawbacks of different modes of delivery.

This scenario generated considerable technical challenges that were not encountered during the study of pedagogical decision-making. Firstly, there was an inversion of movement in the 360-degree filming. While in the teacher training context the two cameras were fixed in place, producing the effect that all movement was taking place around the viewer, in the nursing scenario the central protagonist was an elderly woman, navigating her home in an electric wheelchair. To provide the user with a perspective that revealed the world from her eye level, the stereoscopic 360-degree camera was attached to her wheelchair, raised just above head level.

In tests of early footage, we found that people quickly began to feel signs of motion sickness. This is a common symptom of VR exposure (Allison et al., 2001). This was due, at least in part, to the fact that we had introduced two simultaneous and conflicting levels of motion. Viewers wearing the HMD were already introducing movement to the video, by turning their heads to look around. By adding the movement of the wheelchair to this, we were creating the perfect recipe for nausea by mismatching input from the user's visual system and their vestibular system (responsible for spatial orientation and sense of balance). By applying a series of counter-measures, such as slowing down the wheelchair, making changes to the video, and modifying the instructions for participants, we succeeded in cancelling this effect.

One group interacted with the immersive scenario using an untethered head-mounted VR display with spatial audio. A second group received the same content but embedded within the Virtual Learning Environment (VLE) using a desktop computer, mouse, and

monitor. The embedded content is identical to that in the first group, retaining all the interactivity provided by the digital overlay; however, students control the viewpoint by clicking and dragging the mouse to explore and navigate through the environment. A third group received a 'typical' non-immersive version of the same scenario, constructed using text, images, and other commonly used tools available within the VLE.

While every effort was made to ensure that all three groups encountered the same information, the way in which they consumed and interacted with the media was qualitatively very different. As anticipated, descending levels of immersion and feelings of presence occurred between those using the VR headset and those with more 'exocentric' or 'outside-in' viewpoints, showing that they were not present in the constructed reality. We were also interested in analysing the effects of presence, and the use of the virtual environment as a mnemonic device to support the transfer of information encountered within the scenario into long-term memory. As with the previous example, the results and insights gained from this ongoing research will be disseminated in future publications.

Discussion

The concept of embodiment has a long history in philosophical thought, especially in the work of thinkers in the phenomenological tradition, such as Heidegger (1962) and Merleau-Ponty (2002), who emphasise the body as the locus of identity and highlight the centrality of sensory experience and perception in how we engage with the world. More recently, in cognitive psychology, the theory of embodied cognition (Lakoff and Johnson, 1999; Bergen, 2012) has begun to redefine our understanding of how we process information. This challenges Cartesian views and computational theories of the mind, that have long dominated traditional cognitive

science and informed educational theory, to the point that it is difficult to even speak of theory of mind without recourse to ontological metaphors derived from technology, such as 'process information'.

It is interesting that computer scientists, Human-Computer Interaction designers, and professionals from many other technology-related industries are now drawing upon the ideas of the above thinkers to inform their work. Dourish (2001), for example, emphasises the need to understand skilled, engaged practice and to incorporate social understanding into the design of better interactive systems that connect with the settings in which they are embedded. He distinguishes between 'inhabited interaction' in the world and 'disconnected observation and control' (2001: 102). This distinction can also be found in the work of Heidegger, who describes two modes in which we interact with objects in the world: *Zuhandenheit* (ready-to-hand) and *Vorhandenheit* (present-at-hand). When objects are ready-to-hand, we relate to them on a practical level, using them to achieve our goals seamlessly, as an extension of ourselves. In contrast, when we relate to objects in the present-at-hand mode, we contemplate them, aware of their separation from us. These modes can flow backwards and forwards when, for example, a mouse we are using to move the cursor on a screen suddenly stops working. Just moments earlier, as we worked, we were not even consciously aware of the mouse; it felt like an extension of our arms or eyes. However, once it ceases to work we stop to look at it, pick it up and rotate it to look for blockages or check if the batteries need changing.

These somewhat abstract ideas become useful when we are attempting to construct a coherent digital space that evokes feelings of presence and immersion. Constructing VR environments, whether these are computer generated or built around 360-degree video of authentic locations, requires the deliberate production and manipulation of space (Lefebvre, 1974) to create a designed experience that provides a particular representation of reality. This

representation can quickly lose integrity when we cause a user to shift modes of interaction with the virtual world.

The risk of breaking immersion is further increased with the addition of a digital overlay. The floating hotspots that appear in the virtual scenarios are clearly not part of the original scenes, they are designed to *stand out* from the background. They look 'digital' – visually distinct from the authentic video layer. They prompt interaction by rotating and making a 'pop' sound as they appear to draw the attention of viewers. The use of the overlay was an initial cause of concern, precisely due to the danger that its obvious artificiality would cause a jarring breakdown in the aural ambience of the VR scenarios. However, both in testing and in practice, this proved not to be the case. Viewers appear to accept the overlay as a semantic interface to the experience without question or a shift in their mode of engagement with the VR world. Curiously, only when a hotspot failed to work as expected during testing, did we notice a clear breakdown in immersion and presence. This is a phenomenon that clearly requires further exploration.

Conclusion

It would appear that the sense of presence and immersion is quite robust within VR environments, to the point that it is possible to interrupt cognitive flow (Csikszentmihalyi, 2014) without jarring the viewer/user into a mode in which the experience becomes perceived as present-at-hand. This was explored in our early study on trainee teacher reflection and is also a current theme in our follow-up study on in-situ pedagogical decision-making. This point is especially interesting as other studies on VR have highlighted the experience of flow as a strong predictor of empathy and embodiment (Shin, 2017). The service-user scenario for nurse education applies the use of intentional flow-breaking as an integral part of the learning design. Hotspots were used to interrupt the

scenario, freezing the 360-degree video while participants answered multiple-choice questions. In both cases, the interruption of flow was used as a tool for prompting participants to consciously contemplate events, objects, and people in the VR world, at moments identified as key opportunities for active, situated learning. These insights and the results of these ongoing studies will guide decisions regarding the identification of future opportunities to improve learning through VR. They will also inform the theoretical understanding of the affordances of VR, the learning design principles that underpin their educational application and the technologies and production methods used in their creation.

Further exploration of the limitations of this form of VR is required, including issues surrounding accessibility, for example, and the absence of tactile feedback. We also need to more fully understand the role of sound, especially spatial audio (Cohen, 2015), as a tool for designing 360-degree soundscapes that match the visuals in order to increase the feeling of immersion. More broadly, it will be useful to further investigate the role of narrative and gameful design (Aguilar et al., 2018) as tools for the deliberate sequencing of events to scaffold learning and create engagement.

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7. Barriers to scaling up Active Collaborative Learning

RACHEL BERKSON AND UWE RICHTER

Introduction

After a successful pilot of Active Collaborative Learning (ACL) in 2015/16, Anglia Ruskin University (ARU) joined with two other Higher Education Institutions (HEI), the University of Bradford (UoB) and the lead institution, Nottingham Trent University (NTU), in a national project aimed at scaling up our ACL offerings to institutional level. Like all UK HEIs, ARU needs to ensure that all students fully benefit from their education, which necessitated making the transition from *best practice* to *common practice*; from pilots to an institution-wide culture of learning and teaching using proven approaches.

In this chapter we discuss some of the barriers we identified which hinder widespread adoption of ACL. We discuss the solutions we have started to implement at ARU, and compare some of the approaches taken at UoB and NTU.

Scaling up to institutional adoption

There is a strong evidence base for the effectiveness of ACL, including improving student engagement and outcomes in a wide variety of contexts (Freeman et al., 2014). Most literature refers to

educational innovations where ACL is introduced in a context where it was not previously being used (Haidet et al., 2014). There is usually a strong motivation to change the learning and teaching approach, championed by enthusiasts. Initial proof of concept studies may apply a quasi-experimental design where cohorts are split, with one group taught using traditional methods, and another group taught using the new method (Deslauriers et al., 2011). In these contexts, the change to ACL produces a clear improvement compared to the previous approach.

However, there are inevitable biases in this kind of educational research. Novelty in its own right can contribute to initially measurable improvements. There is also an element of publication bias where studies that show a marked improvement are more likely to be submitted to and accepted by journals than interventions with limited effects (Franco et al., 2014). We must therefore question whether studies of innovations are representative of the efficacy of a learning and teaching approach in more general use, particularly if the original data comes from an intentionally experimental setting.

Institutions may encounter significant barriers in making the transition from innovations by pioneers to adoption at scale, and must commit to solving these barriers in order to scale up. Following a phase of institutional investment in an innovation, once the new method has been in place for some years, there are likely to be fewer targeted resources available. To be sustainable, the approach needs to be adapted to more constrained circumstances. In addition to overcoming practical barriers, scaling up a method requires a widespread change of organizational learning culture. This change needs to permeate to all levels of an institution, including the students who need to embrace being taught differently from how they may expect. Successful scaling-up is more effective when support is available from the senior managers at the institution.

A particularly interesting question is how well an ACL method performs as it transitions to 'business as usual' across the institution. Scaling up the approach presented us with a number

of challenges which were not apparent during the initial stage. By analysing some of these challenges and how they can be resolved, we aim to develop guidance for institutions that want to extend an innovation that has demonstrated promising results.

Context of project

In 2017, three universities working in partnership, ARU, UoB and NTU, received Catalyst funding from the former Higher Education Funding Council for England (HEFCE), now the Office for Students (OfS), for a project called, *Scaling up Active Collaborative Learning for student success* (NTU, 2019). The Catalyst fund was designed to 'address barriers to success' for groups of students who 'experience significant differences in levels of retention, attainment and progression' (NTU, n.d.). The three institutions had demonstrated success in introducing two ACL methods: Team-Based Learning (TBL) at both ARU (see Chapter 2) and UoB (see Chapter 3), and SCALE-UP at the lead institution, NTU (see Chapter 1). Evidence from the literature shows that these methods benefit all students, but with additional benefit to students who otherwise perform poorly (Beichner et al., 2007; Koles et al., 2010).

The OfS project started in February 2017, at which time UoB had used TBL for over four years, primarily in their Pharmacy course; ARU had used TBL for two years in a number of different courses (known as programmes at some institutions) in the Business School and the Science faculty; and NTU had used SCALE-UP for four years in several departments. All three universities were committed to expanding these ACL approaches across their institutions, in line with strategic plans to increase active learning and effective, innovative pedagogies promoting success for all students. From September 2017, the three institutions embarked on ambitious plans to encourage more modules and courses to adopt ACL, and extend ACL to all faculties and schools/departments.

Methodology

Our approach to identifying and addressing barriers to scaling-up was based on an Action Research cycle (Carr and Kemmis, 2003). Barriers were identified in the original funding proposal, based on data from pilot studies and general experience of educational change. We designed research instruments, including questionnaires and semi-structured interviews, with these barriers in mind, asking staff about whether they had experienced predicted barriers. Colleagues provided feedback on what resources they required to overcome these barriers to successfully scale up ACL. In parallel, we implemented solutions to any barriers we were able to address from the start of the project. We discussed our solutions with stakeholders across the institution and refined them based on the feedback. Ongoing research into barriers, with a mixed methods evaluation of scaling up, allowed us to identify emerging themes and implement or propose further solutions.

Design of research instruments

All three partner universities had successfully introduced ACL in some courses prior to the start of the project, with support from experts in TBL and SCALE-UP. These pilots were evaluated through surveys with staff and students, along with preliminary outcome data. While overall findings were very positive, some challenges were reported by the original pilots, and these challenges were incorporated into the business case of the funding proposal. Description of the expected barriers was refined through predictions of what issues might become more prominent as ACL was scaled up. The project teams undertook detailed discussions with colleagues from all parts of our institutions, as well as applying their knowledge of the institutional context.

As part of the effort to scale up ACL, we started to identify and introduce solutions to the barriers. We included questions in staff surveys and interviews about whether academics had encountered similar problems to those seen by the early adopters, and about what support had been helpful in overcoming them. Results from these evaluations were compared across institutions, identifying patterns that held true in a range of contexts, plus a small number of institution-specific challenges.

The scale of the project provided the opportunity to analyse the experiences of more staff, coming from various disciplines, and with varying levels of enthusiasm for ACL. We were able to identify new barriers specific to scaling up the approach.

Refinement of observed barriers and proposed solutions

A project team was constituted at ARU with representation from all faculties, as well as a project steering group representing all areas of the University including senior management. These groups met regularly and provided input into solutions to the barriers.

We discussed our emerging themes at several conferences, both internal learning and teaching events, and to audiences from multiple institutions. We asked participants to comment on whether our findings reflected their own experiences of extending the use of ACL. Colleagues from UoB led a Twitter Chat on the subject of TBL, working with the 'Learning and Teaching in HE' Twitter community. The Twitter Chat was not designed for the identification of barriers *per se*, but inevitably some participants in the Twitter Chat raised problems they had encountered. We were then able to refine our suggested list of barriers incorporating new, albeit anecdotal, insights from colleagues.

Through this iterative process we continued to identify new barriers and proposed solutions to them. In the final phase of the

project, we analysed further qualitative evidence from staff working on scaling up ACL, as well as outcome data, to determine whether the barriers had been successfully overcome.

Findings

Initial barriers

The barriers originally proposed for the business case for funding applications were:

- Fitting multiple summative assessments (required for TBL particularly) into existing university assessment regulations
- Changing the learning culture in some disciplines
- Moving from module level adoption to course level and strategic delivery
- The lack of a collaborative staff community sharing good practice and providing mutual support for developing ACL
- Practical issues relating to the learning environment such as availability of suitable rooms and resources

Multiple summative assessments

University assessment regulations are often based on traditional categories such as exams and coursework, which do not map well to the approach of continuous assessment or assessment for learning used in ACL (Sambell et al., 2013). Usually an exam is regarded as a single assessment element, while coursework is an assessment element consisting of multiple components. Regulations to avoid

the risk of over-assessing students limit the number of assessment elements for a given module.

TBL, however, uses regular low-stakes summative tests (individual and team Readiness Assurance Tests – iRATs and tRATs) to engage students, support peer learning, and improve accountability (Michaelsen et al., 2002). iRATs and tRATs are exams in one sense, but regarding each as a standalone assessment would effectively preclude their being used summatively under most regulations. This is less of a problem for SCALE-UP, which does not traditionally use in-class summative tests (Beichner et al., 2007). Similarly, peer evaluation of group or team contributions can be seen as a separate assessment, which may not be permitted if multiple other assessments are already used.

Even where regulations are interpreted as allowing multiple tests, the practical problem of extracting a single combined mark which can be submitted into university assessment systems remains, especially if weighting or selection (e.g. best six out of eight tests) is applied. The traditional TBL approach, where tests are taken on paper and using 'scratch cards' (where participants reveal the correct or incorrect answer by rubbing off a coating), may require extensive manual transcription. Further, if the iRATs and tRATs are treated as 'exams' then students who have declared a disability may be entitled to reasonable adjustments (e.g. extra time, sitting the exam in a separate room, and so on). Such adjustments are sometimes impractical and frequently do not make sense in the TBL context. Likewise, regulations often require that all exams must be able to be retaken if a student misses the assessment date for a valid reason. However, it is not realistic to retake iRATs and tRATs as these are intended as learning tools, to develop accountability for team effort, and ensure students are ready to apply their new knowledge to solve problems (Michaelsen et al., 2002). Even if teams could be reconvened at a later date to retake a test, this would not be meaningful because the test was designed to prepare students for a class which had already taken place.

Conversely, if iRATs and tRATs are regarded as 'coursework' in

that they continue throughout the module, they are not anonymous and as such would be subject to a process of blind double marking at some institutions, including ARU. Double marking is not usually feasible for rapid tests at the start of a class, and would not improve the reliability and grading fairness of a short set of multiple choice questions.

Because of this barrier, many academics have opted to use the iRAT and tRAT and/or the peer evaluation scores for formative purposes only. Yet, removing the summative element negates the theory behind TBL, where these regular summative tests ensure accountability for the completion of pre-session work.

There is some flexibility in the interpretation of regulations. One option we have explored is to include iRATs, tRATs, and peer evaluation marks under the heading of *participation* or *engagement* which can account for a proportion of a module mark under the regulations of universities in the project. Other modules accept treating the combined outcome of multiple individual tests as a single assessment element, as long as it can be demonstrated that this is not a way to circumvent the intention of the regulations to limit over-assessment. ARU is moving towards formalizing and providing infrastructure to support multiple components within a single assessment element.

To assist with the practicalities of combining multiple in-class test scores into a single reported mark, the project employed a Data Analyst at ARU, who worked with academics to identify examples of assessment practice, and to support and partially automate these processes. For the future, we are exploring possible software solutions for electronic approaches to TBL assessment.

Colleagues have been supportive in adapting regulations to match the reality of ACL. For example, disabled students' official Statements of Reasonable Adjustments at ARU now specify end of module exams and note that in-class tests may have a different set-up. The regulations allow tutors to offer remediation for missed iRAT and tRAT tests, as an alternative to an improbable resit opportunity. It is common practice to record the marks only from

the best of students' iRAT and tRAT scores, (e.g. the best 8 out of 10), limiting the impact of a single missed test.

Learning culture

Some departments are resistant to adopting ACL methods, especially in areas where academics feel that a great deal of factual content needs to be covered. They can be attached to traditions such as extended didactic lectures (Gibbs, 1981). Some subjects which currently use very little active learning have a long distance to travel in transitioning to ACL. Additionally, courses which lead to a professional qualification may be perceived to be restricted in how much change they can make to their learning, teaching and assessment methods, even if professional bodies are often supportive in practice.

Occasionally cultural resistance arises in a department for the opposite reason: in disciplines where learning and teaching is already highly active and interactive, there may be a perception that there is little need for changing to a specific form of ACL. For example, students in Arts subjects may work together to produce an output in some medium, and critique each other's work, or students in natural sciences may already take part in field-work in teams, or work in groups in laboratories. These activities are arguably a form of active learning, but may lack some of the benefits of more structured methods.

As the most effective way to overcome cultural resistance is to provide clear evidence of the benefits of ACL, we promoted ACL at several staff development and practice sharing events. As the project acquired and analysed large-scale data on the outcomes of TBL for student success, we are in a position to build a compelling case for further adoption.

We have encouraged flexibility in partial adoption of elements of ACL in the case of reluctance or practical difficulties with applying

the method in its traditional form. For example, some disciplines remove the flipped classroom element, and maintain didactic teaching such as lectures in place of pre-session independent learning, where, in the case of TBL, lecture content may be tested using the iRAT and tRAT. Preliminary evidence from the project suggests that blended approaches to TBL do improve outcomes, though the benefits may be less substantial than the original approach.

Moving from module-level adoption to course level and strategic delivery

Institutional structures can sometimes hamper major changes in delivery of a particular subject (Freeman, 2012). It is usually possible, and indeed expected, for an individual module leader to innovate in learning and teaching in a module, but changing an entire degree course can be very challenging. Curriculum changes that affect assessment and delivery format require an often cumbersome formal approval process. In the era of Consumer and Marketing Authority (CMA, 2015) scrutiny of HE provision, advertised course descriptions need to match actual delivery and this requirement can further impede changes.

The key feature of a strategic implementation at course level is not the number of sessions or modules which use ACL, but whether the use of ACL forms an intentional part of curriculum design. Several academics have reported that there is simply no time for the whole course team to meet and coordinate adoption of new teaching methods. The ability to change the course-level curriculum depends very much on the culture within a particular department. Supportive senior management can provide a framework within which individual academics can collaborate. However, bottom-up change can only flourish with top-down support.

The capacity to integrate ACL both at course level and at institutional level is the area of greatest variation between the three institutions in the project. NTU has a large number of courses which include multiple SCALE-UP modules. UoB started using TBL within a particular course in Pharmacy, and much of their adoption of new modules has been at course level, but in fewer courses. ARU has increased the number of modules using TBL, and has some courses with several TBL modules, but there is so far slow progress towards embedding TBL in the course curriculum.

The creation of new courses, or the revalidation of existing ones, affords an opportunity to implement ACL. The newly created combined Health faculty at ARU has started several new courses as of 2018/19, which use TBL strategically as part of a blended delivery. To address issues around finding time for course teams, we have proposed updating the staff workload model so that changing the teaching approach to use ACL is allocated time on a similar basis to developing a new module. Additionally, we recommend the provision of ring-fenced time for course teams to meet regularly to review and address curriculum changes. We are engaging with course leader training to provide support with embedding TBL in curriculum design.

Collaborative staff community

This barrier is very much related to the above; as ACL is typically adopted by individuals rather than course teams, staff are often left working on their own. The workload of developing appropriate pre-session study guides, in-class tests, and application exercises can, therefore, be a challenge. Consistency and quality of materials would improve if staff had colleagues to peer-review them.

We are working to create resources and guides which can be accessed online, such as suggestions for student induction to ACL based on research findings regarding preparedness and expectations. We are creating a repository where colleagues can

share resources such as successful application exercises, which can also be used in training across disciplines.

Scaling up to institutional level means that increasing numbers of academics require training and development, which requires additional resources. When relatively inexperienced ACL practitioners provide training to other colleagues, the training may not be of equivalent quality and consistency to that received from experts, and variations in delivery may result in mixed outcomes. Meanwhile, academics newly trained in ACL may not have access to a more experienced colleague who can guide and mentor them in their implementation. At the same time, scaling up delivery is positive because a critical mass of practitioners enables better peer support for individuals.

At the start of the project, academics felt they were working on ACL in isolation. Despite sharing common interests with colleagues, they often did not know who else was using a similar approach across the University. They found it difficult to collaborate with colleagues who were not in the same building or even on the same campus, not to mention the challenges involved in working across disciplines.

The project has resulted in institutional knowledge of who is using ACL, which has facilitated connections between colleagues working in related disciplines, countering the sense of isolation. At ARU the project identified TBL leads in each faculty, who are helping to establish links between practitioners and form a meaningful Community of Practice (Wenger, 1998). One approach to sustaining ACL beyond the lifetime of the project could be to form a User Group at university level, perhaps initially based on the network of faculty TBL leads.

In contrast to the US where methods such as TBL have a high profile, ACL networks are relatively weak in the UK and Europe, and there are few practitioners in Europe (although this number is increasing). UoB and ARU have contributed to the formation of the European TBL Community, supporting the use of TBL in Europe, and contribute to national active learning networks linking universities

that use ACL. Project institutions have also hosted national ACL conferences.

Practical issues

The SCALE-UP approach to ensure effective group working and dialogue between different groups is based on a particular arrangement of furniture, large round tables permitting groups of three to merge into groups of nine. Reporting group outputs also expects availability of a shared laptop for each group (Beichner et al., 2007). However, although TBL is relatively agnostic about learning environment, technology, and room layout, it is less well suited to traditional lecture theatres with seating in fixed, banked rows (Yuretich and Kanner, 2015), yet these are the most common arrangement for large teaching spaces in most universities.

Where specialist rooms with furniture designed for group collaboration are available, they are often in high demand. IT facilities designed to support ACL are attractive to many academics even if they are not using the specific methods the equipment was installed for. Timetabling has a long lead-in time for academics to book a small number of specialist active learning rooms. Staff may not decide to adopt TBL until after the deadline for booking rooms for teaching in the upcoming period.

Increasing student numbers also put increased pressure on limited physical space. This problem is particularly acute in HEIs where the campus space cannot be expanded with new builds. Tables arranged in rows allow more students to be accommodated than tables arranged in the café-style, which is more conducive to group work. It is not always feasible, or permitted, to move furniture between teaching sessions.

Timetabling and Estates departments have been supportive of quick-win solutions such as provisioning more rooms set up in café-style rather than rows by default. In the longer term, more learning

spaces can be adapted for active learning in line with the regular upgrade and refurbishment cycles.

All three partners have benefited from investment in creating new active learning rooms, both through new build and converting existing spaces. New lecture theatres have been furnished with adaptations for ACL, such as swivel seats, allowing students to collaborate across rows. Improving and creating learning spaces to promote active learning is a current priority for much of the sector, so eventually more suitable spaces for ACL will become available.

Emerging themes

As ACL is extended beyond enthusiastic early adopters, some challenges become more prominent. For example, the ARU pilot in 2015 reported only a few student complaints that ACL did not match how they expected to be taught (perhaps based on their experience in school and their limited exposure to student-centred learning approaches), or did not provide value for money. As ACL is scaled up from early adopters, it may be delivered by less enthusiastic academics, which can have a negative impact on student satisfaction. We are addressing this through staff development to improve student induction to ACL methods, as well as design of activities to promote a positive team dynamic.

Another factor related to scaling up is that with more students experiencing ACL, there is a higher chance of encountering a particular student or group of students for whom the approach may be less suitable. There is currently little information available about adapting ACL to include students with social disabilities such as autism or social anxiety, or those with sensory impairments, such as hearing impaired students, for whom the noisy environment of multiple overlapping group discussions can present a significant barrier.

Anecdotally, it seems that early adopters found ways to adapt their approach for individual students in their class with particular

learning needs. The broader pool of practitioners now using ACL may be less well equipped to make these adjustments. There is no record available of good practice in the area of adapting ACL to meet learning needs (Kent et al., 2015), and academics do not have networks of colleagues experienced in the methods. With traditional approaches such as lectures, where there is far more literature and guidance available, appropriate adjustments can more easily be made. As ACL is more widely adopted there will be opportunities to gather research evidence and create guidance for adapting ACL to support all students. Table 7.1 shows barriers and solutions we have identified so far.

Table 7.1Barriers and Solutions

Barrier	*Solutions*
Multiple summative assessments	Flexible interpretation of regulations
	Development of tools to support assessment
Learning culture	Gather and disseminate evidence for benefits of ACL
	Adoption of elements of ACL
	Improving student induction
Moving to course-level and strategic delivery	Senior management support
	New courses and planned revalidation
	Time allocation in staff workload models
Collaborative staff community	Institutional knowledge of ACL practice
	Online resources and guides
	Engagement with national networks
Practical issues	Collaboration with Timetabling and Estates
	New build Active Learning rooms
	Adapting learning spaces gradually with upgrade and refurbishment cycles
	Create evidence-based guidance for adapting ACL to different learning needs

Conclusion

Embedding educational change on an institutional scale requires support from all levels of the institution. The different experiences of the three project partners have highlighted the importance of collaboration between senior management, mid-level leaders such as heads of department, and staff implementing the teaching innovations. Collaboration between all areas of the universities, including Academic Registry, Estates, Timetabling and other professional services, has been key to project success.

Although regulatory barriers featured prominently in the initial analysis, these barriers can largely be resolved with goodwill from stakeholders. There is a widespread understanding that regulations should support rather than undermine the student experience. There are always practical difficulties surrounding learning spaces and budget for equipment, but our experience matches reports in the literature showing that ACL is not dependent on particular technology or room layouts, but can be delivered effectively in any space (Michaelsen et al., 2002; Beichner et al., 2007).

A more significant barrier is building a Community of Practice around TBL. Moving from individual to course level adoption has proved very challenging, even with resources put in place by the project to support this outcome. This can affect student experience where course delivery is not consistent. Importantly, where individual staff adopt ACL in isolation, there are knock-on effects on staff workload, because academics have to prepare all materials on their own, whereas they could be sharing, reviewing, and improving each other's resources.

Sustainable scaling up also relies on cross-institutional collaboration, and leadership at national level. The project has demonstrated the value of three institutions working together. Despite very different institutional contexts, the partners have been in a position to share good practice. Collaboration has promoted

finding imaginative solutions to barriers shared across the project institutions.

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8. The 1–2-3 Feedback Cycle

MIKE HOBBS AND ELAINE BROWN

Introduction

Student engagement covers a variety of different contexts (Healey, 2014) but it is 'engagement with learning' that has often been achieved through student-centred approaches that are also used in AL. Engaging students with the content and curriculum is a major topic in education research, policy and practice. The QAA Code on student engagement suggests that although this theme has a long history it is now focused on both quality issues and 'improving the motivation of students to engage in learning and to learn independently' (QAA, 2012: 4).

More recently, student engagement has included the idea of students as partners, or co-creators, contributing to what and how courses are assessed as well as being involved in wider aspects of quality and organisation of the institution (Healey et al., 2014). However, to perform this extended role, a student needs good academic literacies and an awareness of assessment processes. Encouraging student contribution to content and inclusion in the assessment process helps build their competence and confidence to engage more deeply with their subject, their course and institution.

Gibbs and Simpson (2004) reviewed the role of feedback and assessment and provide a framework to support learning. In particular, peer review is identified as a way to provide timely feedback and increased 'time on task'. To provide coherent feedback on other students' work, students need to understand assessment criteria and must apply their knowledge through analysis and evaluation. Working in groups offers the opportunity for students to share knowledge, co-develop ideas, and improve communication skills (Boud et al., 2001).

The 1–2-3-Feedback Cycle presented in this chapter is based on Gibbs' (1998) Reflective Cycle. The task we designed uses an authentic case study with genuine analysis and group discussion allowing a range of legitimate answers depending on student interpretations.

The pedagogic context

A simple definition for Active Learning (AL) is given by the UK Higher Education Authority (HEA, 2018) as follows:

A method that encourages student engagement through activity, group discussion, experimentation and role-play, in contrast to the passive memorisation of information (online)

AL is a constructivist educational theory, characterised by the need for students to build (construct) their knowledge. The broad definition of AL can include traditional learning activities such as listening and making notes. However, it is more usual to include higher order thinking tasks such as analysis, synthesis and evaluation (Bonwell and Eison, 1991). AL is associated with student-centred, enquiry/problem/discovery-based learning and a desire to develop learners as well as impart knowledge. Team-Based Learning (TBL) is another example of a student-centred approach credited with improved results and engagement with subject content (Michaelsen and Sweet, 2011). This study shares some aspects of TBL including the use of permanent teams, preparing students for the task, providing a significant problem for students to consider, peer evaluation, and whole class discussion to provide immediate feedback.

These concerns for developing the learner are echoed by organisations such as the UK Centre for Education and Skills (UKCES, 2015) and employer agencies, which put emphasis on the need for better graduate soft skills. Shadbolt (2016) emphasises the

urgency in addressing softer and work-readiness skills, to complement the technical skills that will make STEM (i.e. Science, Technology, Engineering, and Mathematics) students more suitable to employers.

The motivation for change

The focus of this study is a 30-credit module, *Fundamentals of Design*, which students take in their first semester for the BSc Computer Science. This cohort also take the modules, *Introduction to Programming*, and, *Computer Systems*, which have quite different pedagogic requirements. *Computer Systems* focuses on knowing the properties of components and how they work together; programming is a skill that requires understanding, application and practice. However, for both of these, at this level, there is an explicit 'right way' or optimum solution to any problem. This way of thinking is reinforced when students are programming, as they receive a form of instant feedback from the compiler (a computer program which translates one computer language into another), which shows basic errors in their code.

Conversely, in the design domain, which is the context for this study, there are many plausible solutions, which need to demonstrate the correct application of the basic principles, but can be different yet equally valid depending on the view of the designer. In industry, practitioners typically start their career with programming and gradually move into more senior roles as they gain the experience required to analyse and design information systems. In *Fundamentals of Design*, even at this entry level, we need to consider the development of the learner and their higher-level skills as well as the correct application of techniques.

The principal motivation for reviewing delivery of this module was to improve the pass rate and the mean and median marks, and thus improve the student experience. Although student satisfaction,

as indicated by the standard institution evaluation survey, was acceptable, it was not particularly high, and free text comments highlighted a lack of understanding about the nature of analysis for design. It seemed that students were focused on easily identified programming skills, but did not appreciate the more nuanced analytical skills required for design thinking, leading to frustration and a lack of deeper understanding of the assessment criteria.

Methodology

The regularly repeated deliveries and the involvement of teaching staff make Action Research (Norton, 2009) a suitable methodology, as it aligns well with the normal review process, and provides a direct link between the research and the improvement of practice. Kemmis et al. (2014) characterised educational action research as spiralling circles of problem identification, systematic data collection and analysis, followed by reflection, data-driven action, and problem redefinition. This study broadly follows this process by splitting the activity into three main phases: the initial state before any specific action had been taken; the state after action had been taken; and the state after a final refinement of the action.

For each phase, analysis of the available data, both quantitative and qualitative, was used to frame the explicit problem to be addressed, followed by a review of the data after the action had been taken, and reflection on the outcomes.

Phase 1 – Initial state and course re-design requirements (prior to 2013/14)

Students achieve the learning outcomes for *Fundamentals of Design* through analysis and documentation of an information system case

study using the industry standard UML (Unified Modelling Language) diagram design language (Rumbaugh et al., 2005). This remains a practical and professionally relevant outcome for the module, so, despite the need to change the delivery, the core purpose and content remained the same throughout the study. The ability to read and write design diagrams are essential skills for a career in computing, and as students are expected to use these techniques in other modules, they need to demonstrate competence for this learning outcome in this module. Contact time consisted of a one-hour lecture and a two-hour seminar/practical class with 20–30 students, in four separate classes. For any given delivery there were three or four teachers: two experienced lecturers and two part-time post-graduates.

The delivery pattern introduced a topic in the lecture, followed by formative exercises carried out in class. The aim was for students to understand, and apply, the analysis techniques represented by five different types of UML diagram. This delivery pattern was supplemented with practical work involving creation of an Access database demonstrating the link between design and implementation. Assessment for the module was through a large, single case study that brought together the analysis and application of five UML diagram types, plus an in-class demonstration of the Access database. The content was supported by material (including lectures, class exercises, and sample answers) and links posted onto a VLE (Virtual Learning Environment) as well as specific readings for each topic from the course book.

A significant problem was that students focused on the final assessment and, to some extent, regarded both lectures and seminars/practicals as optional. Lecture attendance was low, settling around 50 per cent, and it was difficult to get students with an existing, but shallow, knowledge of the topic to engage and develop their skills. This was characterised by superficial assignments that used diagramming conventions such as flow charts, which are regarded as precursors to UML.

Any revised approach needed to help students improve results,

gain a deeper understanding of the design ethos, and establish good learning habits for future modules, while maintaining or improving the efficiency of the delivery for staff. As this module is delivered in the first semester of the first year, it needs to support the transition between school-based 'teaching' and university-based 'learning' environments. The new design introduces responsibility for learning and participation with assessment so that students will be more prepared to be co-creators and full partners in later modules.

The 1–2-3 Feedback Cycle

The re-design of the delivery and assessment process was based on the educational research about feedback and peer evaluation by Gibbs and Simpson (2004). From this guidance we used assessment as part of an AL strategy, increasing 'time on task', which was important for students to gain a sufficiently deep view of the subject. This 'time on task' was supported with a variety of timely feedback mechanisms to help students assess their subject knowledge, but also provided a template to develop an effective approach to learning. The result was the following weekly cycle repeated five times, once for each of the five kinds of analysis and UML diagram:

1. Topic introduced in lecture (Week 1) – including whole audience exercises, *Kahoot* (2017) quiz sessions and highlighting supporting materials: reading, pod/video casts and external tutorials and videos such as *Lynda.com* (Lynda, 2017). The assessment for this topic is set for completion by the following week
2. Later that week the topic and assessment are discussed in a seminar class, supported by class exercises to practise the concepts – all the assessments are available on the VLE from the start of the delivery

3. Work is submitted following the lecture in the week (Week 2) following the introduction of the topic
4. Generic feedback – posted immediately after the lecture on the VLE (Week 2). Common issues are identified and addressed through a list of key points and illustrative diagrams
5. Detailed Annotated Feedback (provided between lecture and seminar class in Week 2) – Tutor provides detailed annotation on two scripts posted to the VLE for the first peer review class to use as discussion for the tutorial. Having read through the submissions, two scripts are selected for marking, which are re-used for subsequent deliveries as common issues followed a predictable pattern
6. Peer Evaluation in the same week as the submission (Week 2) – students review and annotate each other's work, tutor gives marks for participation and 'reasonable' attempt, work is handed back in the next tutorial session (Week 3) with letter grade

Student preparation

The six overlapping stages of the delivery cycle have at their core a simple three-step feedback cycle:

1. Generic feedback published to deal immediately with any common errors while the submission is still in students' minds
2. Detailed annotated feedback produced to show what is needed but without providing a 'correct' sample answer – used to guide students when they give peer feedback
3. Peer evaluation for the topic submitted earlier that week, ensures that each seminar class marks work from a different class, identified only by Student ID number. Groups of three or four students jointly discuss the work before providing individual feedback. During this time the class tutor briefly

joins each group to answer questions, give guidance, record who is present, and provide feedback

To prepare students, and help them engage with AL, we introduced the module and explained the purpose of peer review, and the potential advantages of the process. The pedagogic justification was also discussed so that students were aware of the deeper reasons for the change in assessment practice. Gibbs' (1988) Reflective Cycle was used to help students understand the generic learning skills they needed to gain in addition to subject knowledge.

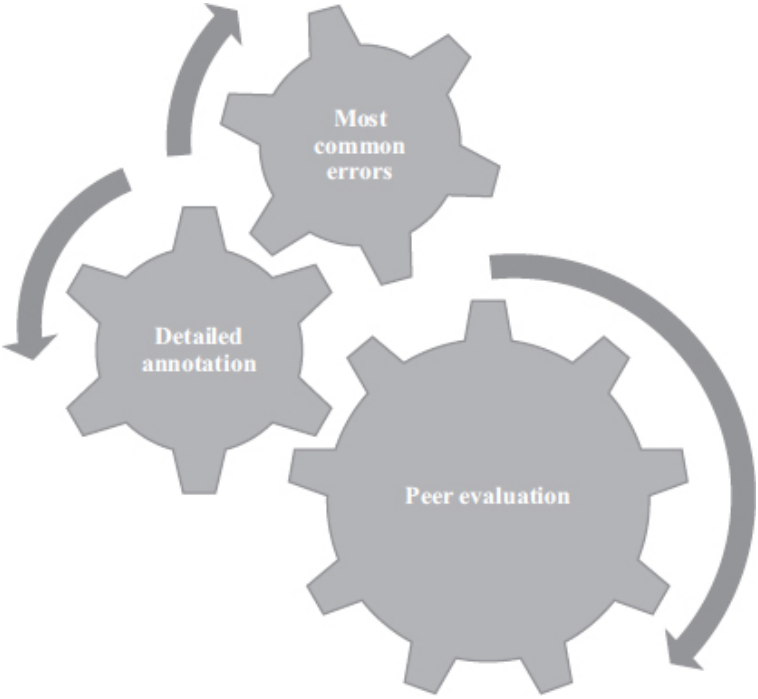

Figure 8.1 The 1–2–3 Feedback Cycle

Although more commonly used to support reflective writing, the stages of reflection provided a template to help students understand that they needed to develop their learning, as well as their knowledge of the subject. The stages of reflection map onto

the stages of requirements analysis, initial design, reflection, design refinement, implementation and evaluation that are at the core of the systems analysis process being taught in the *Fundamentals of Design* module.

The introduction of the topic included an indication of the type of feedback expected: 'not just compliments', 'constructive criticism', 'what was right as well as what was incorrect', and 'ways to improve'. And how to behave when working in groups: 'be open but have respect', 'criticise the concept not the person', 'assume you may be wrong', 'ensure all voices are heard', and 'work together to improve the outcome'. These ideas are 'topped up' in later lectures with reminders and explanation on how to give and use feedback.

In the first class a detailed marking scheme was provided, and discussed, so that students knew what was expected and how to grade differing levels of work (see Table 8.1 for sample guidance).

The assessment tasks (with marks out of 100):

- Five peer reviewed UML diagrams for the case study (5 marks)
- Demonstration of database design and queries in practical class sessions, feedback and marks given to students following demonstration (30 marks)
- Improved versions of the five UML diagrams based on the case study, submitted at the end of teaching (55 marks)
- A reflective commentary on how feedback was used to improve the work for the final submission (10 marks)
- Final submission to include paper copies of the database queries and all the in-class, peer reviewed diagrams

Table 8.1 Example showing review criteria and guidance for class diagram (one of five UML diagrams)

Assessment criteria by level	
DIRECTIVES: Look at how well the case study has been analysed. • Does the diagram use the same vocabulary as the case study? • How well has the syntax been used to represent the case study? • Are inheritance and aggregation used correctly in the diagram? • Are there places where these relationships could have been used? • Are there any classes which are too generic, or 'system' classes? • Check the attributes and operations, are these true attributes, or are they values? • Do they belong in this class? • Do the operations change the values of the attributes? • Could they be operations, or are they physical behaviours from the case study that would not be implemented? • Do association relationships demonstrate cardinality?	
Marking standards (by mark band)	*Characteristics of student achievement per mark band*
7–10 Excellent	Excellent representation of the case study, excellent use of notation. Making full use of notation where it is appropriate.
6–6.5 Good	Good use of notation, making mostly good use of all types of relationships, with cardinality specified. May be minor errors, such as incomplete cardinality, but diagram demonstrates correct representation of the case study.
5–5.5 Satisfactory	Satisfactory use of notation, using inheritance and aggregation, maybe incorrectly. Likely to have too many classes. Classes maybe mostly correct with inappropriate attributes, or inappropriate operations.
4–4.5 Basic Pass	Basic Class Diagram. Probably too few classes, or classes which are not required by the system (such as a system class), demonstrating a possible lack of understanding of the role of the diagram. Unlikely to have attempted inheritance or aggregation relationships. May also be lacking cardinality.
3–3.5 Limited Knowledge	Limited Use Class Diagram, likely to have a limited number of classes, with no relationships modelled.

0–2.5	**Inadequate (Or Not Present)**	Diagram unlikely to have been submitted.

Student comments included:

'A use case is meant to be a phrase written with a verb followed by a noun, three use cases have not included verbs.'

'General understanding is well represented with knowledge of syntax.'

'There is a use case description format available to view on Chapter 3: Britton and Doake where you can see [...]'

Phase 2 – results, reflection and refinement (2014/5, 2015/6)

Results – observations from delivery

The results of the feedback cycle were a noticeable improvement in the quality of the work and depth of analysis. This supports findings from previous studies of peer review (Boud et al., 2001; Dowse et al., 2018) that the knowledge that other students would be looking at their work, even anonymously, improved the presentation of the largely freehand diagrams.

While it is difficult to measure engagement, we saw a decreased rate of non-submissions and an improved pass rate (as shown in the summary provided in Table 8.1); positive module evaluation comments also suggest that students had been focusing more closely on this topic. The 'time on task' increased considerably, and providing immediate feedback gave students help when they needed it, to improve their revised submission. The peer review process requires students to justify the marks they give, which also

helps develop the same high order judgement skills required by this module.

The results from the first delivery 2013/14 showed an increase in submission rates as well as the pass rate but continued with a modest mean mark (Table 8.1).

Critical success factors learned from first delivery

- Make students aware of the pedagogic process
- Ensure approach and materials are understood by tutors and supporting staff
- Include the student voice – the class seminar discussions revolve around the peer review where student opinions are valued
- Students act as partners within the class environment, making judgements about the validity of solutions and allocating marks in the peer review process
- Academic literacy: clear and continuing instruction to guide students on how to participate in learning activities and what to provide for assessment
- Vary feedback types: Vodcast, PowerPoint, online documents, links to other material, plus group and one-to-one discussions
- Ensure timely feedback so that students can use it

Figure 8.2 is a screenshot of the VLE showing a list of feedback items that had been provided to a student.

Key challenges and issues for the AL approach

Complexity – conveying the concept of AL (despite explicitly including this in lectures and seminars), and the practical details to students, proved to be a constant issue that was reflected in

comments and low ratings in the evaluation questionnaire regarding the organisation of the module. The majority of students had no problems but a significant minority, with a poor attendance record, were confused.

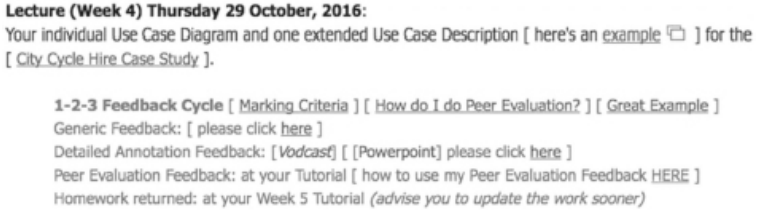

Figure 8.2 Snapshot of VLE showing variety of feedback

Management – there were many small, paper-based components during delivery of the module that could easily become lost or overlooked. It quickly became apparent that students were concerned about every single mark, so everything had to be accurately accounted for. A small number of students with late or lost work, or other exceptional circumstances, caused a disproportionate increase in administration.

Assessment reward – getting the balance right between work and reward. The original concept was that the in-class element would be an initial 'rough copy' to be refined by the peer review and feedback process. However, students were putting considerable effort into this work. It seemed that the balance of marks did not take sufficient account of this and over-rewarded small improvements, which could be derived easily from the feedback given.

Contingency planning – students had to attend all relevant lectures and classes to fully participate in the feedback cycle. This made these sessions 'worthwhile' from a student perspective, but made it difficult for those who missed sessions.

Staff workload

The improvements in the results did not mean more work for staff. A key consideration was to make the learning materials and process clear and easy to deliver for all staff, so that the quality of the module did not depend on the performance of one remarkable tutor.

In the original delivery, the tutor provided detailed feedback on a large and complex piece of work, which took approximately 24 hours for 56 scripts, and the student gained feedback at the end of the delivery when there was no opportunity to utilise this in their work.

In the new delivery, the tutor spent eight-and-a-half hours preparing two batches of five sets of detailed feedback, equivalent to two old scripts, to create the detailed annotation. Additionally the tutor would spend time preparing generic feedback, but by re-using material, preparation times can be significantly reduced in future deliveries. With practice, time saved in subsequent deliveries allowed provision of additional resources, including explanatory video clips, rather than just marking large numbers of scripts.

Students now have feedback equivalent to four old-style scripts. More importantly, each student sees up to four examples of the five diagrams and, as well as providing their own work, gives feedback on another five diagrams.

The feedback for the revised diagrams used the peer review marking rubric, which also allowed individual comments to be inserted, precluded the need for extensive feedback as this had been delivered during the module.

Assessment refinement

Submission and marking

The database task is used as an illustration of how a design can be turned into a working system, more as a prototype to check the logic than a serious implementation. As such, it is peripheral to core content and is dealt with in a second year compulsory module. Tasks remained the same but guidance reduced the emphasis on theoretical knowledge and marks were decreased from 30 per cent to 10 per cent.

Marks for the in-class peer review were increased from 5 per cent to 20 per cent for the five diagrams (four marks each). This allowed an element of fine grading: one mark for participation, one mark for work that was significantly wrong but showed some understanding, two marks for work that had errors but showed understanding of the technique, and full marks awarded for work that was largely correct but may still have some errors. The aim of this revised scheme was to reward learning and participation rather than the specific output.

The revised, 'neat', diagrams were submitted to Turnitin, which gave staff an opportunity to check that students were still engaged, and that they understood the electronic submission process.

Ten per cent of the total mark was allocated for submission of the 'neat' diagrams. This was regarded as high enough to encourage submission but not so high that it over-rewarded a relatively simple task. The main point of this step was that if students failed to submit, or performed poorly, they would be able to recover and could be identified easily for extra support before the final submission.

The final assessment mirrors the tasks and techniques of the previous assessment but applied to a different case study. This means that feedback for the in-class case study cannot be repeated 'parrot fashion' back for the final assessment but must be applied

to a different situation. As the final assessment case study is now a substantial and definitive component for the module, it attracts a significant mark of 60 per cent. Submission was online via Turnitin and the rubric was still used to justify the marks, but free text comments and a library of re-useable comments ('quick marks') for repeated errors were used to give feedback on the scripts.

Assessment complexity and management

After repeated deliveries, staff were able to avoid issues that had occurred previously and could provide examples for students. Three assessment types were described to students: 'rough, 'neat ', 'applied'. A 'rough' design is typically hand-drawn, fluid, flexible, discussed and improved through peer review. A 'neat' submission gave students the chance to demonstrate what they had learned from feedback. The 'applied' submission demonstrates how students can use their learning in different situations. The changes to the submissions, and move to electronic submission and marking, also made it much easier to manage.

Content presentation on the VLE was also redesigned so that all materials, exercises, and feedback for a particular week were shown as part of a single web page rather than having different areas for lecture materials and homework. This provided a 'one-stop shop' for students who could highlight significant dates, processes, and content.

Contingency planning

As a first year, first semester module, students need to be able to make mistakes as they take more responsibility for their learning than they may have been used to at college or school. This is acknowledged by the ARU academic regulations, which require first

year modules to be passed, but which do not contribute to the final mark. With its many components, *Fundamentals of Design* module is a challenge for some and, once a single assessment has been missed, it is easy for this to become a negative experience that demotivates the student. However, there needs to be a clear demarcation between those who contribute to a class and those who, for whatever reason, do not. There is a fine balance between rewarding performance and motivating engagement and improvement. Our clearly stated 'contingency planning' policy was that if a student misses a submission they can submit the work via email, as long as it arrives before feedback is published, and will receive brief feedback, but with a maximum of half the available marks. The idea is to reward attendance but allow some flexibility without causing a critical drop in marks.

Phase 3 – Results and reflection (2016/7, 2017/8)

The changes outlined in *assessment refinement* (above) have now been run in both 2016/17 and 2017/18. Data from all deliveries is provided in Table 8.2. Although there is a gradual increase in the mean mark of work submitted, there was a set-back in 2014/15, when student numbers doubled.

Table 8.2 Results for Fundamentals of Design

Year	*Candidates*	*Submission* rate %*	*Pass rate % (of submitted)*	*Mean mark*	*Delivery style*
2012/13	40	93%	85%	52	Original
2013/14	51	100%	94%	53	Phase 1
2014/15	110	82%	77%	48	Phase 1
2015/16	88	88%	71%	57	Phase 1
2016/17	76	90%	91%	61	Phase 2
2017/18	72	90%	90%	62	Phase 2

*submission rate includes all who start the module

The submission rate and pass rate for 2012/13 and 2013/14 were

only calculated for students who completed the module, rather than all who started it. These data are not comparable to other data as they do not include students who dropped out during the course, thus underestimating the total number and overestimating the pass rate and mean mark.

Conclusion

The learning and assessment activities described in this study help the transition between the student as passive receiver of knowledge, and taking a more active role in all aspects of their learning. For some students, the change in emphasis is unsettling and, initially, they find it hard to trust their own, or other voices, that are not endorsed by the tutor. As well as delivering knowledge of a subject, each module in a course needs to develop some aspect of the student as an independent learner or practitioner.

Student involvement in the assessment process also allows teaching staff to focus pro-actively on supporting students in an AL context, rather than the traditional passive delivery and post-hoc evaluation. We have also incorporated student input into the assessment process through peer review. This increases student assessment literacy and helps to provide a mechanism for meaningful input into content and curriculum development.

Changes to the assessment increased students 'time on task' and provided a deeper challenge as they still learn from the exercises and feedback, but now have to demonstrate their understanding by applying these principles to a new case study. The concepts to be learned have remained the same, but the level and depth of learning has increased without a significant increase in workload for students or staff. This qualitative improvement is somewhat hidden by the quantitative results for the module, as marks are typically allocated to the degree of attainment for a given learning task, but the same relative performance for an easier task would give the

same result. However, based on the overall level of submissions, total engagement has improved, and mean marks for submitted work have also improved.

The action research process provided a framework for continuous analysis of module delivery, and helped to align the curriculum to represent, and change, student views and expectations. The key mechanism for this has been the use of feedback in an AL context. Although based on the development history of a single module, the generic lessons learned are clearly applicable to other disciplines.

In this module, at the start of their experience of a university education, we have attempted to effectively teach the subject but in doing so have also provided a template for independent study. We provided scaffolding for students to develop good learning practice by getting students to expect and use feedback as an integrated part of their learning, spread throughout the delivery of a module.

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9. Students as professionals: The audit experience

SUSAN SMITH

Introduction

Continued changes to the environment in which accountants work particularly in relation to globalisation of the financial markets and continual technological advances have contributed to an ongoing focus on the skillset of professional accountants (Al-Htaybat et al., 2018). Work has migrated from the technical and process based (e.g. book-keeping) to focus on analysis and interpretation of large datasets. Accountants are increasingly relied upon to adopt a critical mindset and communicate their findings in an appropriate manner throughout organisations and externally to interested stakeholders.

Against this backdrop, research continues to show that whilst accounting students are technically proficient, they often lack transferrable skills which are important to potential employers and advancement in the workplace (Paisey and Paisey, 2010). Many university degrees offer students the opportunity to undertake a placement year in industry, however not all do so. Those who undertake a placement benefit from an extended opportunity to develop their skills in the workplace (Paisey and Paisey, 2010) before returning to complete their studies. Those who choose not to identify a number of barriers, including already having sufficient work experience, placement applications distracting from studies, a preference for a year abroad, and inability to find an attractive placement to apply to, amongst others (Shepherd and Sumner, 2018). For students who may have little or no work experience,

exposure to the wider development of skills to foster their employability is particularly relevant.

This chapter outlines student reflections on the blend of skills required for the workplace following an active learning experience offered on an optional third year module at a UK university.

Experiential learning involves students participating and learning from an experience which helps them relate their studies to the real world. Assessment based on such experiences is referred to as authentic assessment (Palm, 2008). The audit experience facilitates a condensed version of experiential learning and authentic assessment which might otherwise only be available to those undertaking professional placements (Paisey and Paisey, 2010). In so doing, it facilitates an understanding of the blend of skills required to establish professional credibility (Jones, 2014).

This study adds to the emerging body of research on experiential learning within the curriculum as a means of developing a blend of student employability skills (Jones, 2014) and is one of the first studies to consider this approach in an auditing context.

The chapter is organised as follows. The next section reviews the existing literature in the context of generic skill development and draws on the skills literature to frame the research. The following section describes the methodology and method adopted, which is followed by the results and discussion. The conclusions of the study are discussed in the final section along with the limitations and possible avenues for future research.

Literature review

The literature in this emerging area highlights two key areas: 1) the issues facing accounting education in finding a balance between technical skills and generic skills, and 2) how experiential learning may contribute in addressing this tension without sacrificing quality.

Generic skills development has consistently been an area of focus for accounting research and is, for example, the second largest category of articles in the journal *Accounting Education* between 1992 and 2011 (Jackling et al., 2013). Recent literature reviews indicate that interest in student competencies continues (Apostolou et al., 2018).

It appears that accounting students tend to focus on the importance of technical skills whilst employers focus on generic skills (Jackling and De Lange, 2009). This leads to a mismatch or expectation gap between the students and employers (Jackling and De Lange, 2009; Howcroft, 2017). The importance of generic skills is also evident in the marketing materials of the 'Big Four' professional services firms (i.e. Deloitte, Ernst and Young, KPMG and PricewaterhouseCoopers (PwC)), professional bodies (i.e. Institute of Chartered Accountants in England and Wales (ICAEW), 2018) as well as in the wider recruitment market.

In relation to Big Four graduate recruitment materials, for example, 'The PwC Professional focuses on five core attributes; whole leadership, technical capabilities, business acumen, global acumen and relationships' (PwC, 2018). Numerical and other technical skills are assessed through online testing as part of the initial screening process. This indicates that such skills are assumed in the process which is consistent with the practices of large recruiters of trainee accountants.

In an audit environment it is essential that individuals can swiftly establish professional credibility (Jones, 2014) with clients to facilitate co-operation of client staff in the process and the timely completion of the audit. Jones (2014) identified communication, technical skills, team skills, business awareness and 'X-factor skills' (e.g. confidence, self-awareness, professional attitude) as important components in the overall skillset of trainee accountants. The skills identified are consistent with an analysis of job adverts that found that 'Overall, a team player with a positive attitude and good communication skills appeared to be the most valued behavioural skill as perceived by employers' (Tan and Laswad, 2018: 403). An

understanding of the attitudes and behaviours required to establish credibility is difficult to establish in a classroom environment where each skill is practiced in isolation.

A number of suggestions have been put forward in the literature to help students develop the skills that they need for the workplace including virtual internships which rely on students working through a simulation exercise (Bayerlein, 2015) or case based audit simulations (Bautista-Mesa et al., 2018), adopting 'high impact' practices to develop soft skills (Pernsteiner, 2015).

This quest to develop a relevant blend of technical and generic skills has driven the growth of what is known as authentic assessment (Ashford-Rowe et al., 2014), a term which has increased in use since the late 1980s (Palm, 2008). This type of assessment helps to align student experiences to activities undertaken in the outside world, providing students with exposure to workplace experiences in a controlled manner, to support their learning (Stein et al., 2004).

The approach undertaken by this study sought to expand student understanding of the broader skillset required by accountants to establish professional credibility through offering students the opportunity to undertake audit work with a real client as part of their audit module.

Methodology

The study applies an action research method which is based upon a participatory inquiry paradigm (Guba and Lincoln, 2011). Action research is grounded in a practical understanding of knowledge leading to changes in practice, and is a post-positivist research method (Baskerville and Wood-Harper, 1996). As such, action research rejects the positivist ideals of objectivity, rationality and truth (Carr and Kemmis, 2003).

Action research is a reflective process that focuses on change

during the research process (McNiff, 2016) which is often characterised by means of cycles (Elliot, 1991). Each cycle typically has four stages; planning, acting, observing and reflecting (Zuber-Skerritt et al., 2002). Often a further step is added, namely the recognition of a need for change which stimulates the research in the first place (Curtis, 2017).

Although widely used in educational research, action research methods have not been widely used to date in the field of accounting education research, and the number of published papers remains rather limited (Curtis, 2017). A criticism of action research is that the stages of action research are simply hallmarks of good teaching, however its proponents argue that the critical reflection involved can also contribute to changes of theory and practice. For example the problem solving process can be considered generalisable if others feel inspired to address similar problems in different contexts (Curtis, 2017).

This research design was selected as it promotes discourse about practice (Heikkinen et al., 2001) seeking to improve (by means of developing student understanding through reflection) the outcomes of students undertaking the experience (Kemmis, 2009). It is particularly well-suited to small scale practitioner-based enquiry (Paisey and Paisey, 2003) and is typically written in the first person. It aims to inform others of the process of enquiry including both the expected and the unexpected elements (Grant, 2007). Such details add to the authenticity of the account and highlight that practice-based research is not positioned as objective.

The study draws on the experiences of the instructors (the author and another colleague who jointly run the audit module) and quotes from both students and clients who participated in the various iterations of the experience.

In 2016/17 student and client feedback was collected on various aspects of the experience and a news story was created for the University website using student quotes. Ethical approval was received to use student reflections from the assessed assignment in 2017/18 and all participating students signed a consent form to this

effect. It was felt that the students' own reflections would constitute a more reliable method of appraising this understanding of the development of their skillset rather than undertaking a survey as the group sizes were small and the experience was different for each group.

The next section outlines the processes and results of each cycle of research focusing on the problematisation, the first tentative steps to introduce changes to the module, then incorporation of the experience into the assessment of the module. Student reflections are compared to those of the instructors and client.

Findings and discussion

The action research project comprised a reconnaissance in 2015/16 followed by two cycles of delivery. During this period the module was delivered by the same two lecturers with seminar work primarily focused on case studies. Student numbers were broadly similar each year (around 54) on this optional final year module. In both cycles of delivery, the client interaction consisted of a two-hour meeting and up to three follow-up emails for each group. Two groups of four students participated in each of the cycles of delivery.

Reconnaissance and problematisation

The first stage of the process was to identify the research problem from an observation of the module (Haysom, 1985). The module had been constructed around case studies to help students apply the somewhat abstract knowledge of audit processes to different scenarios. Part of the assignment was a group case study building on the formative case study teaching throughout the module. The case

studies, whilst useful in exposing students to specific learning and interpretative skills did not appear to help students to understand the process of establishing professional credibility with clients on an audit.

As a result, we felt that it was important to expose students to the interaction between an audit problem and a real client. The action research problem was how to develop student awareness of the importance of developing a blend of skills to establish professional credibility thereby bridging the gap between classroom-based learning and a professional work environment.

First cycle

In the first cycle, groups of students were asked to volunteer to participate in an 'audit experience' during the reading week. The work was assessed, and formative feedback was provided therefore students did not feel that participation might adversely affect their module mark. Students were asked to assess an inventory cycle and identify and report upon any control weaknesses with recommendations to the client. In this cycle two groups of four students participated, meeting with the client for two hours each. They were also able to send up to three follow up emails. The groups produced informative reports with clear control recommendations, which they presented to the client.

The client provided feedback in four areas informed by Jones (2014): professionalism (encompassing Jones' 'X factor' skills and commercial awareness), group work, communication skills, and the report. Whilst client comments on both groups praised the professional approach, they identified that the students might have demonstrated more confidence and enthusiasm. This was reinforced by further comments related to the communication skills between group members and between the group and the client. For

example, the client observed that the students did not ask many questions during the process walk-through.

The final report was of a high quality and demonstrated that students had listened to the client: 'The students' report was very thorough, and our considerations were definitely taken into account by the group – it was great for the [...] team to be able to work with students' (Client feedback).

Students felt that the experience was beneficial in terms of helping them relate their studies to practice. One student, for example, noted that, 'The experience gained from this task really helped us with our coursework' (Student feedback).

This experience prompted us to offer a similar experience in the second cycle and extend it to form part of the summative assessment of the module. We decided to do this to ensure that those participating did not also have the additional burden of the case study assessment and could devote their time to the audit experience without concern that it would adversely impact their module performance. In addition, the practice of our own reflection encouraged us to include an individual reflection (1,000 words) alongside the group assessment to enable all students to express their learning process beyond the technical (i.e. to reflect upon) and the challenges that they faced in completing their assessment (either case study or audit experience). We hoped that students undertaking the audit experience would start to address the importance of professional credibility.

Second cycle

In the second cycle, we extended the audit experience to form an optional part of the summative assessment. The alternative assessment task remained a desk-based group case study. Both assessments required an accompanying reflective piece of writing

and for those undertaking the experience the client provided feedback.

Clear marking criteria were provided to the students at the outset so that they were aware of the expectations and the fact that the client would be providing feedback on their performance. Again, the clients scored the students on questioning, group work, professionalism, and communication skills constituting 10 per cent of the overall assessment.

Students were offered three experiences and asked to justify their choice of client so that the experience could be fairly allocated to the interested teams. In the event, two teams of four progressed to the experience. The task was similar to the first cycle and centred on a control process, identifying weaknesses and offering recommendations. The students met with the clients for around two hours and again were able to send up to three follow-up emails.

We evaluated the recognition of skills that combine to build professional credibility using the students' reflective writing. We also used the client feedback as a means of calibrating the student reflections on their skills. Unsurprisingly, we learned that for many of the participants, this represented an opportunity to gain experience within an organisation, which can be difficult to secure. Failure to evidence work experience can result in candidates being overlooked in recruitment to graduate roles. As one student pointed out, 'It's a rare chance for a student, especially someone without any work experience like me, to involve and work in real organisation' (Group 1, Student 2). Others appeared more instrumental in their choice of the experience and related it directly to their CV rather than their own skills development and experience.

Questioning

Both teams identified a leader who led the questioning, however they did not appear to appreciate the importance of taking notes of

the discussion and indicated they would have preferred to record the conversation. However, in a busy work situation this would not be standard practice, as the recording would require transcription to create a fuller set of notes. In addition, recording of conversations might undermine professional credibility and the candidness of the staff with the audit team.

The appointment of a leader was important as it provided the client with confidence that the group was organised, and the individuals had clear roles during the meeting. In future, we would suggest to the students to plan questions and split them across team members so that each is covering a logical part of the assignment. One student, for example, 'found it challenging to focus on coming with questions one after another to ask and take note of answers to each one of them' (Group 2, Student 2).

The pressure of the meeting made the students focus on the task in a different way to an exam or case study scenario as failure to ask the appropriate questions would mean that they would have gaps in their knowledge of the client processes. One student, however, stated that, 'I believe that we did well in asking questions, we asked the questions with manners, all the questions were appropriate, and we clarified our understanding' (Group 1, Student 1). This student recognised the importance of maintaining a professional approach to questioning as well as clarifying their understanding of the client responses. If misunderstandings persist, they can lead to inappropriate recommendations and a loss of credibility with the client. In contrast, one of Student 1's teammates felt they did not have sufficient confidence to ask the appropriate questions during the meeting and then felt that they did not make a sufficient contribution.

Group work

The student reflections identified that many had not thought

beyond who would lead the questioning. For example, Group 2 had not prepared as diligently as they might have done prior to the meeting, and the client was 'left with the impression that there had been a lack of preparation' (Client 2).

The students' own reflections also identified that their lack of preparation had limited their effectiveness during the meeting. Thus, one student reflected, 'After the meeting, I think I should do more before meeting. The biggest problem is not enough preparation' (Group 2, Student 3).

Communication Skills

As the students reflected upon the overall experience, they identified the benefits derived from talking to employees across an organisation rather than perhaps relying on the 'official' explanations which enabled them to better understand the constraints as well as the needs of the stakeholders. One student described how, 'This was also great opportunity to learn the problem of an entity via different employee levels and derive a solution to accommodate all the needs to the primary users' (Group 1, Student 3).

They identified that the opportunity to have exposure to multiple perspectives may have led them to propose a different solution. As one student put it, 'Without this practical activity, seeing the same events may lead me to look at the whole event in a completely different ways, and I may take different actions' (Group 1, Student 4).

This comment underlines the importance of gaining a real insight into the needs of a client and the specific organisational dynamics. Students cannot easily get an insight into the importance of this contextual understanding without exposure to real businesses.

Professionalism

Students also reflected that the interaction with a real client was exciting to them, bringing auditing to life. At the same time, it was evident from clients' observations, the student reflections and our own observations of the meetings (where we accompanied students but did not take part) that the students from both groups felt very apprehensive and unsure of themselves in conducting the client meeting. The lack of confidence led to one group failing to establish credibility in a professional manner as would be expected when entering a meeting (Jones, 2014), with one student noting how 'This led us to being extremely nervous and unfortunately caused unprofessionalism of not introducing ourselves' (Group 1, Student 3).

Whilst both teams greatly benefitted from the experience, we felt that the students might have been better briefed in terms of business etiquette as both teams failed to introduce themselves. The student reflections identify that this is an important part of the process of establishing credibility in business. Hence, as one student said, 'I will definitely remind myself to greet and introduce myself before getting anything to start' (Group 1, Student 1).

Prior to running another audit experience, we would run a further session for participants on how to run a client meeting to ensure that the teams had a clear idea how the meeting would be structured and to help them to plan their questioning in advance. This might help them to establish credibility with the client more easily.

The reflections indicate that participants did feel the task was challenging as it exposed them to a new experience. However, they appeared to have appreciated the opportunity to develop their skillset in a real life environment.

The experience combined the application of technical skills with generic skill development that students often struggle to appreciate within the confines of the classroom. Their reflections indicate that they identified areas for improvement, which they might not have

recognised without such exposure. So for one student, 'Let's sum up, this was a wonderful experience for me … I learned a lot both personally and professionally and plan to use this knowledge to better myself' (Group 2, Student 3). The importance of student recognition of and development of skills to establish professional credibility was clearly articulated through the student reflections, which differed in this respect from those undertaking the alternative case study assessment.

The reflections and client feedback also exposed some areas, in which students might be better prepared to undertake a similar task, which will be addressed in future iterations of the module. The findings add support to the view that students need to establish credibility which results from a blend of skills rather than a focus on individual skills (Jones, 2014). Whilst in both cycles the experience was offered to all and we had anticipated being inundated with requests, this was not the case, and most of the class decided to remain within their comfort zone. Initially, we had attributed this to the formative nature of the experience, but it was also the case in the second cycle where we made the task summative to reflect the significant effort involved.

Conclusion

Active learning in the form of an audit experience offers a promising route to developing the blend of important student skills required to establish professional credibility. Students' reflections captured their enthusiasm for workplace exposure in this manner. The students self-identified similar strengths and weaknesses as the clients indicating that the process of reflection made them more self-aware.

Action research is not yet a mainstream methodology within Business Schools, however the adoption of an action research methodology to support scholarly activity in Business Schools is

encouraged by the accrediting bodies, such as the Association to Advance Collegiate Schools of Business (AACSB). It is likely to be considered more frequently as a method within the business disciplines as Business School accreditation becomes more prevalent. It enables those engaged in teaching activities to devise a means to make changes in teaching, and for them to be reviewed systematically by incorporating informed changes to the curriculum and evaluating the impact of those changes (Paisey and Paisey, 2005). In so doing this approach enables continual improvements to be made in practice.

The most noticeable limitation is the scale of the study. However, whilst the study was small this is not unusual for action research projects, the Paisey and Paisey (2003) study, for instance, only involved 11 students.

Next steps and future planning

In future cycles of the module, the challenge might be to extend the experience such that it becomes a core part of the assessment for all students on the module. This would involve identifying and working with a significant number of local employers and arranging student meetings within a short window during the module. We would also focus more time on preparing students for a business experience, such as introducing themselves, having a clear agenda, and allocated lines of questioning, strategies for notetaking, to help them establish credibility with the client.

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PART III

THEME 3: SPACE AND RESOURCES

10. A tale from the north: Moving away from formal learning spaces to active learning spaces

Moving away from formal learning spaces to active learning spaces

AUÐBJÖRG BJÖRNSDÓTTIR AND ÁSTA MARGRÉT ÁSMUNDSDÓTTIR

Introduction

This chapter gives a review of the transformational process of moving from formal lecture rooms to active learning classrooms at the University of Akureyri (UNAK) from 2014 to 2016. UNAK is located in the Northern part of Iceland, with approximately 2,000 students. It was established in 1987 to offer university education, encourage research, development and innovation in rural areas of Iceland, and to tackle the problem of 'brain drain'. The University has been leading in the teaching of distance and campus-based students in Iceland for 20 years. In recent years, the University has moved towards flexible learning models, with the focus on shifting from traditional lectures to more flexible and innovative teaching and learning. The Centre for Teaching and Learning (TCTL) at UNAK, was established in 2015 to support this initiative, and one of their first projects was the creation of developmental classrooms, with the aim of turning them into active learning classrooms (ALCs) over time.

Our example of the process of moving from a formal classroom to an ALC, took place in a first-year course, General Chemistry, in the Department of Natural Resource Sciences. This course had high attrition of around 30 per cent, low attendance, a failure rate of 40–50 per cent, and low student satisfaction according to course evaluation. After the instructor had used 'flipped classroom' teaching for a year, student satisfaction increased compared to the previous year, but student attendance remained low. The failure rate on the final exam was still around 40–50 per cent. In this review, we address the different obstacles we faced in the process, the importance of using flexible classrooms, and the importance of cooperation with key faculty staff and students. Students taking the course were surveyed and the results related to the ALCs are reviewed.

Literature review

Active Learning Classroom (ALC) is the term often used to describe a student-centred, technology-rich learning environment at the University of Minnesota (2019). ALCs are a modification of the SCALE-UP room layout (Student Centred Active Learning Environment with Upside-down Pedagogies) (Brooks, 2011). The SCALE-UP project started as a reform movement in the 1990s at North Carolina State University (2011) to change the teaching of large introductory physics courses by reworking the layout and technology of the classroom where these courses were being taught. These new learning spaces consisted of round tables with laptop connectivity for students, and good access to lab equipment. In addition to restructuring the learning spaces, the pedagogical approach and teaching material were amended to facilitate cooperative learning, in-class problem solving, and increased instructor-student interaction (Beichner et al., 2007).

Other projects such as Technology Enabled Active Learning

(TEAL) at MIT (2019) and Transform, Interact, Learn, Engage (TILE) at the University of Iowa (n.d.), plus the before mentioned ALC at the University of Minnesota, have been modelled on SCALE-UP (Baepler et al., 2014). Numerous evaluations of learning, using both substantial quantitative and qualitative data, have been conducted in parallel with the curriculum development and the classroom design efforts accompanying the SCALE-UP projects. The findings can be summarised as having shown an improvement in students' problem-solving ability, an increase in students' conceptual understanding, better student attitudes, and a significant reduction in failure rates, especially for females, minorities, and at-risk students, who generally do better in later courses (Beichner et al., 2007).

The ALCs at the University of Minnesota feature large round tables that can seat nine students; each table is linked to a panel display screen. Students can project content on to those screens from laptops located on their tables. There is an instructor station, from which instructors can display content via projector screens, and control the feeds to the student display screens. There are wall-mounted glass marker-boards around the perimeter of the room (ALC Pilot Evaluation Team, 2008).

A study at the University of Minnesota was performed where two sections of the same course taught by the same instructor were compared, the only difference was the learning environment for each section. The two different learning environments were an ALC and a traditional classroom. The results of the study showed that, when all factors, apart from the learning space, were kept constant, students in the ALC section outperformed students in the traditional classroom in terms of student learning (Brooks, 2011). The advantages of working in ALCs include increased learning gain and students reporting high satisfaction with the learning environment. However, these spaces can present some teaching challenges, including a room with no front or focal point; noise and other distractions that may impact individuals with certain learning disabilities; and a need for expertise in the technology.

Teaching in ALCs requires time, effort and, for some, a new approach in teaching. Teachers need to take the time to study the room because the setup is not traditional, and possibly reconsider their teaching methods to, for example, incorporate active learning into their teaching. Due to the lack of a front or focal point in the classroom, teaching that relies heavily on lecturing is not suitable for an ALC (Baepler et al., 2014).

These findings and the set up for the ALCs were considered in the designing of the UNAK's ALCs.

Transformation process

The process of moving a traditional lecture room to an active learning classroom at UNAK, took around three years. This transformation began in 2014 when a teacher started to change the first-year mandatory General Chemistry course at the Department of Natural Resource Sciences, from traditional lectures to flipped learning. The reason for this change was that the course had around 30 per cent dropout, low attendance, around 40–50 per cent failure rate, and low satisfaction among students according to course evaluations. Flipping the classroom, as the name indicates, means that students study the course content at home, often by listening to lectures or watching videos that the teacher has submitted on the internet, and do the ´homework´ in class with support from the teacher. The time spent in class is spent entirely on problem solving activities and discussions. Students are engaged for the entire time, either as individuals or in groups, and the teacher has much more time to offer one-to-one support to individual students (King, 1993; Lage et al., 2000; Bergman and Sams, 2012).

During the first year of flipped learning in the chemistry course, few students attended, and therefore did not make full use of the learning material available to them. According to the course evaluation, student satisfaction increased significantly, but the

failure rate was about the same as the previous year. Following this, the instructor started working with the newly established TCTL to improve the course, with the aim to increase student attendance, participation and learning. In the second year, it was therefore decided to change the assessment in the course from individualised to collaborative assignments in an attempt to improve these three factors. Students still had access to all the material beforehand and were invited to attend class to work on the collaborative assignment with the help of the instructor.

Before students came to the classroom, the setting of the room was changed from lecture-based to group-based. The tables were grouped together so that they could accommodate up to six students. The underlying notion was to give students a clear message of the collaborative group work that was expected to take place in the classroom as they entered. The instructor had to arrange the room before the class. During that second year, the instructor had to get permission to rearrange the room from the instructors that were teaching in the classroom before and after.

This change improved students' attendance dramatically compared to the previous year, from less than 30 per cent to over 70 per cent of the campus-based students. The failure rate on the final exam for this second year of transformation was similar to the previous year at around 40–50 per cent. It is difficult to compare failure rate on the final exam between years in this course, as the final exam is not standardised.

As the change in classroom set up had resulted in such a positive effect on student attendance, the TCTL applied for changing the setup of the classroom to an ALC before the end of the second year. The Management Board at UNAK granted TCTL permission and funding to change the classroom to an ALC. The classroom was then modified by setting up six big tables, each with six chairs and by each table there was one 55-inch (140cm) panel screen and a whiteboard. There was also a projector and a teaching station located in the middle of the classroom with a computer for the

instructor. During Fall 2016, before the start of the third year of the course, the ALC was setup and ready to use.

However, the process of changing the classroom was not initially supported by all university staff. The obstacles were institutional, conservative, and teacher-centred impacts. Institutional challenges included convincing supporting staff, especially those in charge of scheduling classrooms for academic staff, and custodial staff that the classroom was changing. Even though the permission to change the setup of the classroom had been granted, the cleaning staff would often arrange the classroom to the original setup, and classes with traditional lectures would be scheduled in the classroom. An example of the conservative teaching attitude at UNAK was that some academic staff thought it was a petty task to try to change the classroom, while others pointed out that classrooms at UNAK had always been that way (i.e. lecture-based), and therefore they should not be changed.

Progress was only made when the Managing Director at UNAK issued an email to supporting staff that announced that the classroom was now a flexible classroom overseen by TCTL. Nevertheless, during the first semester after the ALC setup, there were still requests to use the room as a lecture room. TCTL staff were firm on the ALC setup and that it could not be changed, and no exceptions were made. All scheduling of the classroom had to go through TCTL. Instructors could request to use the classroom, but the idea behind the ALC was then explained to them by TCTL staff, who discussed if their way of teaching really was adapted to the ALC idea. The fact that ALC is informed by research helped to convince some of the staff who were not sure why the TCTL had changed the classroom. Other staff who had been using active learning, and especially cooperative learning in their classes, were very accepting and supportive of the changes being made to the classroom. A list of faculty members from all three faculties at UNAK, who stated that they were willing to use the ALC, was crucial in convincing the Management Board to support giving jurisdiction over the classroom to TCTL. Figure 10.1 shows the classroom in 2014 and 2015

when it was still a traditional classroom. Figure 10.2 shows the room after its transformation to the ALC in 2016.

Figure 10.1 Classroom before transformation to ALC, 2014 and 2015

Figure 10.2 Classroom after transformation to ALC, 2016

Methodology

Two surveys were used to collect data from students in the General Chemistry course: pre- and post-instruction. The surveys were administered during the first semester after using the ALC in 2016 and then repeated in 2017. The pre-instruction survey was used to gather information on students' personal status, scholastic preparation in the subject, attitude and expectations for the course. The post instruction survey gathered information on students'

experience of the different aspects of the course, their estimation of their own performance so far, and their experience with the ALC. The instruments used included 19 items for the pre-survey and 27 items for the post-survey, 16 of the items were the same for both surveys. The pre- and post-surveys were created in 2015 by the teacher and a TCTL staff member skilled in survey design. When ALC was used in the course, items were added to the post-survey to collect data on students' perception of the use of ALC.

Table 10.1 Three items on the post-instrument survey that pertain to student perception of the use of ALC, 2016/17

#	*Item*	*Response Type*
1	The effect of ALC on: i. Interaction with the instructor ii. Interaction with other students iii. Group performance iv. Collaboration in the group v. Understanding on the course material vi. Engagement in class vii. Wellbeing in class	5-point response scale: 1) Very positive effect 2) Positive effect 3) No effect 4) Negative effect 5) Very negative effect
2	Please list positive and negative aspects regarding the ALC	Open-ended
3	How could the ALC be improved?	Open-ended

To understand student's perception of the use of ALC, three questions on the post instrument were related to the ALC (see Table 10.1). The first question used a 5-point Likert scale (Very positive effect, positive effect, no effect, negative effect, very negative effect) to measure the effects the ALC had on seven areas of teaching. Two additional questions were open ended, one of which asked students to list positive and negative aspects about the ALC, and the other asked students to suggest how the ALC could be improved.

Findings

Figure 10.3 shows the results of the survey made at the end of the 2016 course. The total number of students in the class was 14 at the start of the semester, however two dropped out, and 11 of the 12 students who were still on the course participated in the survey, giving a response rate of 92 per cent. Figure 10.4 shows the results of the 2017 survey. The total number of students in the class was 22 at the start of the semester, however seven dropped out, and 12 of the 15 students who were still on the course participated in the survey, which resulted in a response rate of 80 per cent.

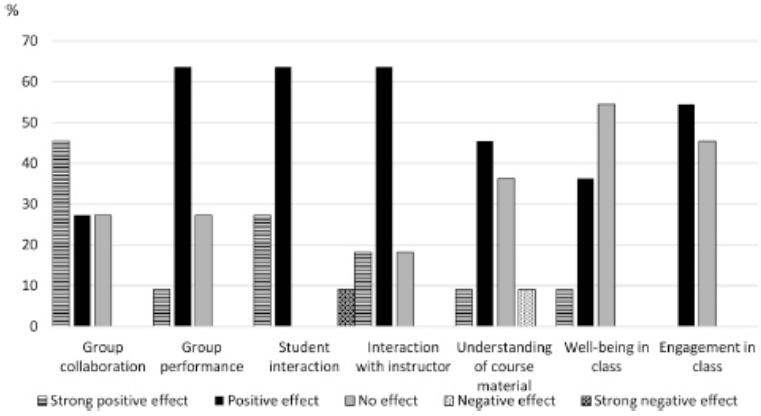

Figure 10.3The effect of the ALC on factors of teaching and learning (Fall 2016)

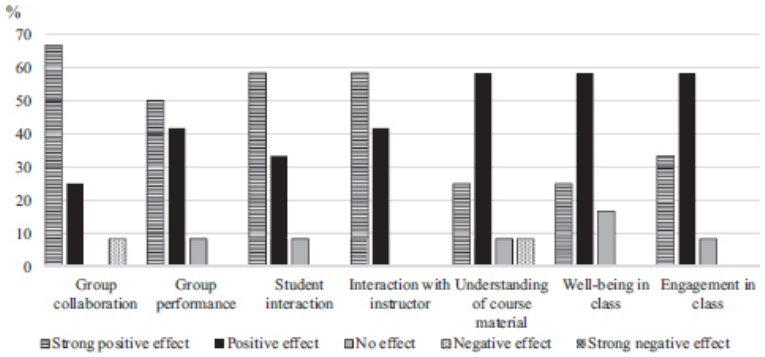

Figure 10.4 The effect of the ALC on factors of teaching and learning (Fall 2017)

Responses to the open questions were similar for both years. Students were asked to list positive and negative things regarding the ALC, most of the responses were short and positive, such as, "it's perfect, no need to change it" or they mentioned that they liked the change that had been carried out within the room. Also, some students mentioned that it facilitated group work: "It is very good to have one 'base' for each group. It facilitates communication in a circle rather than sitting in two seats rows in a traditional classroom". In terms of technology, students mentioned that the panel screens made it easier to observe calculations being performed in the classroom. There were two negative responses, one regarding the chairs in the room. The other one was about group members who did not attend, and therefore the students did not use the room as much.

The other open question asked how the classroom could be improved, but students did not make many suggestions. Some students said the chairs were uncomfortable, and others mentioned that a wider range of connections, like HDMI, should be available to connect to the panel screens. Other students noted that it was difficult to connect their laptops to the panel screens. Students also mentioned that the whiteboard should be used more by the groups and the teacher.

Discussion

The results from the survey for students taking the course in 2016 indicate that students experienced positive effects of the ALC in relation to communication between students, and also between students and the instructor. Additionally, the majority of students felt that the ALC environment had a positive influence on the efficiency of the group work. Some positive effects were reported in relation to collaboration in the group, wellbeing in class, students' understanding and willingness to participate. The results from the same survey from students taking the course in 2017 show more positive effects of the ALC classroom than the year before. More than 50 per cent of the students reported very positive effects in relation to communication between students, and between students and the instructor, the efficiency of the group work, and the collaboration in the group. The survey also shows the positive effect regarding wellbeing in class, understanding and willingness to participate. Overall, the students reported a positive or very positive experience of ALC, with 2017 being more positive than 2016. However, this is not surprising since technology in the ALC had been improved by, for example, the addition of cables to connect to the panel screens for the second year.

The open responses from both the 2016 and 2017 surveys were positive, in that they highlighted how the ACL facilitates group work and overall students were satisfied with the changes made in the classroom. In addition, students were given the opportunity to criticise the change and to come up with suggestions for improvement in the classroom. Their short and positive responses indicate that they liked the changes made to the classroom and that they did not have any further suggestions or comments.

Conclusion

The results support the transformation from the traditional classroom to the ALC. Nevertheless, as Baepler et al. (2014) stated, teachers that use the ALC have to be prepared to allocate time and effort, and be ready to try new approaches. Instructors need to take the time to familiarise themselves with the classroom because of its non-traditional setup and embrace new opportunities that might require them to reconsider their teaching methods. The ALC is not suitable for delivering traditional lectures due to the lack of a front or focal point.

The transformation of the traditional classroom to an ALC, was an interesting journey that started in 2014 with a Chemistry instructor flipping her classroom and later adding collaborative assignments. The process was more challenging than expected, as there were technical problems, ongoing negativity from some of the teaching and support staff, an under-estimate of both the cost and the complexity, and it took longer than expected to set up the ALC. However, the importance of having data to support the utilisation of the ALC was instrumental in convincing the teaching and administrative staff to transform the classroom. Having collected our own data from those who have used the classroom in support of the usage of the ALC, will make it easier to continue with transforming more classrooms to ALC in the future.

The transformation of the traditional classroom to an ALC is only one of several pedagogical developments that have taken place at UNAK in recent years. This is part of the ongoing professional development for academic staff in adjusting their teaching styles to match the mode of flexible learning offered at the University.

The ALC supports and contributes to the flexible learning model offered at UNAK, and students can access learning material, and online content, and communicate with their teacher. On some occasions, however, students must come to campus to meet other students and the teachers. During these on-campus sessions it is

important to practice active learning, and the ALC is ideal for that. The frequency of student visits to campus varies between departments and subjects, but in the case of Chemistry, students could attend class for active learning sessions almost every week.

Next steps and future planning

The next step at UNAK is to support and develop the ALC further, by adding more ALCs and develop this mode of study so it can also serve the students at a distance. That work has started with the addition to the Chemistry class, which allows distance students to participate in class via a telepresence robot called Beam® (Suitable Technologies, Inc., 2018). Beams have been used at UNAK, with both staff and students, since Fall 2017. The Chemistry teacher has, for example, participated in the ALC from Norway through a Beam. The use of Beams at UNAK opens up new and exciting opportunities for both staff and distance students who want to participate in the ALC.

Another project underway at UNAK is the use of portable ALC stations. The three portable ALC stations currently available at UNAK each include a stand with a panel screen with a computer, and an 80 x 120cm (31 x 47 inches) whiteboard. The present ALC can seat 36 students, but it would be ideal to increase this number to 60–70 students. The Nursing course at UNAK, for example, has 60 students. The idea is to transform the main hall, which can seat around 180 students, so that it can accommodate approximately ten portable ALC stations. The main hall already has portable tables and chairs, so should be easy to rearrange the tables to form the ALC arrangement.

The introduction of flexible learning, the transformation of a classroom into the ALC, and the use of telepresence robots, would not have taken place if it were not for the support of the Management Board at UNAK. The Management Board made the decision to offer financial support to flexible learning at UNAK in

2015, which led to the formation of the TCTL. The TCTL supports academic staff to adapt to more innovative teaching methods, and is responsible for the transformation of the learning spaces at UNAK.

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11. Layers of interaction: Object-based learning driving individual and collaborative active enquiry

Object-based learning driving individual and collaborative active enquiry

MARIA KUKHAREVA; ANNE LAWRENCE; AND KATHERINE KOULLE

Introduction

Our ambition as educators is to support students in developing academic competencies and subject knowledge through facilitating conditions for deep and meaningful learning; through individual and collaborative enquiry; and through creating processes which build on students' curiosity and creativity (see Alvarado and Herr, 2003; Hardie, 2015; Chatterjee et al., 2016).

In this chapter, we share our experience of designing and facilitating a pedagogical approach built around artefacts from our institutions' special collections, with a view to promote active learning through exploration of objects and images. We are drawing on our reflections from a series of workshops: staff development events at University of Bedfordshire (UoB), and two national conferences; *Playful Learning* (Playful Learning, 2018), and the *Active Learning Conference 2017* at Anglia Ruskin University (2018), which featured colleagues and students in our respective institutions (i.e. Foundation Level Business Studies; Final year undergraduate Education Studies; and Academic Writing for

Postgraduate Music Education students). Here we share our practice in relation to the pedagogical method, *Layers of Interaction*, which underpins our design, and insights that transpired while facilitating these sessions and observing the dialogue between the participants and the artefacts.

Exploration through practice was our core aim: we wished to offer learners an alternative method of engaging with the discipline-related topic, including the underpinning academic skills, whereby the innovative element resided in introducing additional *Layers of Interaction*. In other words, we wished to introduce interactions with historic artefacts to facilitate activities, which would often be taught through the use of less complex methods, such as group or pair discussions. In so doing, we followed the core principles of the action research approach, to inform the steps of our exploration (cf. Somekh, 2006; McNiff, 2013). We then used participant feedback and our observations to inform our next steps, both in terms of feasibility of the method and further developments and adaptations.

Literature Review

There has been a growing recognition of the potential of special collections as catalysts, or 'conductors', of active learning in HE, stimulating both the sense of curiosity and playfulness, and responding to the expectations and demands of the specific discipline. Chatterjee et al. (2016) provide a detailed and convincing discussion on ways in which 'multisensory' interaction with objects facilitates active enquiry and meaning making in the classroom. Similarly, Hardie's (2015) exploration of object-based learning offers activities that meet key learning outcomes and are engaging and entertaining at the same time. Both Chatterjee et al. and Hardie's work are situated in a HE learning context and underpinned by museum education practice and literature, with discovery learning at its heart (see Bevan and Xanthoudaki, 2008; German and Harris,

2017). In our work, we draw on the idea that interaction with 'unfamiliar' objects can 'surprise, intrigue and absorb learners' and create rich learning (Hardie, 2015: 4), going beyond traditional 'information-bearing materials' in stimulating ideas and creative thinking (Chatterjee et al., 2016).

While exploration of, and interaction with artefacts from special collections is central to our pedagogical approach, we would like to draw attention to other interactions, which occur in parallel with learning through artefacts. Therefore, it may be useful to frame our pedagogical approach using three interaction 'lenses' namely:

- Interaction with the subject (*enquiry-based learning*)
- Interaction with artefacts (*object-based learning*)
- Interaction with peers (*collaborative learning*)

In Figure 11.1 we illustrate how these layers of interaction manifest themselves during a teaching and learning activity. Firstly, interrogating the objects (*individually*), then, continuing the dialogue with the artefacts as a group (*collaboratively*), and finally, connecting back to the discipline, or the discipline-specific outcome (*knowledge*, *understanding*, *skill*). The image illustrates how the interactions interlace during the teaching and learning activity, supporting and 'fuelling' one another. In fact, we argue that it is the interaction with the discipline that is being facilitated through the interaction with artefacts and with peers. This is an important distinction from the design point of view, as the method, and the activity will appear different to an activity participant or to an external observer, as opposed to how it will look to the facilitator. The next section explores each layer in more detail.

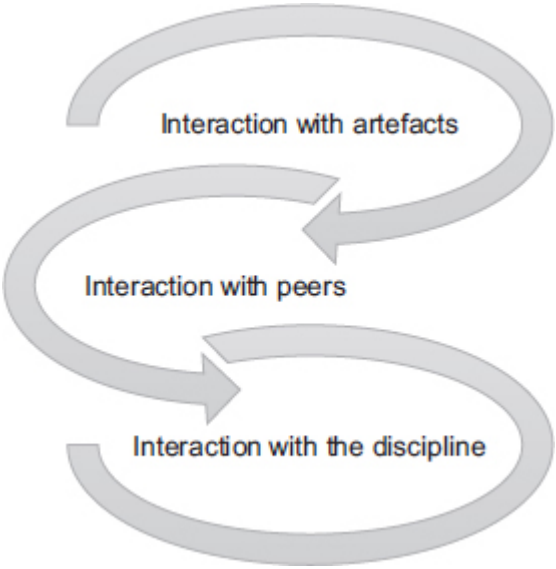

Figure 11.1Pedagogical method presented as layers of interaction

Interaction with objects

Object-based learning offers great potential for promoting individual enquiry, reflection, and knowledge construction; the latter is informed by prior learning experience. This approach echoes Piaget's work (1976) on the interaction between subjects and objects. The subject enters into a dialogue with the object, and questioning and curiosity is encouraged and facilitated by the educator. The physicality and 'multidimensionality' of the objects and images play an important role too, as they invite curiosity, which is aided through haptic, visual and multisensory learning during the exploration process. Curiosity is particularly relevant to our work with special collection artefacts, and recent literature in the field of museum education has emphasised the potential for historical artefacts to act as an 'agile' tool (German and Harris, 2017), igniting creativity and enquiry in the classroom through the

'unfamiliar' (to students) knowledge they embody. Chatterjee et al. (2016) connect these features to Csikszentmihalyi's (1988) concept of *flow*, whereby simultaneous engagement of cognitive, affective and psychomotor domains results in a state of immersion, which leads to higher cognitive processing and deeper learning. Falk and Dierking (2000) echo this discussion in their work on museum education and meaning making.

Interaction with peers

Individual interaction with the artefact, and the resulting reflection is subsequently followed by a series of peer interactions in small groups. We draw on Vygotsky's (1978) socio-constructivist view of learning through interaction with others, whereby students develop their own understanding through collaborative activity with their peers.

We also expand the use of questioning in the style of Socratic dialogue (Paul and Elder, 2008), this time, in a social, collaborative context, with questions acting as drivers for developing critical thinking, reasoning, and own positionality, through verbal articulation (Vygotsky, 1978). In fact, literature on object-based learning suggests that interaction with objects frequently implies collaborative, socially situated activity. Brookfield (2012) advocates for group discussion as a social learning process, which creates space for exchange of critique, and therefore accommodates subjectivity (initial assumptions), and critical analysis (considering other views and incorporating them into own position). Further 'deconstruction' of the process of developing criticality can reveal such (emotional) dispositions as inquisitiveness and truth-seeking (see Facione et al. (1995); Giancarlo and Facione (2001), which links intellectual curiosity and criticality, echoing the discourse around object-based learning.

While the process of active learning is very much student-driven

and student-centred (Chatterjee et al., 2016), the role of the facilitator is crucial for effective directing and managing of the dialogical process to support students in their interaction, by broadening and deepening the dialogue, encouraging reflection, reiteration, and the critical enquiry into the subject.

Interaction with the discipline

It may not be immediately obvious to participants that they are, in fact, interacting with the topic related to their discipline of choice, when they enter an explorative dialogue with artefacts and each other. Indeed, the main aim, and therefore, the overarching interaction occurs at the level of participants' process of enquiry into an area of their field. In particular, the concept of open, 'true inquiry' (Banchi and Bell, 2008) is fitting here, whereby students are able to structure their own engagement (through questions) with the topic and formulate the results. Brown's (2003) reference to enquiry-based learning as 'inquisitive learning', as opposed to 'acquisitive learning', is helpful here, as it draws parallels with curiosity and student-led process of construction of subject knowledge. Interaction with artefacts through peer collaboration is the pedagogical method that takes the participants beyond the immediate expectation of the teaching and learning approaches associated with the discipline. Scaffolded facilitation from one object to multiple, from direct to more open questions, welcoming complexity and multiplicity of opinions, and skilled questioning may help students 'travel' and cross the boundary between their preconceptions of the teaching method associated with their discipline of choice, and the method we present here. Dalrymple and Miller (2006) point to the importance of the pre-set learner identities, which can act as a 'stumbling block' for students who are invited to cross (expected) disciplinary boundaries to explore a previously unfamiliar and unexpected learning method. That said,

by going beyond the (expected) discipline-specific approach, students arrive at a more meaningful, personalised and contextualised subject knowledge through the process of enquiry and discovery (see Bruner, 2009).

Designing the pedagogical approach

As mentioned earlier, our aim was to explore innovative teaching approaches which would provide students with an alternative way of connecting with subject-related material. It was important to create a learning environment that invites participants' subjectivities and lived experiences, and builds on the latter, helping them navigate the process of enquiry, thus leading to a deeper, meaningful learning experience. We were also keen to use an approach that had potential to ignite participants' sense of exploration and curiosity, and reinforce the enjoyable nature of critical and creative thinking.

It would also be fair to say that we share a 'learning development' approach, whereby an explicit importance is placed on the way students learn, as well as on the way students reflect on their own learning and knowledge construction. In other words, it was also our aim to bring students' application of their academic competencies (i.e. criticality, creativity, information literacy), as well as their reflection on this process to the forefront of the learning process; to give shape to something that can be perceived as too abstract, and therefore may be difficult to grasp and apply. As authors and learning developers, we also come from different disciplines and backgrounds; this allowed us to develop three 'strands' of student learning: information and research literacy; narrative construction and research skills; and criticality in postgraduate academic writing.

The practice discussed here represents an amalgamation of developments that took place at a number of development and

teaching events over an eighteen month period. The inspiration for our engagement comes from exposure to the object-based learning methodology, and its unique potential to invigorate the learning experience. Links to museum education and its underpinnings served as another foundation block for our exploration. The sentiment around universities' special collections being underutilised resonated with us and presented an opportunity to both enrich our students' learning and raise the profile of special collections and their value – not just historical, but also pedagogical.

As this is a practice-driven and practice-based exploration, elements and principles of action research were particularly useful to us, in terms of informing our approach and mapping out the steps. We naturally fall into the educator-researcher role, which would allow us to observe potential areas for experimental teaching and learning design, carry out the activity, make changes and inform further professional and learning development (cf. Somekh, 2006; McNiff, 2013). Of course, alongside the valuable position and the insights that the role of educator-researcher bring, it was paramount that we are aware of, and account for potential vulnerabilities such as awareness of own position, and how this subjectivity may be affecting the course of the exploration, as well as students' subjectivities and input.

Conversations with archivists and librarians curating special collections in our respective institutions (Bhimani, 2018; UoB, 2018) ensured that a shared understanding was developed around the use of special collections as an aspect of active learning methodology. This iterative dialogical process involved different areas of expertise, in this case, museum education/historical canon and academic writing, information literacy and research skills; with the involvement of subject specialists at key points (i.e. Education Studies; Music Education; Business Studies).

Before the method was adapted for student learning, however, several staff development workshops were delivered, aimed at our teaching and academic support peers. In these events, each involving 10–15 participants, the methodological 'formula', grounded

in object-based learning was offered to participants, whereby they went through the process of interaction with the artefacts and each other, approaching the activity through the lens of their own field of expertise. These development sessions served as a pilot and helped shape the method and the activity, and to consider possible adaptations and raise interest in the method as well as the special collections.

Participants in the staff development sessions were asked to explore artefacts from the UoB Physical Education archive and subsequently consider how similar activities could be used in their practice. Sufficient time was given to discussion around theoretical frameworks underpinning the activity (e.g. active leaning; object-based learning; discovery learning, enquiry learning), to ensure that the conceptual pedagogic understanding was developed, alongside the skill of facilitating and adapting the method for specific subject areas and topics.

In terms of design, each session followed a specific set of development steps: collaboration with our institution's special collections colleagues to identify relevant and suitable collections and co-design activities; collating and grouping of artefacts relevant to the students; development of scaffolded explorative activities to support interaction with the objects and peers.

We worked on developing this activity with several groups of students that ranged in level and subject, across two institutions. The number of students ranged from 15–30 per session, allowing us to explore the approach in a range of contexts and group size. At the University of Bedfordshire, for example, we worked with students at Foundation and Undergraduate level. The three groups of Foundation Year Business students (ages between 16 and 18, 30 in each group) used the method as a way to engage with academic literature, through interrogation and questioning of a range of academic material. At the same institution, we also offered this approach to two groups of final year Education Studies students (30 students per group). These students were starting their dissertation

project and used the method to practice formulating a research question and building a critical narrative.

At the Institute of Education, the method was used to explore criticality in the literature review process with Postgraduate Music Education students (20 students in 2017; 25 in 2018).

Facilitation of the approach

Participants were invited to interact with artefacts from our institution's special collections (Bhimani, 2018; UoB, 2018): images, texts, historical records, physical objects. Sessions were staged to incorporate and build each of the three layers of interaction: interaction with objects, interaction with peers, and interaction with the discipline. Initially, one or two objects were explored and interrogated by participants, through consideration of a number of questioning prompts, and the subsequent objects were revealed to stimulate further questioning and exploration, both individually and in small groups. This culminated in an activity where students were asked to draw conclusions about the origin of the artefacts and interpret links between artefacts and what they represented.

The staging of the sessions and 'layering' of interaction were underpinned by the principles of 'Socratic questioning' (Paul and Elder, 2008) and the 'think-pair-share' format (Millis et al., 1995), a practice that promotes reflection and higher-order thinking through both individual reflection and group interaction. The use of Socratic questioning encouraged students to 'dig beneath the surface of ideas' (Paul and Elder, 2008: 36) and students in turn used Socratic questioning and dialogue to establish an 'additional level of thinking' and 'powerful inner voice of reasoning' (Paul and Elder, 2008: 36). In this way, critical thinking and reflection were embedded in the learning process and developed through the three layers of interaction.

Pedagogic practice informed by museum education and object-

based learning offers students an opportunity to practice creative and critical enquiry and participant-led exploration into the subject matter. As Hardie (2015) suggests, teaching built around object-based enquiry can achieve the educator's ultimate ambition: make the learning engaging and fun, while 'hitting' the learning outcomes. Using special collections not only gave us an extra dimension of engagement and tapped into the 'curiosity' domain of discovery-based learning, but also added value by broadening the learning experience and opening a 'window' into previously unexplored aspects of the university, and the related context and history. As facilitators and workshop 'designers', our task was to invite students to digress from direct interaction with the discipline by taking a detour to fully engage with the objects, individually and in groups, to develop and share subjectivities, and to notice commonalities and differences. Lastly, and very importantly, our task was to lead students through the process of 'skill transfer' (Gibbs, 2014) whereby the process of object-based learning enquiry would be deconstructed and applied to the enquiry into the discipline. Hence, the 'sweet spot' is where the critical and creative aspect of the dialogue with an artefact can be noticed and made more tangible through articulation; this newly visible creative and critical thinking can then be used to broaden and deepen interaction with the subject knowledge.

Findings

As outlined above, we aimed to use participant feedback on how they found the method, to be able to develop our thinking and practice further. Although the development and testing of the method was framed from the outset as an exploration into pedagogical practice, we used core principles of action research, such as initial reflection on an existing issue, constructing a response or action, collecting evidence via feedback and

observation, and introducing further re-iterations following post-event reflection (McNiff, 2013). Thus, we used participant discussions and feedback, and our own observations to inform our reflection, as well as the next steps in method development.

While keen to capture participants' views on the use of the pedagogical method, it was equally important to strike a balance between encouraging feedback and not contributing further to what could be described as 'survey fatigue'. Using 'post-it note pedagogy' (Quigley, 2012) to collect students' views and generate discussions served as a simple and effective solution (Peterson and Barron, 2007).

Feedback from the sessions echoed our reflections and helped us draw conclusions about the participants' engagement, motivation and interaction with this learning method, providing us with a direction for further development. Considering the innovative nature of the method, and the potential challenge of engaging with something unexpected, the choice was made to capture a relatively surface 'layer' of students' perceptions through post-its. Therefore, we asked our students to respond to three questions: (a) 'What did you enjoy the most?' (b) 'What did you enjoy the least?', and (c) 'what did you find most surprising/unexpected?' While the first two questions would help us ascertain the key aspects of the method, as well as the direction for future improvement, the third question was grounded in the 'curiosity' and the 'discovery' learning aspect of the methodology. We were also equally keen on getting a quick view of 'what worked' and what could be done better/differently, as learners were engaging with not only a new, but unexpected approach to learning and to the discipline.

Overall, student feedback was consistent with reflections and verbal feedback from staff development events and conference workshops; key themes in feedback from all participants were also supported by our observations.

Interaction with objects

The majority of the feedback from participants across all subjects and levels of study indicated that they enjoyed handling, investigating and exploring the objects and their history. When reflecting on what we observed, all three facilitators also agreed that the excitement in the room increased when engaging and interacting with the objects, creating an engaging learning environment. The positive feedback on working with the artefacts supports the idea that learning through interaction with objects promotes effective learning, plus development of knowledge and skills that go beyond the immediate subject (see Falk and Dierking, 2000; Piaget, 2007; Gibbs, 2014; Hardie, 2015; Chatterjee et al., 2016; Maybee et al., 2016).

Observations of group dynamics reinforced the idea that facilitation of meaningful transfer of learning requires skilful facilitation and contextualisation for level of study, discipline, group size, and composition. For example, staff members and postgraduates responded quickly in deconstructing the core principles of the activity, which could then be applied to other contexts (e.g. the process of creative exploration, critical thinking and evaluation, synthesis); they recognised the skill of transfer as one of the aims of our methodology design. In comparison, the Foundation cohort needed more time and scaled instruction to establish the connections between the process of object-based learning and application of the related skills and processes to the discipline-related task that followed. The Foundation groups were also larger in size than others, which affected facilitation and pace of the session.

Students at the higher level of study and, even more so, teaching staff would be more familiar with the language and expectations of HE learning, both in terms of discipline-specific knowledge and associated learning approaches and competences. Therefore, the facilitation for earlier levels of study, in our case, Foundation, would

ideally include a more gradual scaffolded instruction, possibly through a series of sessions, which would allow more time for setting the context and building familiarity with a breadth of learning approaches to their discipline of choice. The Foundation students did enjoy working with the 'unusual' and 'old' artefacts as much as other groups, stating that the opportunity to physically handle the objects and learn something about them was a pleasantly surprising element of the activity. This view is supported by the feedback from other groups, where participants found the objects and the associated history and meaning surprising and unexpected (Hardie, 2015; Chatterjee et al., 2016), and participants reiterated this in response to the question 'what did you enjoy the most?' For facilitators, this means that once the sense of engagement and level of familiarity is established, facilitation can move towards capturing the understanding of the knowledge and processes encompassed in the activity, and how they can be transferred to the interaction with the discipline.

Participants' enjoyment of the object-based learning aspect of the activity also meant that the most common answer to the question 'what did you enjoy the least?' was 'not enough time'. Despite sessions varying from one to two hours, it was clear that every section of the activity could have been allocated more time, whether exploring the objects, engaging in the discussion, and deconstructing and applying the skills and processes utilised during the interactions. This would need to be taken into consideration in methodology design and facilitation. Factors that play an important role are familiarity with processes and practices in HE, group size, and the subject-related task that requires transfer of skills, competencies and processes practised through object-based learning.

Interaction with peers

Written and verbal feedback suggest that collaboration was not only perceived as enjoyable, but also as a method that helped explore the objects in more depth, and thus helped generate 'interesting ideas'. Both students and staff expressed the view that 'sharing the questions with others', and 'sharing analytical experiences', helped them stay engaged with the activity and 'think outside the box'; the latter suggests the appreciation of, and perhaps slight surprise at, own creativity. Some participants made similar comments in response to the question 'what did you find most surprising/ unexpected?' Our observations matched participant comments; the objects created lively discussions and held participants' attention. Participants were keen to share their views with others and were interested to hear alternative interpretations and commentary from others. These messages echo the literature on interaction with others (Vygotsky, 1978) and group discussion as a means for facilitating energetic, engaging and meaningful learning (Brookfield, 2012).

We would like to emphasise the fact that capturing different ways of thinking, and therefore, learning, was central to our method; this is something that would come through most clearly in the interaction with peers. The activity design aimed to highlight and make more tangible how we observe and interpret differently depending on background and perspective, which was confirmed in the student feedback. In the staff development sessions, participants demonstrated high levels of autonomy; they were constantly reflecting and considering when and where they could adapt and utilise the activities in their own teaching. Their feedback was similar to reflections of the postgraduate group: both could see the value in the techniques for their own practice and skill development. In comparison, the Foundation group found more structure, guidance and reassurance helpful to 'stay' with the process of exploration and go deeper into their own observation

and reflection. Some of their feedback was more descriptive and brief than that of higher level participants. Reasons for this may reflect the expectations imposed by the discipline (i.e. Business Studies rather than Education), as well as the level of study (i.e. Foundation rather than final year, and postgraduate). This observation creates an opportunity for a deeper exploration into how this method aligns with different disciplines.

Interaction with the discipline

As mentioned earlier, it is the interaction with the discipline and the discipline-related skills which constitutes our ultimate aim, which we arrive at through two additional layers of interactions. Subsequently, this process facilitates the transfer of relevant skills, competencies and processes. Some participants saw the connection between 'playing detective' and 'writing down questions about the photos' and therefore engaging with principles of discovery and 'inquiry-based learning' (Brown, 2003), and helping them with 'bouncing ideas' and 'breaking down' the process of 'analysing a lot of data or literature'. Reflection and the opportunity to understand the subject in greater detail, as simulated through the process of object-based learning, were also mentioned. Parallels can be drawn here with students' self-contextualised learning (Bruner, 2009).

Again, responses differed between Foundation, final year, and Postgraduate students, and practitioners. The Foundation group attempted to synthesise the information from the objects but seemed to find it more difficult to transfer those skills and processes in analysing literature. The final year and postgraduate groups were more adept at synthesising the objects and could express their own subjectivities, as well as explore different perspectives respectfully. They seemed to have fully understood the benefit of being curious when researching objects, one response even stated that they enjoyed being a 'detective' with objects about

their subject that they never knew existed. We varied our questioning facilitation accordingly, to support the groups in their exploration. Following this thread, it is unsurprising that the professional participants were considering the approach and its transferable application, demonstrating high levels of autonomy and freedom.

Similarly, although with slightly less autonomy, Education Studies cohort feedback indicated that they valued the creative, interesting and unexpected nature of the session. They viewed the session as an opportunity to both reflect on their own perspectives and visual literacy skills, and to think creatively about connections between objects. They also enjoyed thinking creatively about the session process and how they could adapt and amend the session to support their own practice – something that we hoped would happen.

The Foundation Business Studies students liked that the session gave them the opportunity to question as well as learn new analytical skills. They required more scaffolded facilitation to see the wider uses of the skills they were utilising; that said, participants eagerly immersed themselves in the interaction with the objects. They embraced the opportunity to be creative in their interpretations of possible connections between images.

The MA Music Education group expressed appreciation of the fact that the session allowed them to be reflective and practise their criticality, making connections in new and innovative ways, and structuring the process of their enquiry. They responded well to our invitation to exercise creative expression and freedom of interpretation beyond what they would normally be used to. Parallels can be drawn here with Banchi and Bell's (2008) 'true inquiry', where students scaffold their own engagement with the topic.

Conclusion

The pedagogical approach presented here facilitates creative engagement with the discipline through a layer of interactions, grounded in object-based learning, collaboration, discovery and enquiry learning. As our practice and participant feedback demonstrates, exploring physical artefacts from special collections at the level of both individual and group activity provides participants with opportunities to identify approaches, processes and skills that are necessary for acquiring discipline-related knowledge and understanding. Such important and often abstract concepts such as critical thinking and analysis, creativity and exploration, and synthesis, can become more tangible as processes and competencies. This deconstruction and reconstruction of the process of interaction with the objects, and then the application of the reconstructed process, requires participants to develop what Gibbs (2014) describes as 'skill of transfer'.

Feedback and observations suggest that groups of different levels of study may require a varied amount of support and facilitation. In particular, it was clear that this method is most effective when sufficient time is allocated for exploration of the artefacts, discussion and linking back to the discipline and learning outcomes. Peer interaction and skilful dialogic facilitation from practitioners also play a vital role in how effective the process and the outcome are.

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12. Using place to develop a culture for active pedagogy

ANDREW MIDDLETON

Introduction

This chapter reflects on the complexity of developing a culture of active pedagogy across an institution. It describes some of the initiatives led by the author in his central educational development role with responsibility for academic practice and learning innovation in a UK post '92 university. It focuses on developments undertaken in the context of the institution's strategic drive to develop 'future learning space' under the sponsorship of the Deputy Vice Chancellor.

The chapter uses an autoethnographic approach. Following the setting of context and an explanation of the methodology, five accounts of educational change and academic innovation are presented as vignettes; short stories about the future learning spaces work from the author's perspective. The stories cover a two-year period which challenged diverse stakeholders to not only co-operate but work imaginatively, while embracing appropriate risk-taking to transform practices.

An analysis of the overarching story through this chapter has elicited three themes which form the concluding discussion. The first theme reflects on the conundrum of situated innovation as space or place. The second considers the tension between strategy and opportunity in developing active learning. Finally, co-production as an appropriate basis for active development for active learning in complex situations is considered.

Methodology

This study takes an autoethnographic approach. James (2015) argues for autoethnography as a methodology that elucidates practice and makes 'explicit the deliberations, choices and motives that drive our actions and 'theories in use" (p. 102). Autoethnography uses reportage from the reporter's own personal and emotional life (Bloor and Wood, 2006). It is a form of self-narrative that places the reporter as the protagonist (Atkinson and Reed-Danahay, 1999). The methodology allows for critical reflection on rich and complex experience through introspection and dissolves 'the boundary between the author and objects of representation' (Butz and Besio, 2009: 1660).

Vignettes provide reportage in a short storytelling format and offer a useful qualitative approach for representing complex experience. Their use is realistic and provides a way to represent 'fuzzy experience'; situations that cannot be clearly defined because their significance or meaning is dynamic, often being about change over time, with such episodes involving multiple people with multiple roles and drivers. Fuzzy experiences typify educational development which, due to their non-dualist nature, are typically inconvenient for researchers, though nevertheless highly significant to understanding activity and space.

While the stories reflect on work involving many people, a rationale for autoethnography is that 'the writer is freed from the ethical dilemmas implicit in the attempt to represent any experience' (Bloor and Wood, 2006: 18). However, no person's experience can claim to be completely divest of the experiences and interests of others. Before I set out the vignettes, which feature many people as co-protagonists, I declare that, overall, this chapter is a story of good will, shared endeavour and co-operation and I acknowledge the professionalism of my colleagues. An overriding challenge for all of us was not *whether*, but *how* to work co-operatively and, as Vignette 1 reveals, we started from a position of

disconnection. The other vignettes record how we moved towards a shared desire to connect and integrate our work which we understood to be a pre-condition for implementing an institution-wide shift from pragmatic pedagogic didacticism towards an ethos of active learning.

The voice of the chapter now changes as the story of developing a future-ready space for learning is recounted through the vignettes.

The story

Vignette 1: Silos and surprises

The email invited people to hear about the progress being made on plans for fitting out a new building for one of our faculties on our campus. As the institutional lead for academic practice and learning innovation, I was surprised I had not been alerted earlier about the construction of a new teaching facility. I wondered, "Who was representing the teaching and learning imperative in this development?"

I attended the meeting later that week with about seven others: the Estates Manager, two librarians, the University's Head of AV and his colleague from IT Networks, a faculty-based project manager, and the University Head of Catering. They were discussing the detail of the social space; where the printers would be located and how this was already really determined by commitments made to the installation of conduits discussed many months ago. I wondered whether I should be there: decisions had been made, the technical language was impenetrable, and nobody was talking directly about teaching or learning even though every comment seemed to reinforce a naïve and shallow set of assumptions about what academics do and how learning happens.

I realised the pink boxes circumscribing an indecipherable central

space on the plans for each floor were classrooms. The assumption, which was later confirmed for me, was that the lecturers would know what to do because the classrooms were standard classrooms. It was apparent that the plans had been signed off a while ago.

"Which academics have been involved in the design so far? How were the specifications drawn up?" I asked.

"We've tried to involve academics but they never turn up, and they can't give us the answers we need." Colleagues needed answers to technical questions. Academics either did not have a view, were not empowered to answer on behalf of others, or had no understanding of what the questions meant or why they might be important. Colleagues read this as an essential disinterest in the project, beyond the questions concerning their own office accommodation, with the exception of two specific space requirements to support Early Years Education and Science Education.

Despite this inauspicious introduction to what appeared to be an ill-conceived 'new build' project, the people I met that day were to become some of my closest colleagues for the next few years. My respect for their openness, courage and professionalism grew steadily. I soon learnt about their frustrations with academic disinterest and their appreciation of the opportunity a new build creates as a catalyst for innovation. I learnt how building developments do not pause for academics to learn about teaching innovation or for the moments in the academic year when they can give such questions the time they deserve.

As I left, I promised I would engage and represent the academic voice, one way or another.

Vignette 2: Creating a typology as a common opportunity

Initially I noticed that discussion about learning spaces at institutional level was demarcated by a culture of jargon, policies,

and budgets which created a counter-productive 'silo mentality' that suppressed innovation.

As I began to talk in subsequent meetings of the Learning Spaces Operations group about the implications of their decisions for innovative pedagogy and the learner experience, a common desire to break through their deficit discourse blossomed. I had felt excluded by their jargon and I realised that a common project to develop a learning spaces typology would benefit everyone. More to the point, the institution needed a way to talk about its various classrooms and ensure that Timetabling, Facilities Management, AV refurbishment cycles, and IT Services had a way to interoperate. Works were not co-ordinated and clearly aspects of the teaching estate had suffered over the years by fits and spurts of investment in one area or the other. Classrooms were functionally and aesthetically incoherent due to the variety of new and worn out furniture, decoration schemes, and AV updates; works apparently carried out without logic. I realised that academics could not depend on a consistent offer. All concerned were open about their different approaches to managing refurbishment but felt they were determined by circumstances imposed on them. I realised that once a new build had been launched, it steadily decays in different ways at different rates. From a teaching and learning point of view, spaces were functional, but the estate spoke loudly of a lack of attention to academic and student belonging and this reflected poorly and unfairly on the institution's attitude to learner engagement.

The task of creating the Learning Spaces Typology was challenging. Categorising room types proved nearly impossible. We agreed it would be meaningless to define too many types and we eventually agreed baseline descriptions for lecture theatres, small classrooms, large classrooms, PC labs, and specialist facilities including science laboratories and studios. The classrooms were sub-divided according to capacity. Capacity is a contentious matter because it is dependent on room configuration and student-to-floor-space ratio (Boys, 2011).

While developing the Typology, we introduced SCALE-UP, an

active learning pedagogy in which students engage in problem-solving through structured group work framed in a specific classroom environment (Beichner, 2008). As other vignettes describe, we began to devise active learning facilities by developing our appreciation, and that of others, of whiteboards, floor space and technological components. However, we were trying to create a typological system while our understanding of its dimensions were still developing.

We never did get to the point of surveying every room against the Typology as we had intended. Our senior sponsor left before we got to that point, but we achieved a deeper understanding of what matters in designing, maintaining and supporting the teaching estate: an understanding of space and its relationship to learning along with a common language and stories about spaces for learning.

Vignette 3: Learning space walks in the twilight zone

Conversation, experience and space intersect around the act of walking. Walking creates a familiar, common space for forming trustful and confident relationships that can inform understanding.

Haigh (2015) considers the value of conversation as a context for professional learning. He had recognised how his most valuable professional development came from the just-in-time impromptu conversations he had with his colleagues. He analysed such conversations and identified serendipity, improvisation, parity, timeliness, contextuality, the use of storytelling, openness and trust as valuable features of conversational encounters. These values are also evident in third place theory (i.e. social surroundings other than Home (First Place) and Work (Second Place)) (Oldenburg, 1989), characterised by its neutrality and good conversation. While change

projects often focus on processes, deep and lasting change is cultural and, with this in mind, I devised Learning Space Walks.

I have organised many learning walks designed to consider spaces for active and student-centred learning. The walks, taking two hours, run during the twilight zone between four and six o'clock, fittingly straddling the boundary marking the end of the normal working day and, by implication, normal working roles. The idea of twilight zone is both practical and symbolic, presenting the possibility of a deviant space in which more relaxed attitudes can create the right mood for walking together; it is a tacit boundary space shaped by a collective generosity to hang on at work for an extra hour in the day. The group, therefore, comes to embody a collective curiosity.

The Learning Space Walks use a co-created route. Walkers are each invited to nominate and make the case for a 'viewpoint' when they register to take part. As organiser, I select about five viewpoints and devise a useful route and discussion outline.

I have organised walks explicitly for academics and for senior managers, but they are most effective with a mix of participants: a student walking with a Vice Chancellor or a member of the Estates team walking with a couple of academics. Questions or ideas are posed at each viewpoint and then the walkers set off again engrossed in discussion for the next 10 or 15 minutes. Few instructions are given. People know how to go for a walk!

I have observed how people normally walk and talk in groups of two or three. Clusters tend to overhear parallel conversations, and this leads to merging or exchanging behaviours. I look out for quiet people and my job, as host facilitator, is to bring them into conversational groups.

The viewpoints act as stimuli. We might visit a classroom suggested by one person who might say, "I wanted to bring us here to tell you about the day when I was teaching here and …" The conversations will pick up on the stimulus and by the time we reach the next viewpoint people may have wandered 'off topic' but into areas of mutual interest.

Finally, we will gather in a campus café or classroom to share and reflect on our meanderings. People are vested in hearing about what others discussed and how this was different to their own conversations.

Walking is a versatile active learning space. It has structure, but as an active space the structure is usefully loose. I have used walks to consider a variety of foci; not only learning spaces. I also have extended the approach by creating global 'twalks' in which co-created routes run in parallel across time-zones using social media to connect walking groups (Middleton and Spiers, 2019).

Vignette 4: Stand-up pedagogy and white-boarding

A few things came into focus at about the same time for me. I took a colleague, a professor well-known for his work on experiential learning, on a Learning Space Walk. Unusually, it was just the two of us. We had walked as members of a group a week or so earlier and this led to us wanting to take a closer look at one or two things. He showed me a classroom with no windows; a left-over space from some development. Nevertheless, it was regularly timetabled. "How did this happen?!"

We continued on our way and observed the 'classroom litter' in every room: that is, the inevitable broken chair, the disused Over Head Projectors, tables with wonky legs, and odd contrivances that had once had a purpose, though no longer. *Every* room was like this. We observed the plentiful whiteboards, many of which were not cleaned. We observed tables and chairs stacked perilously high. "Surely a hazard" we noted as we realised that this structure demonstrated how some tenacious academic had determinedly rearranged the room to suit *their* pedagogy despite the challenges.

At about the same time, I was emailed a photograph from a Maths lecturer who was visiting a South African university. The picture

showed a line of mobile whiteboards arranged down the centre of a hall. Students were touring and interacting with the whiteboard wall. Another colleague in Maths explained how they got their students to work side-by-side at whiteboards on mathematical problems. I was working on the Typology and had begun to realise that wall and floor spaces, not just room capacity and technological infrastructure, were significant to active learning space.

The outcome of this was an initiative called Stand-Up Pedagogy (SUP). I explained my thoughts to my collaborators in professional services. Later the Estates and AV Managers surprised me by finding an unused teaching room. We took it off the timetabling system and I arranged for all the furniture and IT to be removed so that the space was bare, save for whiteboards, pens and erasers. It looked bizarre, but it implicitly communicated a pedagogic challenge. The overwhelming sense was of there being nowhere to hide. It signalled loudly that if you're in the room you were expected to interact with the people and the whiteboards. I called for volunteer innovators from the academic community.

The project emerged as an unexpected opportunity and meant that I did not have time to properly plan and support it. There were technical obstacles too: the room could not be formally timetabled in case people were assigned to it unwittingly, yet the students in the SUP pilot had to be notionally assigned to another room to ensure something appeared in their schedule. This confused them. Further, we could find no adequate way of managing whiteboard pens and erasers. Standing for a full session could be tiring and we realised we needed to allow for students with disabilities by reintroducing three chairs. While it was not a perfect experiment, it was a useful start. We learnt a lot about the value of wall space in any classroom which led me to devising many active learning wall-based methods including collaborative drawing, concept mapping, myriad Post-It Note exercises, and gallery techniques. In turn, this led me to consider how floor space can be used to set out 'crime scene' scenarios, flip chart activities, photographs, and other objects for student interrogation.

Vignette 5: Flexible classrooms

As in SCALE-UP (see Chapter 1), the efficacy of flexibility comes from adjusting only specific pertinent variables. Fixed tables, for example, can create a strong foundation upon which interactivity can thrive. This principle applies to both teaching and the space it uses. SCHOMS, AUDE and UCISA (2016) highlight how flexibility introduces weakness to the physical design of space: wheels can fail on chairs, hinges on tables, and so on. Adaptation, rather than flexibility, is a more useful way of considering active spaces and active pedagogies.

To test this, I argued for the development of a series of three rooms in the heart of our university to act as both a lab for the investigation of active learning and as a 'showcase' suite of adjacent classrooms. Each room had its own definite 'built pedagogy' (Monahan, 2002). I wanted to raise the visibility and debate around active learning.

Building on the sound relationships developed with AV colleagues, and having no budget beyond that available in their annual refurbishment programme, we established three different active learning classrooms (see Figures 12.1, 12.2 and 12.3), each nominally accommodating 36 students. We specified each room according to a different idea about active learning:

Lined with whiteboards, and without a dominant lectern, these ideas were mostly achieved through table configuration. I produced pedagogic guidance to encourage staff to adopt a range of active pedagogies and ran CPD workshops in each of the rooms to model white-boarding activities like listing, sorting, ordering and concept mapping in response to problem stimuli. Mostly, however, the sessions afforded an opportunity to ponder on ideas and take a few risks together; to discover that learning objectives can be met by involving participant learners as collaborators and even co-conspirators in an active learning experiment.

Tables in the Boardroom were set out as a single open box shape.

We made use of the narrow desks that had been in the room previously, where they had been set in rows. Immediately it became clear that the possibilities were quite limited. People sitting next to each other can converse and everyone can pay attention to the facilitator touring the room, but every interaction required the participants to turn. Even people sitting opposite each other would have to shout to be heard.

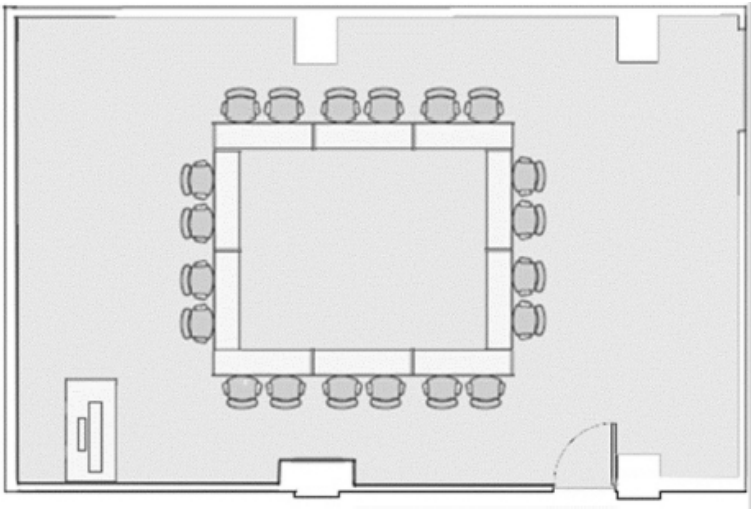

Figure 12.1 The Boardroom

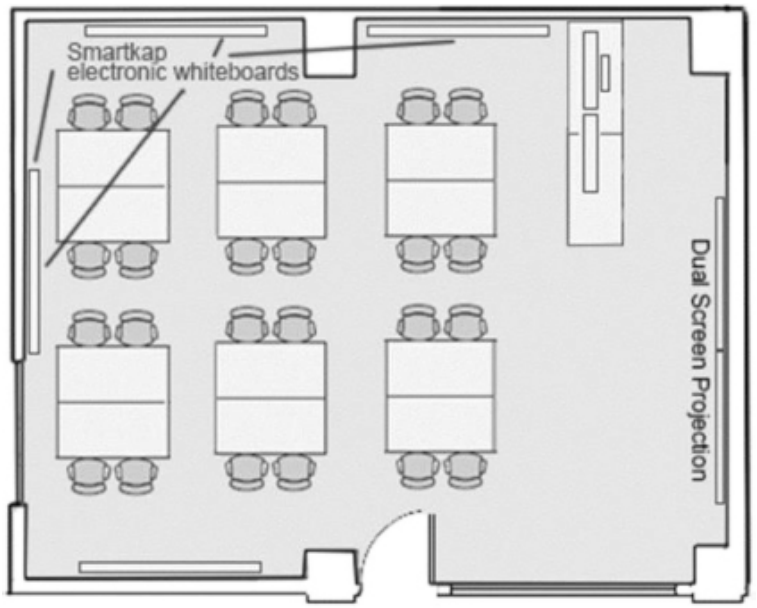

Figure 12.2 The Project Studio

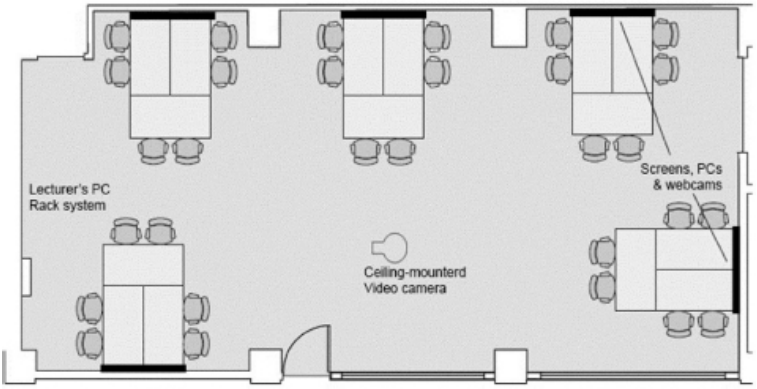

Figure 12.3 Media-enhanced team-based learning

The seating plan itself, proposed to model formal meetings for employability purposes, had little learning value. The room started to make sense, however, when the facilitator set problems. Groups, defined by the four sides of the box, could swivel their chairs around

to the whiteboards and the constraint of the layout was immediately released as the groups set to work on writing or drawing-based problem activities. Whiteboard photographs, animations and video commentaries of concept maps were made using smart devices.

In the Project Studio, dual projectors could present information from two sources side-by-side. Again, whiteboards lined the walls, and additional *SmartKap* boards were installed to capture drawings to personal devices. This time the desks were laid out in six large islands surrounded by plenty of floor space to give project groups space to browse their whiteboard work. All of the rooms featured light, stackable chairs which made it easy to use or dispense with them. In this case the large groups organised themselves around table-based tasks using flip chart paper, spreadsheet data, or other sources of information brought into the room by the project teams, their tutor, or a guest. All rooms had digital visualisers and in the Project Studio information, objects or drawings created at earlier project stages could be presented alongside current work to show progress for self-reference or to external participants such as employers or clients for authentic feedback.

The cost of acoustic treatment, microphones, video cameras, mobile whiteboards, and multiple-screen projection made the installation of the Media-Enhanced Team-based Learning room more expensive, but it was still put together within the normal refurbishment budget by reconfiguring existing furniture. Acoustics were further controlled using mobile whiteboards, one side of which was covered in green screen textiles so that teams could produce overlay backgrounds on the videos they produced. A ceiling mounted video camera, capable of following movement, was installed for capturing role play or performances.

Our main challenge came from various people persistently reorganising the room into rows. This was due to the limitations of the institution's timetabling system to specifically target and timetable 'trained' academics, the regular use of the high-profile rooms for non-teaching events, and because cleaning staff struggled to accept the design or follow the laminated instructions I

posted to describe the layout! The opportunity to develop the space was fortuitous, but it became evident that our original request to maintain the space and offer a continuous programme of CPD through a continual staff presence was critical.

However, we learnt a lot and this work led to me developing a Flexible Classroom Policy that committed the University to a default of cabaret style settings for all pool classrooms, and etiquette for leaving classrooms in a good state and reporting breakages.

Analysis and discussion

Three themes are explored through the following analysis of the vignettes that reflect the need for change in the management and pedagogic adoption of active learning.

Space or place

The first vignette introduces the conundrum of needing to create space and manage its maintenance while not being able to predict its meanings as a locus of personal and communal academic endeavour; its sense of academic place. This conundrum is evident in all the vignettes in different ways.

The collaborative development of the Typology aimed to address this conundrum. On reflection, the challenge of producing it came from attempting to map the active learning as a lived experience (place) to a formal conception of its use (space).

In the third story, the idea of place is central in the idea of the conversational learning walks. Conversation epitomises the idea of active learning in spatial terms: walking and talking is a means of creating place and identity through the act of goal-orientated and open-ended learning.

Similarly, in Stand-Up Pedagogy, the physical space is devoid of the typical bland constraints that usually interfere with the natural inclination of people to interact and think together communally. This contrasts with a space like SCALE-UP, for example, where special fixtures (tables, repeater screens, etc.), people and problems, create a special sense of *structured place* in which the facilitator and learners value navigating and negotiating their learning.

In the fifth story, a series of active learning rooms is created. While some rooms worked better than others, overall the outcome of the experiment confirmed that the configuration of a space directly shapes and informs our understanding of, and readies us for, active learning. If place is understood as space in which a learner can shape their own response to a dynamic situation and active learning is defined by its accommodation of challenging possibilities, space and place need to be at the forefront of thinking about the design of active learning. In effect, the space creates a scaffold of possibilities.

Navigating strategy and opportunities

The second theme explores the tension between strategic direction and emerging opportunities in educational development and active learning.

The story began by recognising and grasping the opportunity to challenge assumptions about the 'new build' project. It turned out that my intervention to represent the pedagogic perspective was welcome. My colleagues knew what they did not know, but not how to involve the pedagogic voice in what they perceived to be the mundane matter of facilities development. They had assumed that academics are experts in pedagogy and leaders in academic innovation and were unaware of inhibitors to academic innovation including role, experience, future outlook, time and process.

Creating a typology explicitly valued the diverse perspectives,

experience and professional qualities of the mixed stakeholder group. Its production was opportunist, establishing a common ground for learning about spatial complexity together.

Using devices to facilitate conversation is also an important dimension of active learning. A walk is a device designed to foster serendipity through shared and overheard conversations. It is formal and strategic in its planning, but otherwise informal and opportunistic in its execution. Walks are intrinsically deviant in their learner-centredness, implicitly encouraging boundary-crossing behaviours being loosely scaffolded around the use of viewpoint stimuli. A schedule of questions on a theme coupled with landmarks establishes enough of an active learning space for challenging individuals and their co-walkers.

As with learning walks, active learning in Stand-Up Pedagogy is loosely framed by the device of the space: a room containing only people, pens, problems, purpose and a sense of place. While the intended experiment could be said to have failed due to practicalities, the outcome of the Stand-Up Pedagogy experiment was a deeper understanding of active learning as co-production through loose scaffolding, and its impact was on the design of other facilities.

Perhaps the most salient outcome of exploring the tension of strategy and opportunity is revealed in the exploitation of the 5-year refurbishment cycle as a basis for developing the active learning classrooms. We proved a lot can be achieved through simple reconfiguration and academic support.

An opportunity emerged from all of these vignettes, and other innovations, as they revealed examples of transition, liminality, boundary crossing and connectivity, thereby disrupting binary conceptions and perceptions of space. Opportunities are made, so in all these stories agency, trust and co-operation play a key role.

Using co-production to address complexity

Finally, the development of active learning spaces requires an ethos of co-production. The story begins with the problem of a lack of effective conversation in which the self-defeating use of jargon and indecipherable plans reinforces organisational divisions; a point also demonstrated in the second story in which the act of co-producing the Typology was as valuable as the Typology itself. It led to a professional trust that became powerful later in our collaborations.

Learning walks, in the third vignette, epitomise co-production. Walking and talking together involves a natural flow of people weaving in and out of conversation in ways that create rich possibilities and understanding. Learning walks, therefore, can be thought of as an organic form of active learning. Having just a few waymarks along with some common knowledge, interest, curiosity and purpose is enough to scaffold a deep learning conversation.

Stand-Up Pedagogy and white-boarding are co-productive forms of active learning in which learning is an outcome of people, pens, problems, purpose and place.

In the final vignette, each of the rooms was conceived to promote co-production as a basis for learning. In all cases, co-productive activities were achieved, although the Boardroom configuration demonstrated how easily co-production is disrupted by inadequate seating. The whiteboards in each of the rooms, however, proved how students can learn by physically writing and drawing together as the basis for forming understanding by 'working out' their thinking together through their collective representation of knowledge and ideas.

Conclusion

Effective active learning spaces embody a sense of place in which a

co-operative ethos is a prerequisite for successful learning. Active learning is scaffolded through the provision of enough structure to support individual and collective self-direction, which is often both goal-oriented and open-ended. Knowledge is complex, interpreted and ecological, yet traditional learning systems cannot easily accommodate difference and may be responsible for the struggle that some students endure. An active and co-operative learning space, however, is intended to be learner-centred, accommodating different values, motivations and ecologies more easily.

As with active learning, the vignettes show how the complexity of designing spaces for learning is best resolved through co-production in which conversation supports rich, imaginative thinking.

Recommendations for the development of active learning space

- In learning space development, ensure that the value of all stakeholders is accommodated through an ethos of co-production and purposeful conversation.
- Ensure the academic voice is present, informed and a leading influence on the design of spaces for learning.
- Situate development as a strategic matter requiring ongoing investment through alignment to the business priorities for learner engagement and retention, and the need to address outcomes relating to the future graduate.
- Be clear about the meaning of flexibility in the design of active learning space and how incorporating just enough structure can facilitate both goal-oriented and open-ended learning at the same time.
- Model active learning and space in academic and professional services CPD programmes.
- Design for the dynamic and pedagogic rhythm and flow that

distinguishes active learning.

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Final Thoughts

SIMON PRATT-ADAMS; UWE RICHTER; AND MARK WARNES

The purpose of writing this book was to collect the contributors' experiences of introducing a wide range of Active Learning (AL) approaches in their respective institutions including such diverse activities as VR simulations, Experiential Learning and Authentic Assessment, SCALE-UP, UDL, TBL, PBL, EBL, and even OBL (Object-Based Learning)! The foregoing chapters are a collection of examples of good practice of innovations in active learning in higher education. In this last chapter, we bring together the key issues that have framed discussions and debates about the value of AL that are presented in this book. One thing common to all contributors was a series of challenges, which led to innovative solutions, and resulted in clear benefits for the students.

Challenges

Identifying and overcoming challenges was highlighted by Berkson and Richter (Chapter 7) who focus on barriers and solutions, and describe some of the challenges Anglia Ruskin University (ARU) and University of Bradford (UoB) faced when they introduced and scaled up TBL in their institutions, along with the solutions they developed to counteract them. Challenges experienced at UoB, and elsewhere, included the resistance from some staff, which required a shift in the learning culture, and the need to develop a collaborative community. One of ARU's challenges, not mentioned by other authors, concerned the difficulty in addressing institutional assessment regulations intended to avoid over-assessment of students. The number of individual and Team Readiness Assurance Tests (iRATs and tRATs) far exceeded the number of assessments

permitted per student, per module. However, by carefully labelling RATs as evidence of participation, and/or combining the scores into a single average mark, ARU has tried to accommodate the new approach. Changes to the regulatory framework are under discussion, which will provide a solution to the treatment of TBL assessments by allowing several assessment components to cumulatively form one assessment element.

An important challenge faced by several contributors was the availability of suitable learning spaces, a problem which was also explored at length by McNeil and Borg (Chapter 1), Björnsdóttir and Ásmundsdóttir (Chapter 10), and Middleton (Chapter 12). Suitable learning spaces are, of course, a central feature in many variants of AL, and locating and adapting suitable existing rooms, can pose a significant problem, particularly for universities with campuses with restricted room for expansion.

McNeil and Borg, for example, used an effective combination of persistent promotion to attract early adopters, and research to provide evidence to management. They also collaborated with professional services to develop a cohesive context around the expansion of AL across the university. Communities of teaching staff, such as Programme or Course Teams, for example, also help to reduce the burden of additional preparation and/or conversion of teaching materials, which can be a challenging enterprise for staff members working in isolation. For Björnsdóttir and Ásmundsdóttir, the problems surrounding converting traditional teaching rooms to active learning spaces were compounded by extensive resistance from colleagues, who (initially) refused to acknowledge the need for change. Several contributors noted the need to develop a new learning culture, one benefit of which is to reduce staff resistance. In his vignettes, Middleton explores five different approaches to adapting space to fit learning, including Stand-Up Pedagogies, and the Learning Space Walk.

In addition to staff resistance, some students were also less than enthusiastic about the introduction of AL. Initially at least, some students simply do not like TBL, because, as Smith (Chapter 9), for

example, points out, this moves them out of their comfort zone and, as Berkson and Richter (Chapter 2) explain, away from what they consider to be 'normal' teaching practice. Other students resist group work and prefer to work individually. AL is, in most cases, collaborative, and for TBL at least, competitive, with teams vying to achieve the highest score in tRATs. Teams also try to develop the best responses in application exercises. Consequently, attendance increased as failure to attend affects not only for the students but also for their team members. Hobbs and Brown (Chapter 8), for instance, included contingency planning for students who failed to attend, so that they could still participate in the feedback cycle that is so central to their approach.

Benefits

The benefits of AL approaches were clearly highlighted by all of the contributors. Several authors noted how AL enhances their students' employability, for example. Driver et al. (Chapter 6) use cutting edge VR to provide alternative provision for nursing and teaching placements. Using VR in this way preserved the experiential learning so vital to these professions. Smith describes an authentic assessment process as involving students providing a service to external clients, and receiving feedback on their performance. Other authors, including McNeil and Borg, note that engagement with Problem- and Enquiry-Based Learning provides students with some of the soft skills that are valued by employers. Similarly Kukhareva, Lawrence and Koulle (Chapter 9) used Object-Based Learning to develop students' soft skills. Rushworth and Lawson (Chapter 5) used a novel PBL case study in a UDL framework to test student knowledge and application, in which a students had to apply their clinical knowledge to solve the death of a fictitious student, including analysis of their social media presence.

An increase in student engagement itself was noted by a number

of authors, simply as a result of students being actively engaged in the teaching session rather than as passive recipients. Milner (Chapter 4) introduced the innovative Topic Block Model to help students self-identify their weak areas. Milner consequently noted an increase in engagement due to students' active participation with both pre-session material and post-session writing and discussion groups.

AL also improved student attitudes to group work, with Björnsdóttir and Ásmundsdóttir particularly noting improvements in the levels of efficiency and collaboration in class, with students complaining about peers who failed to attend. Similarly, Tweddell (Chapter 3) highlights the benefits of the bonding effect of social interactions of teamwork, as compared to passive forms of learning, which lead students to want both team and individuals to succeed.

Further benefits of AL noted by the contributors include inclusivity and how AL accommodates a diverse student body, facilitates formative feedback, and results in improvements in attendance. In addition, an improvement in pass marks was observed by Richter and Berkson, McNeil and Borg, Milner, and Hobbs and Brown. All of these factors result in higher student satisfaction.

Future developments

Our intention is to encourage the introduction of AL approaches by sharing good practice. In doing so, we have also raised awareness of some of the challenges encountered by our contributors when trying to implement a new pedagogy, and some of the practical solutions they created to resolve them. Practical solutions such as:

- Refining the technological aspects (McNeil and Borg)
- Changing the institutional regulations (Berkson and Richter)
- Overcoming the dominance of the lecture (Tweddell)

- Introducing successive interventions based on student feedback (Milner)
- Re-designing the delivery and assessment process (Hobbs and Brown)
- Using research evidence to counter traditional attitudes (Björnsdóttir and Ásmundsdóttir)

Successful implementation of AL pedagogies has resulted in improved attendance, higher marks and pass rates, and student satisfaction. It is quite clear that the contributors feel a great sense of professional achievement and satisfaction when having overcome the challenges, were able to measurably improve the quality of the student experience.

We hope that this book sparks your imagination and inspires you to explore AL approaches to teaching and learning that can make a real difference to student engagement, satisfaction, and success.