Leading Global Excellence in Pedagogy

Transforming Teaching Excellence: Future Proofing Education for All

Volume Three

Edited by

Martina A. Doolan
and
Laura Ritchie

International Publishing IFNTF Federation
National Teaching Fellows

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FOREWORD

Martina A. Doolan (NTF 2007)
President of the International Federation of National Teaching Fellows

I am delighted to introduce the third book published by the International Federation of National Teaching Fellows (IFNTF), which highlights the outstanding teaching and learning practices of exceptional educators from higher education institutions across the UK, Canada, Australia, and the USA. These educators have achieved prestigious recognition for their excellence in educational leadership and teaching through National Teaching Fellowship awards in their respective countries.

The International Federation of National Teaching Fellows (IFNTF) (www.ifntf.org) is a non-profit organization that unites award-winning educators from around the world to promote global excellence in learning and teaching in higher education. Officially launched at the House of Lords in London, UK, in September 2016, the IFNTF currently includes members from Australia, Canada, Ireland, New Zealand, the UK, and the USA. Through international collaboration, members work together on initiatives with educators and students to advance teaching pedagogy in response to the rapidly evolving landscape of higher education.

This book is a collection of papers presented at the sixth annual international "symposathon", hosted by the IFNTF in December 2024. Themed "Transforming Teaching Excellence: Future-Proofing Education for All," the symposium focused on sharing transformative methodologies and innovative teaching practices to shape the future of teaching excellence. Embracing transformation is vital for sustaining and enhancing educational quality, especially in today's dynamic academic environment. Topics explored in this volume include digital transformation, lifelong learning,

upskilling and micro-credentialing, competency-based education, equity and inclusion, innovative teaching practices, and mental health and well-being.

The “symposathon” combined the concept of a “symposium” + “marathon” and in its true spirit as an international federation, the “symposathon” spanned multiple time zones with participants from both the Northern and the Southern hemispheres. Each region hosted a two-hour session, providing National Teaching Fellows with a platform to share evidence-based innovations and best practices in learning and teaching on a global scale.

Changes in the Higher Education Landscape has compelled academics and learners in institutions world-wide to make adaptations and alterations to their teaching and learning practices and consider alternative pedagogies. As the higher education landscape continues to evolve change is inevitable, driven by technological advancements, the marketisation and metrification of higher education and a growing commitment to the student experience. Institutions world-wide are reimagining their teaching practices and educational models to meet the needs of a diverse and rapidly changing global society. This has provided opportunities for academics to innovate learning, teaching and assessment practices and pedagogies to engage learners in this new learning environment.

Volume 3 of the Leading Global Excellence in Pedagogy series brings together a curated selection of peer-reviewed papers focused on sustaining a culture of teaching excellence amid these changes in higher education. This volume showcases innovative pedagogical practices from National Teaching Fellows across the UK, Canada, the USA, and Australia, representing a variety of disciplines and educational contexts.

By sharing evidence-based strategies for teaching and learning, this volume aims to inspire and equip educators globally to enhance their practices, enrich student experiences, and foster a culture of innovation and excellence in higher education.

- Martina A. Doolan (NTF 2007), President of the International Federation of National Teaching Fellows

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HOW TO HUMAN: RE-MEMBERING THE HUMAN IN A TIME OF GENERATIVE AI

Jessica Riddell

Bishop's University, Canada

Editorial Comment:

As the opening text to this volume, you are presented with this written provocation. Through her words, the author will draw you in to a genuinely compelling and performative narrative that sets the scene for various branches of inquiry and innovative thinking and teaching to follow across the sections and chapters of this book.

IN THE EARLIEST forms of both art and science, humans have strived to represent – and to reproduce – humanness.

There is a fascination with our likeness that is almost certainly unique to our species: we are captivated by our own ineffability – forever searching for the spark that gives us life. Humans are fascinated with the alchemy that turns us from something corporeal – the body bag, muscle sack, luggable guts and other poetic turns of phrase – into something animate, alive, incarnate, capable of achieving immanence and conceiving transcendence.

Think of the story of Pygmalion's sculpture of Galatea.

Think of Geppetto's carving of Pinocchio.

Think of Dr. Frankenstein's rendering of the creature.

Ivory statue into ideal woman.

Wooden toy into beloved boy.

Dismembered parts into conscious being.

We are suckers for a good simulacrum – forever assembling composites that are different enough to enable us to better understand ourselves.

Think now of Artificial intelligence.

What does AI have to do with the pursuit of humanness? American public interest technology expert Latanya Sweeney (2023) argues:

"The truth is, back in the day, what AI really was the pursuit of building a human. It was literally — it was no different than artists in Grecian urns where you're just trying to represent an image of man or an image of your time — humans have always tried to find ways to express their intelligence and to make likenesses of themselves. And in that way, when I was a graduate student — [that] was at the heart of AI, what drove us"[i]

As we find ourselves at a critical juncture – the rise of technocracy, technological disruption, and exponential AI adaptation – we have the opportunity to become more human.

Or, more precisely, we have an invitation to explore what it means to be human as a time where many of the things we've identified as human activities will be automated, replaced, assimilated, obsolete.

We have been here before.

Or, more precisely, we have been rumbling on this idea for an age, holding it up, turning it around until it catches the light and illuminates our humanity. 'How to human' is a question that feels old and familiar even as our ever-shifting context makes it feel like we are navigating uncharted territory.

We've never done this before, we worry.

This is unprecedented, we fret.

The robots are coming, we catastrophize.

And yet: everything we need to human we already know.[ii]

We need to practice divergent thinking

Think of Michelangelo's Vitruvian man.

The artist-engineer-philosopher set out to represent the divine proportions of the human body in a drawing that was so mathematically precise that it had never been achieved before. Da Vinci was himself building on the work of Vitruvius, a Roman architect who (fifteen centuries before Da Vinci) believed that humans were shaped by the divine and, more provocatively, that the key to the sacred was locked in the dimensions of the human body.

Posters of the Vitruvian Man are plastered over countless dorm rooms across university campuses. This naked human body with its hands and feet touching the edges of a circle (the heavens) and a square (the earth) represents what was, at the time, a totally new paradigm of thought that has shaped our modern consciousness in profound ways.

Da Vinci was using art to remind us that the divine is hiding in plain sight.

We merely have to look around us, at the materiality of the everyday world, at ourselves, for illumination.

This is the definition of immanence.

While transcendence positions meaning beyond or outside the physical world, immanence insists that our shared intellect is part of an intelligent principle of the world acting with specific intention and that divine meaning is found all around us. (see for example, Pythagoreanism)[iii] The concept of immanence locates the sacred in the mundane, centres elegance in the granular, harnesses the power of the proximate, and finds meaning in the ordinary.

These are the same places where we locate hope.

And where we see the most compelling evidence of the better angels of our nature.

American author Maria Popova (2024) reminds us,

"In times of political crisis, we seem to forget that societies are made of selves, are made at all — that they are collaborative acts of the imagination, works of the creative spirit emanating from the collective conscience of this relational constellation of individuals. As such, they require of us a deep and imaginative sensitivity to other selves, to what it is like to be someone else — that hallmark of our humanity we call empathy."[iv]

Whether you call it immanence or empathy or radical humanization, we experience a quality of grace every day even if we might not name it as such.

A tiny illustration: when I was on a US leg of the *Hope Circuits* circuit, I had to make it from Nashville to North Carolina via a series of connecting flights.

Due to a series of unfortunate mishaps, I missed my 5:40am flight out of Nashville. Having never missed a flight before, I was SO EMBARRASSED.

I arrived at the ticket counter red faced and flustered – accidentally interrupting Yolanda, a middle aged woman who was in mid sentence complaining that her boss might not give her the overtime she needed. "He's cutting into my Christmas cash," she exclaimed as she walked over to deal with me. "Oh no," I thought. "She's having a worse day than I am." Instead of bracing myself for inevitable conflict, I collapsed into apology. She looked at me, took a beat, and said, "Don't worry honey, I got you." Five minutes later and zero dollars poorer, she had my new flights, boarding passes, and checked my bag (which miraculously followed me on my criss-crossing country adventures).

There are angels that walk amongst us, and many of them work at the Nashville airport.

I am not an astrologer but the stars aligned that day.

The thing is, sometimes we are on the receiving end of grace, sometimes we are the givers, and sometimes we are merely the instrument.

So, what does this little vignette have to do with higher ed in the age of AI?

I would argue *everything*.

Higher education should – in theory – harness what Maria Popova calls the "creative spirit emanating from the collective conscience." But we can only do this with "deep and imaginative sensitivity to other selves." The key is to exercise radical humanization in our mundane encounters with humans we encounter every day.

Framing it in higher education (and the lens of recruitment and retention), Peter Felten and Leo Lambert's book *Relationship Rich Education* argues that the quality of ordinary, everyday, fleeting encounters are the single greatest predictor of student flourishing. It comes down to some pretty basic human-ing: do people feel they belong and do they feel they matter?

Stunningly, the most powerful encounters are not necessarily with professors but with Trudi from the dining hall checking students IDs while asking how someone's day was. THAT is where the magic happens – and that is not where our energy (or resources or intentional design) has been.

This is also something AI is going to be better at if we aren't attending to human- and humane-scale interactions. We can program a chat bot to ask how you are doing, remember you had an exam, follow up on your birthday, send you a picture from your photo gallery.

AI can out human the human if we fail to pay attention.

Staying with the trouble

Technology is designed to be efficient, frictionless, streamlined, user-friendly, and functional. AI is intended to make our lives easier, but it does so by flattening difference, accounting for anomalies, stamping out weirdness, and erasing idiosyncrasies.

The very ease in which we automate our world risks turning us into automatons.

The thing is, we can't become robots because the robots are always going to be better. (See, for example: the entire canon of science fiction.)

So instead, we must ask: what makes us human and – by extension – how do we double down on these qualities? For the purposes of this project, we also need to think about what social institutions will help us be better at human-ing – and embody the inefficient, frustrating, circuitous, fool hardy, overreaching. The good news is that universities are already all of these. The next challenge is to make it intentional.

Joking aside, we need to design universities for deliberate inefficiencies, the fecundity of frustration, circuitous systems of creation, fool hardy (i.e. not immediately commodifiable) inquiry, and overreaching curiosity.

We need to live into the following questions together:

How do we understand systems that support soul building?

How do we practice relational building and intentional care that nurtures souls?

How might ecosystems shape meaningful, authentic, and equitable relationships with our colleagues, community members, and students? And, by extensions, how do we create places where people are safe to show up in soul-bearing ways?

How do we foster research and other forms of inquiry that brings us closer to understanding our shared, common humanity?

In what ways do we center and manifest these values in our teaching, service, research, governance, leadership, stewardship? How do we embed curiosity and wonder in this work? How do we engage in scholarship dedicated to humanity and the human spirit?

How do we vision for a creative future that makes space for the soul-sustaining work of human and ecological flourishing?

And why do these traditionally soft and historically diminished concepts – love, hope, joy, pleasure, grief, rage – matter now more than ever in helping us foster our collective capacity for human-centered transformation and growth?

The answers are multiple and complex. But a few things are clear.

We need to re-member what we already know.

We need the liberal arts.

We need to appreciate different kinds of intelligence

Education needs to nurture all the kinds of intelligence that we have: not just cognitive intelligence, but emotional intelligence, civic intelligence, spiritual intelligence, embodied intelligence.

We need to embrace complexity.

We need to get weird

We need divergent thinking

We need to centre purpose

We need to embrace emergent design

The only way forward is to double down on what makes us human -- that constellation of concepts like love, hope, empathy, joy, pleasure, despair, grief, healing. We've alienated ourselves from these words and distanced ourselves from these concepts at the very time we need them to save us.

It is time to own our enthusiasm, claim joy, harness love - and embed them into the very systems that can help us imagine a better, creative future and where we can then develop the tools to build it.

This is where higher education saves us by reminding us of how to be human, humane, and exercise our humanity.

It is not yet time to be post Human. It is time to be most human.

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SECTION ONE: PRINCIPLES AND PRACTICES

CHAPTER ONE

Futureproofing the Education of Non-Traditional Higher Education Entrants: Embedding Mathematics into Engineering Curricula

FUTUREPROOFING THE EDUCATION OF NON-TRADITIONAL HIGHER EDUCATION ENTRANTS: EMBEDDING MATHEMATICS INTO ENGINEERING CURRICULA

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Editorial Comment:

In this chapter, the New Model Institute for Technology and Engineering (NMITE) approach to embedding engineering mathematics in the curriculum and associated outcomes is presented. A detailed case study demonstrates how the integrated, reflective methods focus on real world applications of concepts throughout the learning process.

ABSTRACT

Mathematics is fundamental to engineering education. However, higher education courses have struggled to make mathematics accessible to students, with a disconnect between theory and practice. While various approaches have attempted to bridge this gap, there remains an entry requirement for mathematics, and dedicated modules. Consequently, to widen participation, better evidence the applications of mathematics and support students, we present a paradigm shift for mathematics in engineering education. We analyse a case where no mathematics entry requirements or dedicated mathematics modules are present, and mathematics is embedded in the curriculum with focus on applications and physical interpretations. Our results show that, while a difference exists between students with and without mathematical background in the first year, this is no longer the case by the second year, showcasing the effectiveness of the proposed approach. These findings may, therefore, support the widening of participation in STEM (Science, Technology, Engineering and Mathematics) subjects.

Keywords: Mathematics, Engineering education, Widening Participation, Pedagogical research, STEM.

INTRODUCTION

Mathematics plays a vital role in engineering, as well as the wider STEM (Science, Technology, Engineering and Mathematics) disciplines, as evidenced by its presence in the Accreditation of Higher Education Programmes (AHEP 4) learning outcomes (Engineering Council, 2020a), the Washington Accord graduate attributes (International Engineering Alliance, 2024), and the Chartered Engineer (CEng) competencies (UK-SPEC) (Engineering Council, 2020b). Moreover, the reader is referred to Pepin et al. (2021) for a detailed review of current practices, contemporary resources and emerging innovations in mathematics in engineering education.

Traditionally, mathematics in engineering education is taught as a first-year module, often acting as a pre-requisite for further engineering modules involving the application of mathematics (Klingbeil et al., 2004). This heavily theoretical approach results in a lack of engagement from students, who perceive mathematics as very repetitive and overly theoretical (Noskov & Shershneva, 2007), particularly in the first year of higher education (HE), where students have reported not perceiving the importance of mathematics to engineering (Flegg et al., 2012).

Consequently, a more applied approach to mathematics in engineering education has emerged. This includes practices such as the Wright State University (WSU) model (Klingbeil et al., 2004), which advocates for a just-in-time approach to mathematics, to directly support practical applications in other, more applied, modules. In this context, mathematical concepts are taught exactly when needed for their practical application in other modules, supporting students in relating theory and practice. A more authentic approach has been suggested by Herrington & Herrington (2008), with strong support for problem-based learning (Sadler, 2008). More recently, innovative ways to teach mathematics in engineering education and enhance

student engagement and outcomes has included virtual labs (Cheong et al., 2018), and integration as part of design projects (Abou-Hayt et al., 2019). These, however, continue to rely on dedicated mathematics modules, which have implications in terms of entry requirements. To alleviate these, mathematical bridging courses, aimed at facilitating transition from secondary to tertiary education have been developed (Rolf et al., 2018).

However, as long argued by Booth (2004), any approach to teaching mathematics to engineers is rendered ineffective for as long as the students are unable to realise the importance of mathematics to their studies and careers. Moreover, strict entry requirements in mathematics for engineering curricula may prevent the widening of participation and access to HE. Consequently, to support the access of non-traditional HE entrants into engineering education, and foster inclusive education for all, a paradigm shift is needed in mathematics education for engineers.

The New Model Institute for Technology and Engineering (NMITE) is a UK HE institution that stands out in its approach to mathematics in its engineering courses. It is one of only two UK Universities not to have mathematics as an entry requirement. Moreover, NMITE does not feature any dedicated module for mathematics, or examinations. Mathematics contents are wholly embedded in the curriculum, with an industry-driven, challenge-based approach that employs the need for mathematics in these challenges as the motivation for embedded delivery. Here, it is an authentic, industry-driven challenge that creates a need for mathematical concepts, then taught to the students, so the purpose of the theory is evidenced from the beginning.

Mathematics has historically focused on solving techniques in engineering education. But purely solving mathematical equations has been made at the expense of providing physical interpretations of the mathematics in engineering and a qualitative understanding of the utilised mathematics. Students may become proficient in solving repetitive equations but lack a contextualised understanding of the applications of mathematics. Consequently, they can only apply the mathematics in very limited contexts, i.e., the specific contexts they were taught.

Therefore, there needs to be a greater onus on physical interpretations and qualitative understanding of mathematics, and less focus on solving techniques, to foster futureproof learners. This is even more significant given the availability of both software and generative artificial intelligence (Souppez et al., 2023), that can effortlessly solve complex equations, and for

which an understanding of the underpinning mathematics remains essential for modern-day engineers.

As such, we argue that the onus should be placed on developing students' mathematical thinking ability. This should entail taking natural or engineering processes and translating them into mathematical language. Moreover, an understanding of the assumptions made when developing equations and interpretations of results produced by software is essential, particularly for a more integrated approach to engineering. Based on this ethos, we present a new paradigm for mathematics in engineering education, based on a case study of NMITE, and argue that this does not only foster better student learning and outcomes, but also supports the widening of participation in engineering in higher education.

A New Paradigm

The NMITE paradigm focuses on applications of mathematics in engineering. Emphasis is placed on physical interpretations of mathematics to help students understand broad applications of a given mathematical concept in different engineering scenarios. Key aspects of mathematics delivery at NMITE include (Knight et al., 2024a):

- Engineering-led – Mathematics is not typically taught in its abstract form (i.e. is taught in-context with engineering concepts and applications)
- Concept-led – Emphasis on students learning mathematical concepts rather than their ability to reproduce techniques
- Open-ended – Emphasis on students demonstrating how they rationalise and solve problems in their own way over finding 'the correct answer'

The NMITE paradigm is meant to help engineering graduates make sound judgements on the level and depth of mathematical analyses required on a case-by-case basis for different real-life engineering situations.

Mathematics and Engineering Competence

The paradigm proposed here puts the requirements of engineering competence and commitment as a central focus. We put forward the idea that mathematics in engineering education should contribute towards improving engineering competence. The UK-SPEC (Engineering Council, 2020b) includes the following three areas that can be strongly supported by mathematics: (i) knowledge and understanding; (ii) design, development and solving engineering problems; and (iii) communication skills.

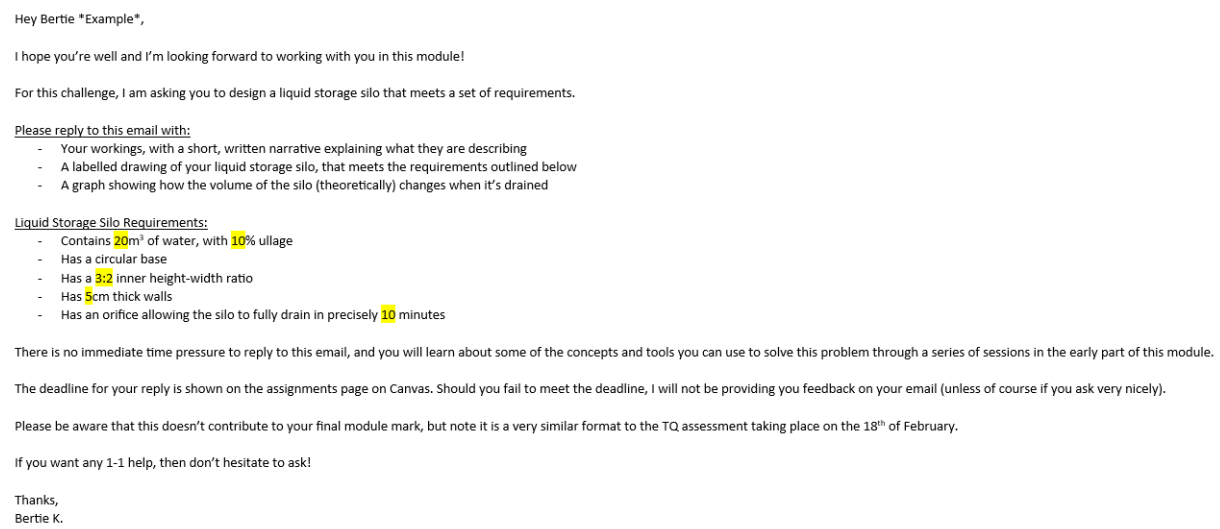
Topics in mathematics that help gain knowledge and understanding of engineering processes should be prioritised in engineering curricula. It may be beneficial to map every mathematical topic to relevant engineering systems for effective contextual delivery. For example, Fourier analysis may be mapped with control systems, acoustics, signal processing, vibration analysis and so on. Likewise, mathematical thinking and modelling should be encouraged to design and solve engineering problems. Helping students explore the integration of engineering, physics and mathematics to design and solve engineering problems could be an effective way to enhance mathematical thinking and modelling skills.

In addition to engineering design and problem solving, students should also be taught how to use mathematics as a communication tool. Mathematics and the results of mathematical analyses often need to be communicated to a wide variety of audiences of different backgrounds in engineering profession. Therefore, mathematical communication should be a part of engineering curricula. Engineering students are generally skilled at communicating mathematical analyses and associated results to technical audiences. However, it is also sometimes necessary to explain mathematical processes and results of complex mathematical analyses to the general public and broader audiences. Consequently, students should be encouraged to explore different levels and types of mathematical communication. Utilisation of relevant analogies and metaphors, easy-to-understand visual aids, and simplification while preserving the gist may help improve mathematical communication skills.

An Example of the NMITE Approach

To illustrate this in practice, we describe how the teaching and learning of mathematics was integrated into a first-year thermodynamics and fluids

module at NMITE. In this module, mathematical thinking and communication was developed early on via a challenge titled 'The Silo Problem' which also served as a formative assessment. At the start of the challenge, students each received a unique email, as demonstrated in Figure 1.



Hey Bertie *Example*,

I hope you're well and I'm looking forward to working with you in this module!

For this challenge, I am asking you to design a liquid storage silo that meets a set of requirements.

Please reply to this email with:

- Your workings, with a short, written narrative explaining what they are describing
- A labelled drawing of your liquid storage silo, that meets the requirements outlined below
- A graph showing how the volume of the silo (theoretically) changes when it's drained

Liquid Storage Silo Requirements:

- Contains 20m^3 of water, with 10% ullage
- Has a circular base
- Has a 3:2 inner height-width ratio
- Has 5cm thick walls
- Has an orifice allowing the silo to fully drain in precisely 10 minutes

There is no immediate time pressure to reply to this email, and you will learn about some of the concepts and tools you can use to solve this problem through a series of sessions in the early part of this module.

The deadline for your reply is shown on the assignments page on Canvas. Should you fail to meet the deadline, I will not be providing you feedback on your email (unless of course if you ask very nicely).

Please be aware that this doesn't contribute to your final module mark, but note it is a very similar format to the TQ assessment taking place on the 18th of February.

If you want any 1-1 help, then don't hesitate to ask!

Thanks,
Bertie K.

Figure 1. Silo Problem Challenge Email. Example email for the Silo Problem, with unique values highlighted in yellow.

Students were informed in the email that they would be taught about the concepts and tools which could be used to solve the challenge via four workshops positioned early in the module. These mathematical concepts and tools are simultaneous equations, differentiation, integration and quadratics. As well as being taught a means to solve the problem, students were also shown how to use a set of tools they could use to communicate their solutions, namely the Microsoft equation editor, various diagramming software tools, and the Desmos graphing calculator. Throughout this early phase of the module, students were encouraged to tackle the challenge and communicate their approach in their own unique way, including going beyond the learning content covered in the four workshops.

In these four embedded workshops, a problem-based approach was taken to teaching and learning, where the problems place an emphasis on connecting mathematics with real-world phenomena. In the differentiation and integration workshops, for example, students were first provided with an A3 sheet of paper with a graph on one side, and questions on the other, asking them to determine rates of change (gradients) and accumulations of

quantities (areas under a curve) respectively. A3 paper was used to enable students to draw on the paper and observe these ideas using physical interpretation. One of the problems for each of these workshops are shown below in Figures 2 and 3.

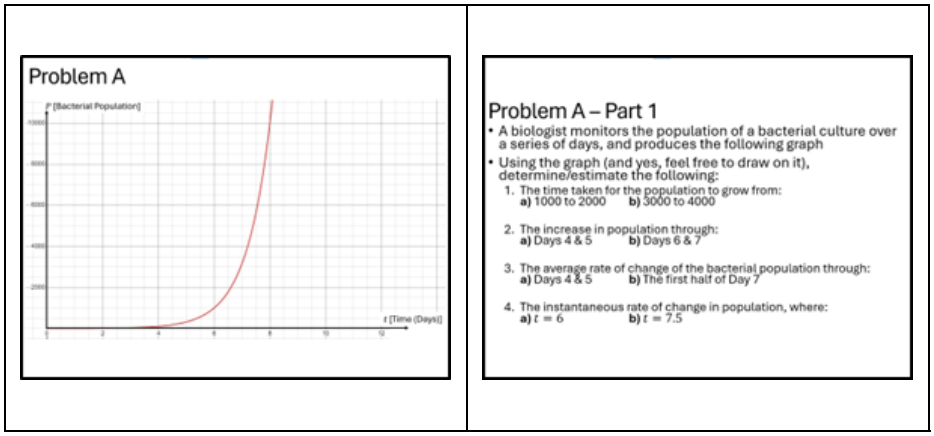


Figure 2. Differentiation Workshop Example Problem. Example A3 handout problem in differentiation workshop

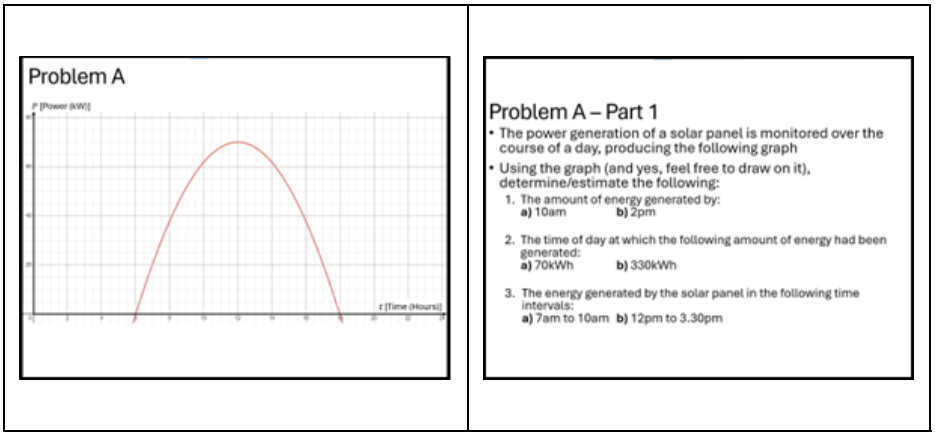


Figure 3. Integration Workshop Example Problem. Example A3 handout problem in integration workshop

After being asked ‘how might you provide a more accurate solution to the last question?’, students engaged with presentations about differentiation and integration, which addressed these topics both as theoretical concepts, and as tools for approaching the problem. Students were then handed a ‘Part 2’

worksheet, which tasked them with redoing the last question on the A3 sheet but instead to use differentiation or integration as a means for solving.

Importantly, it was stressed throughout these first four workshops that students were studying engineering, not mathematics. In doing so, it is highlighted that students do not always need to know how to carry out mathematical operations 'by hand' or 'by memory', rather, they are free to make use of the tools and assets they have at their disposal. In the simultaneous equations workshop, for instance, students were presented with a solvable set of simultaneous equations and assigned a digital tool to use to solve them, as shown in Figure 4.

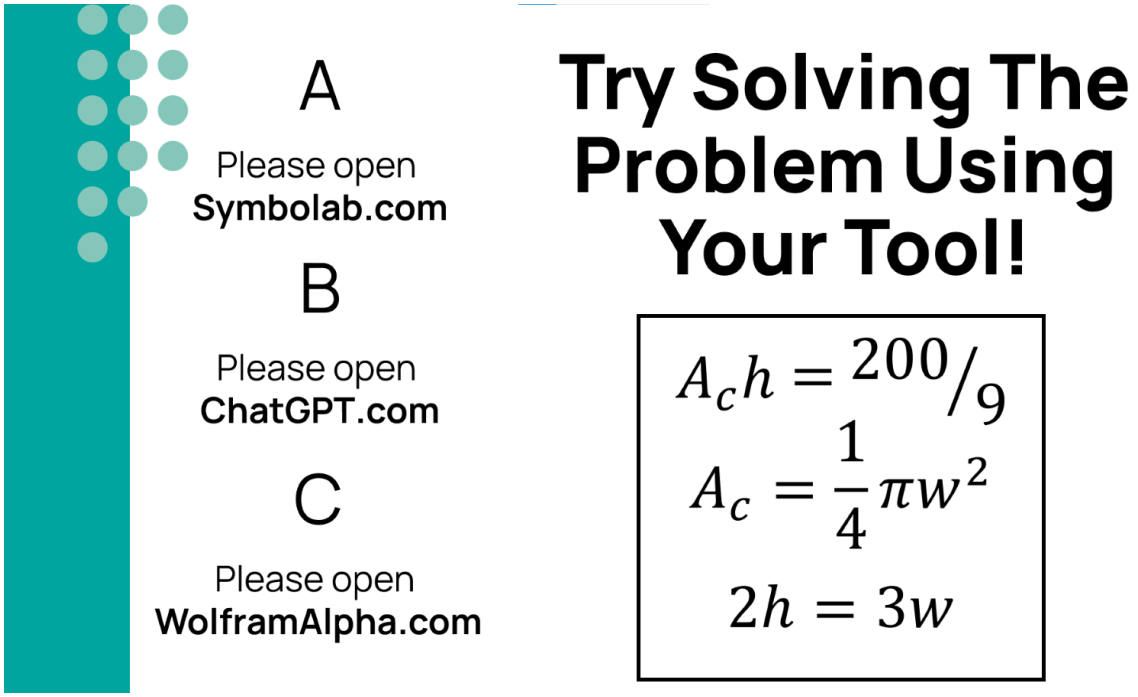


Figure 4. Simultaneous Equations Workshop Example Slide. Example of a slide used to emphasise and encourage the use of digital tools for mathematical problem solving

After replying to the Silo Problem email and submitting their solutions, students were subsequently provided with feedback on their work, which deemphasised if students got 'the correct answer', and instead focused on their problem-solving process and how their solution was communicated. In the feedback, creative and 'out-of-the-box' thinking was positively highlighted; students were critiqued on how they explained and justified their

approach; corrections focused on improving formatting, mathematical notation, diagramming, and graphical communication; and, where possible, students were praised for their level of effort rather than the quality of their work.

The Silo Problem feedback was designed to align with the mark scheme used for a subsequent summative assessment, in which students were asked again to reply to an email with a worked solution to a unique problem. However, in the summative assessment, students were set a problem that was both simpler than the Silo Problem and that was designed to meet the required module learning outcomes.

Widening Participation

The NMITE approach to teaching and learning of mathematics is designed to be both more engaging and inclusive, ensuring fair opportunities for NMITE students with and without a prior qualification in mathematics. Importantly, this approach challenges the traditional view of mathematics in engineering education, which often emphasises abstract techniques over real-world applications.

It could be argued that a traditional focus on mathematical technique and mathematics as an abstract or other-worldly concept, divorced from reality and real-world problem-solving, may undermine would-be engineering undergraduates from pursuing engineering. In the UK at age 16, students may be expected to foresee their post-18 trajectory and, should a student make the 'mistake' of not choosing mathematics at AS/A-level (Framework for Higher Education Qualifications [FHEQ] level 3), they are disqualified from pursuing engineering at the overwhelming majority of UK HE providers.

Moreover, this may be seen as particularly disadvantageous for the female student demographic, considering the gender disparity in uptake of FHEQ level 3 mathematics qualifications. The Advanced Mathematics Support Programme (2022), for example, found that among students taking AS/A-level mathematics and further mathematics, the proportion of female students was 40% and 30% respectively.

NMITE Student Attainment Data Analysis

The assertion that an alternative approach to the embedding of mathematics in engineering education can support widening participation has yet to be fully researched and validated. However, at NMITE, new insights are developing with regards to its strategy of recruiting students without an FHEQ level 3 qualification in mathematics.

Upon conducting a non-parametric analysis of student outcomes and attainment against equality, diversity and inclusion (EDI) data, evidence was shown for attainment effects at FHEQ level 4 depending on whether students had a level 3 qualification in mathematics (Knight, 2024b). However, the analysis did not provide evidence for such effects in student attainment at FHEQ level 5.

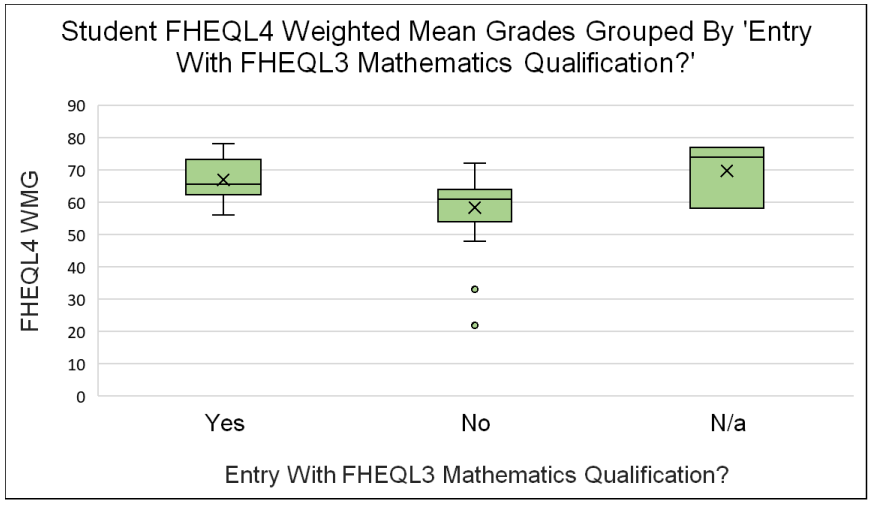


Figure 5. FHEQL4 Distribution. Distribution of FHEQ level 4 weighted mean grades among NMITE students grouped by ‘entry with FHEQ level 3 mathematics qualification?’. Data from May 2023.

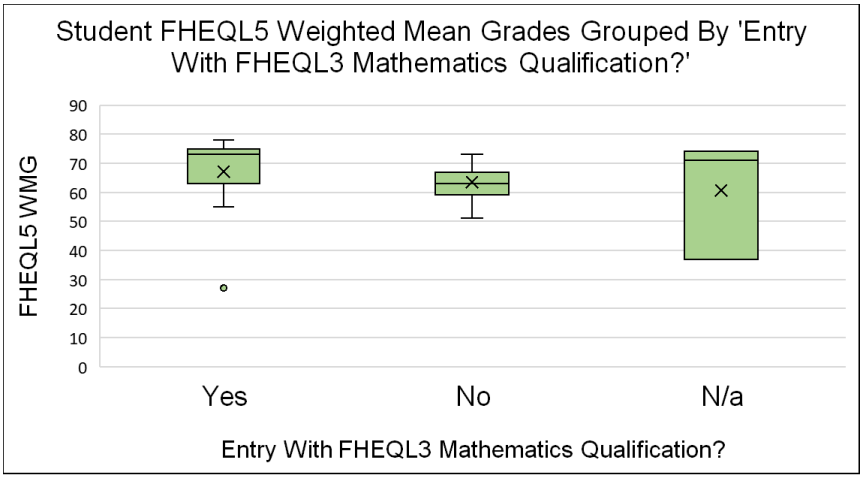


Figure 6. FHEQL5 Distribution. Distribution of FHEQ level 5 weighted mean grades among NMITE students grouped by ‘entry with FHEQ level 3 mathematics qualification?’. Data from May 2023.

Table 1. Non-Parametric Results Summary. Summary table of non-parametric statistical tests conducted on NMITE student outcomes, attainment and EDI data, where ‘Level 3 Maths Qualification’ was the independent variable (Knight, 2024b).

Test Type	Dependent Variable	Significance Level	Reject/Fail to Reject Null Hypothesis	Research Question
Chi-squared	Student Status	0.258	Fail to Reject	Is there evidence to suggest a dependence between student status (registered / leave of absence / withdrawn) and whether a student has an FHEQL3 maths qualification?
Kruskal-Wallis	FHEQ Level 4 Weighted Mean Grade	0.003	Reject	Is there evidence to suggest a dependence between whether a student has an FHEQL3 maths qualification and FHEQL4 weighted mean grade?
Kruskal-Wallis	FHEQ Level 5 Weighted Mean Grade	0.138	Fail to Reject	Is there evidence to suggest a dependence between whether a student has an FHEQL3 maths qualification and FHEQL4 weighted mean grade?

Naturally, given FHEQ level 4 does not contribute to students' final degree classifications, it could be argued that this is a useful period for students to fail, and for a 'levelling of the playing field' to take place within student cohorts. Given that attainment effects appear to cease at level 5, this may suggest that such a 'levelling of the playing field' takes places at NMITE as a function of its teaching and assessment practices through FHEQ level 4.

Conclusions

This paper proposes a novel approach to mathematics delivery in engineering by illustrating a case study of the New Model Institute for Technology and Engineering (NMITE). The underlying principles of the embedding of mathematics into NMITE's emerging engineering curriculum de-emphasises a traditional reliance on mathematical techniques, and instead emphasises its physical interpretations and applications. An example of how this approach was realised in a first-year thermodynamics module at NMITE was provided. Moreover, we evidence the success of this approach in contrast to traditional, dedicated math modules, and the context of widening

participation in Higher Education, with no significant disparity in mathematical abilities by FHEQ level 5.

Acknowledging the need for further research and validation, the analysis in this chapter gives an indication that NMITE's model may be succeeding in mitigating initial attainment disparities between students with and without an FHEQ level 3 qualification in mathematics. By extension, the results shed light on the possibility of removing FHEQ level 3 mathematics qualification requirements for entry onto degree-level engineering programmes. As such, this work also supports Higher Education Institutions in developing a more inclusive teaching for engineering mathematics at FHEQ level 4 (and onwards). Indeed, it is anticipated these findings may be particularly helpful in widening participation, especially among the female student demographic.

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CHAPTER TWO

Authentic Assessment for Lifelong Learning: Futureproofing in Healthcare Science Engineering

AUTHENTIC ASSESSMENT FOR LIFELONG LEARNING: FUTUREPROOFING IN HEALTHCARE SCIENCE ENGINEERING

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Editorial Comment:

The authors present a series of approaches at Aston University that illustrate how co-creation, and authentic assessment can enhance student engagement, uphold academic integrity and enrich the student learning experience. Through case studies in healthcare science and engineering, the authors highlight the versatility and cross-disciplinary relevance of these approaches.

ABSTRACT

Authentic assessments provide higher education students with opportunities to showcase the practical applications of their knowledge to contextually relevant scenarios. This promotes critical thinking and problem-solving skills through industry-relevance challenges, helping students engage more meaningfully with their studies, while fostering strategies for lifelong learning. This is crucial for fast-evolving professions such as Healthcare and Engineering, both in high demand. Consequently, this paper presents how students within healthcare science and engineering courses at Aston University, UK, are prepared for real-world application of theoretical concepts via authentic assessments. Examples used include co-creation, employability skills, leadership and continued professional development, used to prepare students for future professional environments, and enhancing their ability to innovate. This provides new insights into aligning academic learning with practical demands to better equip graduates to meet the challenges of their chosen professions and may inform the design of authentic assessments from healthcare to engineering.

Keywords: Authentic assessment, Real-world learning, Healthcare education, Engineering education.

INTRODUCTION

Healthcare and engineering consistently feature among the most in-demand professions, with shortages worldwide, due to an aging population and an increasingly technological world. Both are characterised by the practical application of theoretical knowledge, and rapidly evolving disciplines. Consequently, there is a need not only to equip students with the necessary employability skills at the time of their studies, but also the lifelong learning skills they will require to futureproof their practice and progress in their careers. In that respect, our work very much focuses on all three dimensions of graduate employability, defined by Hillage and Pollard (1998) as the ability to (a) gain initial employment, (b) maintain employment, and (c) transition to new roles within employment, thereby clearly identifying the importance of lifelong learning.

Authentic assessment, thoroughly detailed by Wiggins (1990) and Darling-Hammond (2000), aims to reflect real-world learning (Archer, et al., 2021), and is a proven strategy to contextualise the students' learning in a more practical, industry-focused manner. This has been successfully implemented across healthcare (Anderson, et al., 2023) and engineering, the latter featuring specific frameworks such as Conceive-Design-Implement-Operate (CDIO) (Crawley, et al., 2007). However, the need to empower student to maintain and transition to new roles within their graduate employment remains to be emphasised, as the onus cannot simply be on gaining initial employment. This is particularly relevant to the UK's context, where, since 2018, statistics on graduate employment are now collected 15 months after graduation (Graduate Outcomes survey), as opposed to 6 months in previous years (Destinations of Leavers from Higher Education survey).

Furthermore, considering Aston University's vision to provide *"positive transformational impact for our people, students, businesses and the*

communities we serve", we further argue the importance of co-creation. This has been shown to support diverse cohorts of students (Cook-Sather, 2018), and frameworks have been devised to support student co-creation (Bovill, 2019; Magni, et al., 2020). This work will also suggest industry as a valuable co-creation partner for both employability and lifelong learning skills.

This paper will, therefore, present strategies for authentic assessment and co-creation to support healthcare and engineering students in developing the practical application of their knowledge, to futureproof them for fast-evolving careers. Consequently, employability skills will first be discussed. Then, the futureproofing of professional practice will be tackled. Finally, the main findings will be summarised.

Employability Skills

***Healthcare Science ***

Students enter university from a wide array of backgrounds and qualifications. The rise of work-based learners and apprenticeships has further diversified the student population and their pathways to higher education. Many students find the transition into university quite overwhelming. To address this, Aston University Healthcare Science students assess the essential skills needed to succeed in their studies. Together with their tutor, they narrow down these skills and are provided with workshop opportunities to enhance them. While proficiency is not expected, students are encouraged to reflect on their skill gaps and consider actions for improvement.

Moreover, a co-created assessment was introduced in a Year 1 module. During the first week, students discussed the qualities and attributes essential for a good healthcare professional, identifying key characteristics as a group. They then explored the skills necessary to support these qualities, such as teamwork for effective patient care. Each cohort discusses and chooses skills which vary year on year. This is where co-creation becomes vital in higher education. To ensure fair assessment practices - recognising that some

students may prefer exams while others favour presentations - a collaborative approach allows all students to contribute to defining assessment requirements. Co-creation involves students and tutors working together to develop teaching activities and assessments. Notably, this is a pass/fail element of the module portfolio. The students work with the tutor to create the pass/fail criteria: by involving students in the creation of the criteria, there is a sense of ownership and engagement.

Table 1. Top 5 chosen skills by 2024 Cohort.

Skills	**Example Evidence Used**
1 Organisation including timekeeping	Wall planners, diaries, Deadlines matrixes, employment or voluntary roles, managing studies and family/other commitments
2 Written communication	Assignments from the module, emails
3 Problem solving-skills	Team work sessions, group presentations, extra-curricular roles
4 CV Development	CVs, LinkedIn profiles
5 Self-wellbeing	Completing e-Learning on mental health, arranging meetings with tutors, arranging time for the gym, seeing friends, hobbies

Students have showcased their work in various ways, but largely posters, presentations, and Word documents. Students highlighted organisation as a key skill to for students to manage multiple and competing deadlines. For example, students shared schedules and/or deadlines lists to show how they prioritise work and allocate time effectively. Students often took pictures of their preferred method for planning, and where students did not have a method in place, they were able to reflect that this was the case. For written communication, students were encouraged to refer to their written assignment

within the same module, but also could include other examples. Some referred to their experience of writing essays prior to starting university education, or even professional emails. In showcasing problem-solving skills, students shared examples of problems they've encountered, and their solutions. Students often showed how they approach challenges, analyse situations, and devise effective strategies. CV development was supported by the university's careers and placement steam. Students created CVs as well as LinkedIn profiles to share with this team for feedback. Whilst some students had many additional experiences or other roles, many did not and this opportunity helped them to highlight what other opportunities they partake in during their studies. Finally, self-wellbeing was a skill identified by the group as being crucial for academic success and personal growth. Students shared examples (often using pictures of personal victories such as marathon completions or other activities) where they took responsibility for their wellbeing. The module lead also shared university resources and support systems who can be contacted or utilised as required.

Ultimately, students provide a reflection on what they've learnt and evidence to support their chosen skills. Students were also requited to provide brief reflections of their skills progress so far and what steps they will take to help them maintain and improve their confidence in each chosen skill. Reflection is a vital aspect of healthcare education and training (Koshy et al., 2015) and therefore students are required to include a reflective commentary in their presentations.

Engineering

Engineering and physical sciences have also witnessed a greater diversity of entry qualifications. Coupled with a drive to widen participation, ensuring fundamental skills are provided early on to maximise student success is crucial. Here, these skills are embedded in the personal tutoring scheme. During the regular timetabled personal tutoring sessions, students can raise the specific challenges they are currently facing, and staff can draw on a resource bank to provide the necessary support to their studies or developing career.

Additionally, co-creation has been employed to understand how students can best be supported in their authentic assessments, particularly in the emerging context of Industry 4.0, featuring a greater integration of cyber physical system. Therefore, a project on Pedagogy 4.0 was undertaken (Boyd, et al., 2023), which constituted a final year student's dissertation. The findings revealed the preferred pedagogical approach by students, with a greater appreciation for autonomy as their progressed through the course and their skills improved, which then informed the delivery of new modules to ensure students are best equipped for employment, while providing them with suitably challenging learning opportunities.

Finally, extensive work has been undertaken on understanding the comparative perception of graduate skills and attribute for employability (Souppez, 2025). A survey of staff, students and local employers was conducted, specifically targeted at the Engineering courses at Aston University. Among the many insightful findings that have allowed to enhance the course to better align with skills and attributes expected by engineering employer, the top five skills for each respondent group are presented in Table 1. Interestingly, the top two skills for industry professionals, namely *"personal and working attitude"* and *"professional conduct"* are absent from the student and academic responses. This will inform changes to the engineering curricula, detailed in the following section, with authentic assessments better targeted at these key skills and attributes.

Table 2. Top employability skills and attributes according to each respondent group, reproduced from Souppez (2025).

Rank	**Students**	**Academics**	**Industry Professionals**
1	Teamwork	Problem solving	Personal and working attitude
2	Problem solving	Critical thinking	Professional conduct
3	Critical thinking	Teamwork	Communication
4	Identification of problems	Communication	Critical thinking

Rank	Students	Academics	Industry Professionals
5	Communication	Identification of problems	Problem solving

Futureproofing Professional Practice

Healthcare Science

Healthcare students will advance into leadership and service management roles, making it essential for them to have opportunities to practice teamwork and leadership skills. Consequently, as part of the 'Leadership, Innovation, and Quality' module, MSc students have access to materials from external guests, including clinician experiences of undertaking quality improvement, as well as resources on leadership in the NHS. Guest lecturers that work in the NHS as Clinical Leads or Heads of Service have inspired students but also provided realistic contexts for students to showcase the applicability of their roles.

The module has been developed iteratively, incorporating feedback from students, healthcare stakeholders, and experts in the field to enhance its clinical relevance and incorporate authentic assessment. As part of it, students are required to reflect on their leadership style for a recorded presentation, develop a business plan for an innovative service improvement, and deliver a group presentation on a quality process. These assessments are designed to interconnect, providing a structured approach to enhancing critical thinking and appraisal skills. Reflection is a vital aspect of the module, and students must include a reflective commentary in their presentations (Hussain, 2024).

Students have excelled in these authentic assessment tasks. They actively engage and participate in live sessions led by clinical leaders and healthcare experts, such as department heads and accountants. Students have noted that

the module pushes them to acquire new skills, reflect on their current practices, and explore innovative ways to implement change. They also contemplate their future roles and responsibilities, outlining the steps necessary for their personal and professional development.

Examples of quality improvement topics chosen by the students include triaging process, to improve timely and appropriate patient care; peer review to help foster collaboration and continuous learning among healthcare professionals; digitising services to streamline and modernise administrative tasks and increase patient accessibility, as well as embedding new clinical pathways to enhance patient outcomes and efficiency of services (amongst others). Students review NHS quality improvement tools and set out plans to involve stakeholder and patient involvement while creating evaluation plans to maintain the improvement process.

These topics are crucial for aspiring healthcare leaders. The varied approach, incorporating different specialties, fosters opportunities for interprofessional education, collaborative working, and reflection. The module aims to incorporate co-creation in the future, providing additional authentic assessment opportunities by allowing MSc students to practice leadership and innovation.

Engineering

At levels 4 and 5, CDIO represent half of the credits for Mechanical Engineering students, highlighting its key role in preparing industry-ready graduates. Contemporary and upcoming societal challenges are addressed in these modules, with authentic assessments covering the design, manufacture and test of an electric car, wind turbine, medical device and fuel cell, all with a focus on sustainability, equality, diversity and inclusion. Indeed, the CDIO approach provides an opportunity to tackled Wicked Problems: highly complex, ever-changing societal challenges with no clear single solution (Lönngren and Van Poeck, 2021), while being applicable to many engineering disciplines (Cheah and Yang, 2018; Souppez and Awotwe, 2022). Such practical experiences support transition into employment, and impart lifelong learn skills on tackling novel complex problems.

At level 6, and to address some of the key employability skills identified by employers while clearly setting a mentality of lifelong learning and engagement with continued professional development, students undertake a module of 'Professional Engineering Practice'. One of their assessments consists in preparing an Engineering Technician (EngTech) application, which represents the first step towards become a Chartered Engineer (CEng) as their career progresses. This is intended to encourage students to position their studies in the context of their career and progression, as opposed to seeing graduation as an end to their learning experience. A key part of the assessment is the development of an action plan, co-created with their project supervisor, covering the first 5 years of their career. As such, the module and this particular assessment evidence a clear commitment to futureproof their professional practice, and leading students to realise the importance of lifelong learning.

Conclusions

In this paper, a range of initiatives at Aston University have been used to illustrate how co-creation and authentic assessment encourage students to actively participate in their learning journey, while ensuring that assessments are equitable and relevant for one of the most diverse student populations in the UK. This integration of authentic assessment represents a clear shift in how student learning is evaluated, prioritising real-world applications of knowledge to prepare students for employment and lifelong learning. Examples across healthcare science and engineering has been provided, thereby showcasing the wide applicability of such practices. Consequently, it is anticipated the examples provided in this work could benefit the wider higher education landscape, particularly at a time where concerns have been raised about the use of generative artificial intelligence in assessment, which authentic assessments help alleviate.

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CHAPTER THREE

The Universal Micro-credential Framework: A transformative approach to micro-credentialing educational provision

THE UNIVERSAL MICRO-CREDENTIAL FRAMEWORK: A TRANSFORMATIVE APPROACH TO MICRO-CREDENTIALING EDUCATIONAL PROVISION

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Editorial Comment:

The problem of recognising and understanding the currency of student's skills as they leave education and enter the workforce is explained. The Universal Micro-credential Framework is presented as a solution. Practicalities of implementing this new system are presented and discussed.

ABSTRACT

To function well in our knowledge economy, learner-earners must be able to change roles and retrain quickly and easily. To do this, educational institutions must recognise learner-earner achievements in a more granular way. An innovative approach, designed to leverage existing systems, is the Universal Micro-credential Framework. The purpose of the Universal Micro-credential Framework is to enable granular achievement through skills profiling within an institution's existing credential pathways. This chapter describes a fundamental and persistent structural issue - *the capability-competency chasm*, that greatly impacts learners traversing the learn-to-earn ecosystem. Next, skills profiling is described, a novel approach to bridging the capability-competency chasm through understanding achievement in both learning and earning. An institution establishing skills profiling can then understand which Universal Micro-credential Framework components to leverage. Last, a brief overview of micro-credential design patterns is discussed, introducing a change management mechanism for guiding implementation of the Universal Micro-credential Framework.

Keywords: Badges, Micro-credentials, Innovation, Lifelong learning, Assessment

INTRODUCTION

Micro-credentials have become increasingly popular across educational institutions, and across the employment sector, due to their ability to enable recognition of achievement at a granular level. Sue Reece's model of micro-credentials within UK higher education (QAA, 2021) provides a useful context in which to understand the many potential benefits of a more granular approach to recognising achievement. As shown in Figure 1, there are five different use cases considered. These are - 1) *independent*, with micro-credentials being gained but not connected to or used within educational institutions; 2) *entry*, with micro-credentials having tariffs associated with them i.e. values assigned to micro-credentials that can be used to reach a level required for entry onto an undergraduate qualification; 3) *accreditation of prior learning*, with micro-credentials again having values assigned to them, but in this case the value enables learners to omit a part of a qualification as they have been recognised as having comparable achievement through micro-credentials; 4) *embedded* (non-credit), where micro-credential achievements support achievement of a qualification but where these achievements are not explicitly linked to fractions of the qualification; and 5) *embedded stacking* (credit), where micro-credentials are explicitly recognised as having a value equivalent to a fraction of a qualification and where this value is expressed through credit.

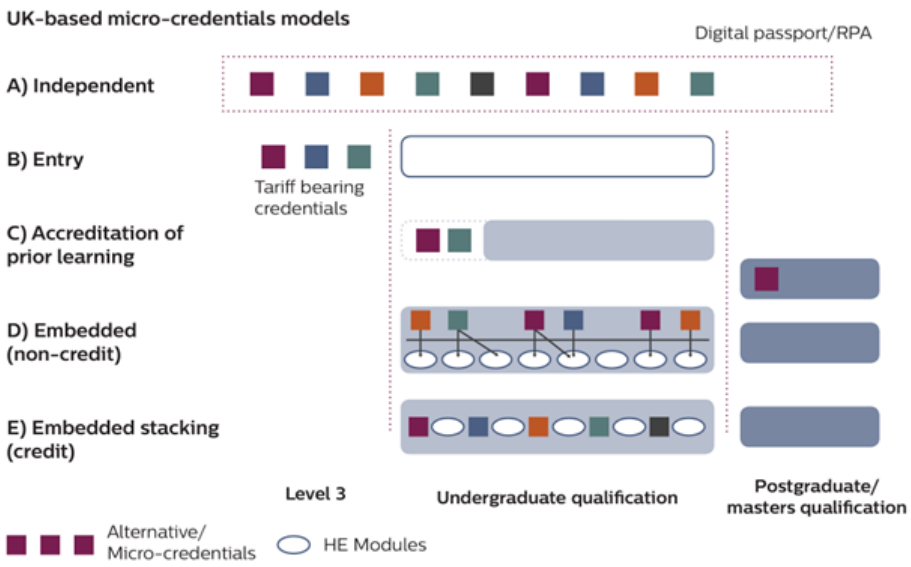

Figure 1. Professor Sue Reece's five potential models for UK micro-credentialing (QAA, 2021, p.7)

These five models are useful to consider as they raise a key question: How can we recognise achievement that is part of a qualification (or degree), connected with a qualification and independent of a qualification through a single recognition mechanism? And, especially in the context of independent micro-credentials, if we do identify such a mechanism, is this mechanism only of use within educational qualifications or can it also recognise achievements related to learning and earning, wherever they may take place?

This latter question is an especially exciting question to answer as it helps resolve a key issue, which is maintaining the bedrock of our current provision within existing educational institutions while simultaneously recognising the rapid pace of change learners must navigate in the modern global knowledge economy. Resolving this issue leads to other questions, such as the following: How can learners better understand and demonstrate their achievements in a way that enables them to be effectively matched to roles they are well suited to? How can they better adapt themselves, based on their existing achievements, without needing to undertake long periods of

time acquiring new qualifications, many of which may be highly duplicative of what they have already achieved?

These questions essentially unearth what until now has seemed an intractable problem. As learner-earners move back and forward between education and employment there are currently high levels of friction within the learner-earner ecosystem. At the heart of this friction is a fundamental problem that has existed since universal formal education developed approximately 200 years ago. The problem, mirroring the questions that arose in use cases identified within Reece's models, is that there is no common system for recognising achievement that traverses both education and employment. This deficit has created a *capability-competency chasm*, discussed in greater detail in the next section, followed by a description of skills profiling as a means to bridge this chasm.

The Capability-Competency Chasm

The fundamental issue affecting learner-earners as they move back and forth between education and employment can be characterised as the capability-competency chasm (Ward et al., 2021). Educational institutions develop learners' capabilities and check that learners have been taught something, and that they are capable of using this learning. Employment, with its focus on job roles, expects learners (now earners) to be able to competently apply what they have learnt to their employment context. Employers then seek earners who are not just *capable* learners but, rather, *competent* in applying learning to specific contexts. Employers therefore seek competency, whilst educators develop, and measure, capability. This capability-competency chasm exists solely because related but distinct measures of learning (one for capability in education and one for competency in employment) are being used. It also explains why employers frequently complain that they cannot find good employees based on qualifications, and why educators complain that they are not there simply to develop the workforce. Both are correct in their complaints, as the current systems clearly serve different needs. However, by exploring this chasm, and thinking about how it can be bridged, we can unlock solutions to many use cases and reduce friction within the learner-earner ecosystem.

The solution to bridging the capability-competency chasm is to understand what is common to both capability and competency, which is skills. By considering both education and employment through the common language of skills we are able to see how capability links to competency and thus enable frictionless movement based on a common understanding of achievement. To do this, two key questions need to be answered. Firstly, what skills should we measure? And secondly, how should we measure these skills? In terms of the skills to measure, a set of subject-specific and transferable skills categories have been developed (see below) and tested to check for full coverage within education and employment. Reflecting traditional measurement of education practices that encapsulate credit hours, measurement for skills development was similarly measured in hours. The bridging of the capability-competency chasm is therefore achieved through the use of *21st Century skills hours*, or skills hours for short.

Skills Profiling

Skills profiling involves starting with educational achievement, defined through learning hours, learning outcomes, and assessment components, which are then translated into skills hours. This is done both from a transferable skills perspective and a subject-specific skills perspective. Having done this, with hours assigned to each skill category, percentage profiles can be generated to show comparative acquisition of skills, as shown in Figures 2 and 3. For example, what is the overall skills profile gained from such study? This is a useful question to ask for educators who may be intending something different from how the qualification is structured and thus provides opportunities for reflection and adaption of qualifications. It also provides opportunities to personalise routes through a qualification such that the skills profile of the qualification can and does vary. This is important both to solve earlier challenges of how we fit micro-credentials into qualifications and to better signal to employers the skills gained through qualifications. A further benefit of developing a percentage skills profile is that this can be compared to a percentage skills profile derived from labour market information from job roles related to the qualification, as shown for a range of qualifications in Figures 2 - 8. By presenting this comparison of capability (qualification) and competency (job roles), both educators and

employers can see where variation lies and make decisions based on a fuller view of the learner-earner ecosystem. For example, from an educationalist perspective, Figures 4 and 5 show very similar skills profiles for qualifications with the same title at two different universities. Figures 7 and 8 show, from an employer perspective, variation in job role requirements between Computer Science and Data Science. A full testing of these concepts was undertaken through a UK national Quality Assurance Agency project (QAA, 2022).

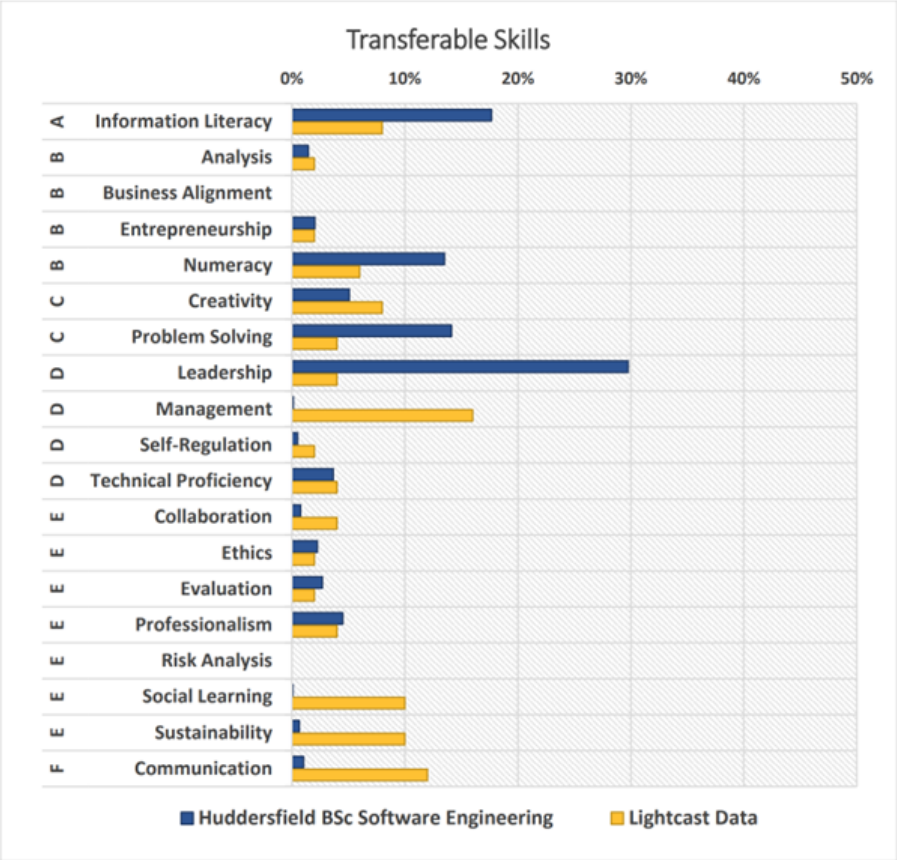

Figure 2. A transferable skills profile compared with associated labour market information from Lightcast

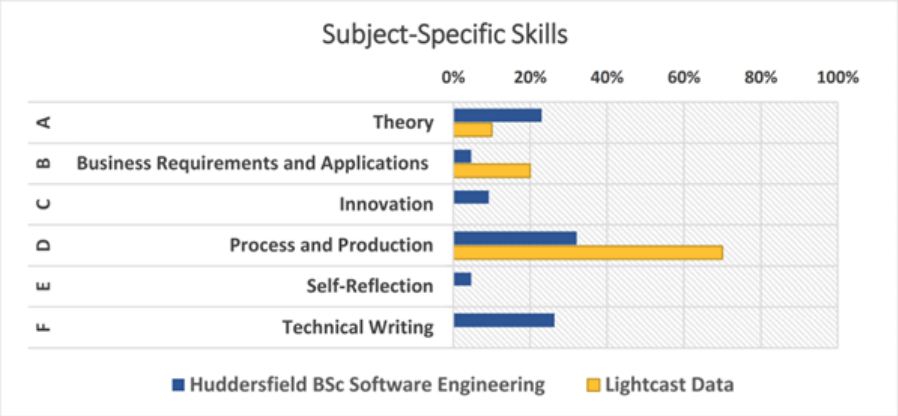

Figure 3. A subject-specific skills profile from the University of Huddersfield compared with associated labour market information from Lightcast

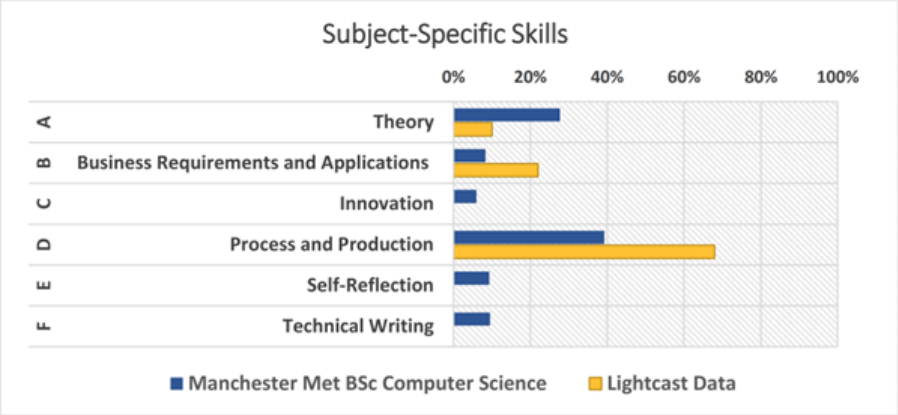

Figure 4. A subject-specific skills profile from Manchester Metropolitan University compared with associated labour market information from Lightcast

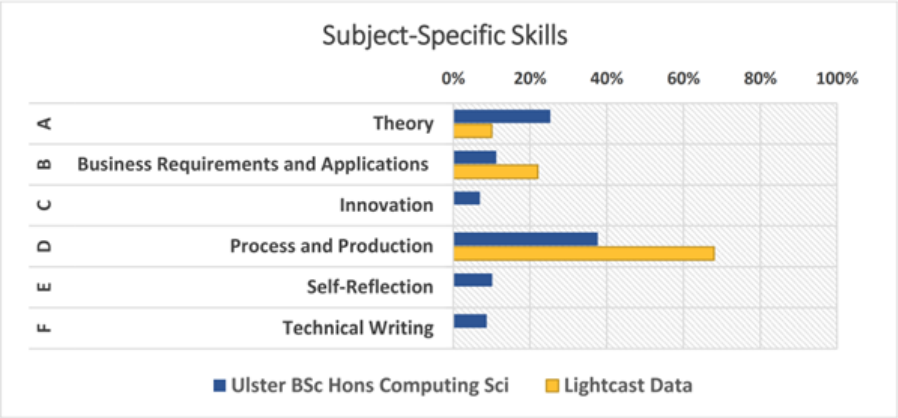

Figure 5. A subject-specific skills profile from the Ulster University compared with associated labour market information from Lightcast

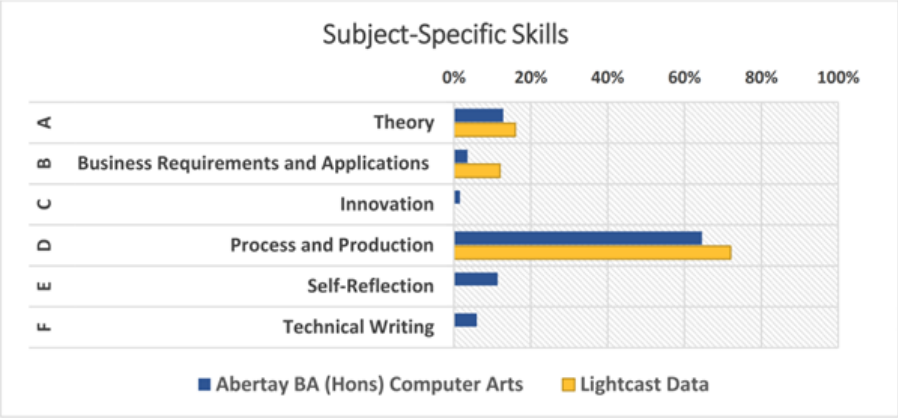

Figure 6. A subject-specific skills profile from Abertay University compared with associated labour market information from Lightcast

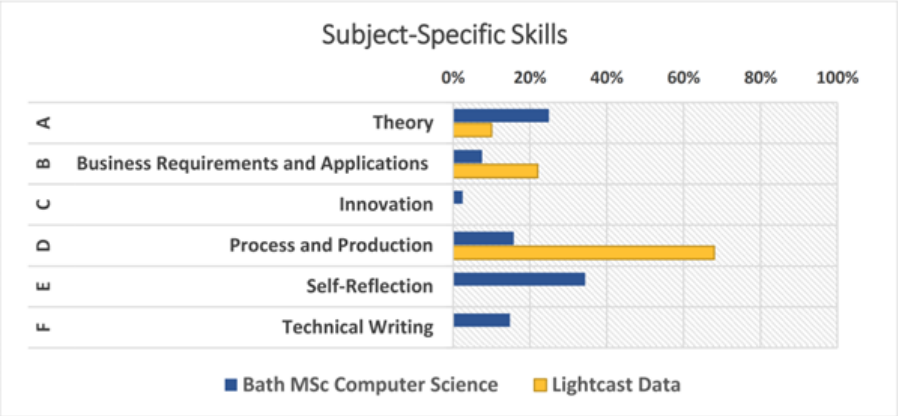

Figure 7. A subject-specific skills profile from University of Bath compared with associated labour market information from Lightcast

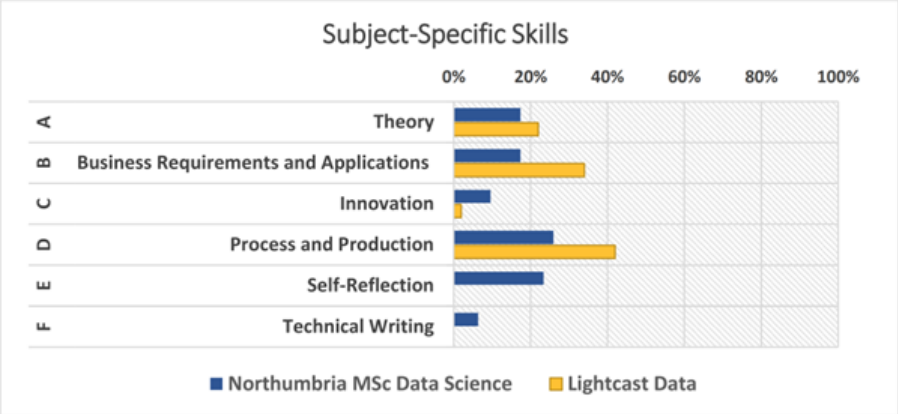

Figure 8. A subject-specific skills profile from the Northumbria University compared with associated labour market information from Lightcast

A promising further benefit of the skills profiling technique is how it enables micro-credentialing and personalised learning to thread throughout education and employment. By breaking achievement into granular components, skills hours can be combined and adjusted quickly and easily. Credit hours can be translated to skills hours, and skills hours can represent micro-credentials, credentials or simply provide variation within a qualification in terms of the skills gained. An example of how a module can be personalised is shown in Tables 1 - 3, where two traditional assessments are reduced to accommodate different combinations of external learning resources within a module.

Table 1. Initial module subject-specific skills and assessments.

CIS2201 Cyber Security			**Module Learning Hours**			**200**
Asst	**1A**	**2B**	**3C**	**4D**	**5E**	**6F**
1	67					33
2				67		33
Total	**67**			**67**		**67**

Table 2. A personalised learning approach to a module, where existing assessments are reduced (internal learning hours decrease to 140 hours) and external learning resources (ELRs) are included to enable variation.

CIS2201PL Cyber Security (PL)			**Internal Learning Hours**			**140**
			External Learning Hours			**60**
Asst	**1A**	**2B**	**3C**	**4D**	**5E**	**6F**
1	47					23
2				47		23
ELRs						
2	10	5		10		10
5	5			10		10
Total	**62**	**5**	**0**	**67**	**0**	**66**

Table 3. A second personalised learning approach to a module, where existing assessments are reduced (internal learning hours decrease to 140 hours) and external learning resources (ELRs) are included to enable variation.

CIS2201PL Cyber Security (PL)			Internal Learning Hours			140
			External Learning Hours			60
Asst	**1A**	**2B**	**3C**	**4D**	**5E**	**6F**
1	47					23
2				47		23
ELRs						
1	5		10	5		
3	5			10		5
4	10			5		5
Total	**67**	**0**	**10**	**67**	**0**	**56**

The Universal Micro-credential Framework

Whilst skills profiling alone is an incredibly powerful technique supporting micro-credentialing and personalised learning, it requires a framework around it in order for organisations to fully realise the many ways these benefits can be manifested. This framework is known as the Universal Micro-credential Framework, the purpose of which is to simplify a universal solution for the development of granular achievement recognition without ignoring complexity (Ward et al., 2024).

The Universal Micro-credential Framework can be best understood through analogy. Educational achievement is recognised through the award of qualifications, and within higher education, to name an example, this may be the award of a degree certificate.

The degree certificate can be thought of in two different ways. Firstly, it can be considered as a signal of achievement. In this regard the signal itself transmits very little information, and for this reason a transcript of module results is often requested when such certificates need to be checked, even though this provides limited information. With skills profiling, much greater

information can be provided about learner achievement, and within the Universal Micro-credential Framework this information signals in three ways: externally (to potential employers, for example), internally (to the educational institution) and to the self (providing information that better supports learner-earner decision making).

The second analogy relates to when such certificates are checked. A degree certificate can be thought of like a bank note, as a form of currency. Currency transactions are built on trust, with notes needing to be reliable, and with a clear value established in order that they can be exchanged. Within the Universal Micro-credential Framework both trust and exchange are carefully considered. In terms of trust, skills profiling works with existing trusted proxies of achievement (learning hours, learning outcomes and assessments) and translates these into a more granular form (the skills hour). The framework, by enabling more granularity, also enables existing qualifications and new micro-achievements such as badges and micro-credentials to work together. Within the Universal Micro-credential Framework, badges and micro-credentials serve distinct but complementary functions. Using the currency analogy, the skills hour represents the lowest currency value, badges represent coins (small amounts of skills hours), micro-credentials represent medium-value notes and existing qualifications are like high-value notes. Returning to the discussion of Reece's model, this approach enables all the different use cases presented in her model to be addressed through the Universal Micro-credential Framework.

Micro-credential Design Patterns

The main challenge to the implementation of the Universal Micro-credential Framework is often conceptual. Innovation can be complex, dynamic, and messy (Kotter, p. 24), even when stakeholders are committed to a common objective. Effective change management processes are therefore required. Many working in educational institutions want reassurance that any challenges identified have been resolved elsewhere, and that there is a blueprint to guide their efforts. Design patterns were developed to provide this blueprint, specifically to support the implementation of the different elements of the Universal Micro-credential Framework. If the purpose of the Universal Micro-credential Framework is to enable granular recognition of

skills across the institution, design patterns enable people to facilitate the processes, adapting solutions to their specific context.

Universal Micro-credential Framework design patterns provide a high-level solution featuring four essential parts: pattern name, problem, solution, and the pros and cons of applying the pattern. Intent of the pattern, tips for implementation, and a set of links to research, resources, and workshop activities are included. The first set of ten design patterns, as listed in Table 4, include: Frame (i.e. assessing tolerance for risk and transformation), Trust (i.e. evaluating trust in digital credentialing technologies), Embark (i.e. implementing a strategic approach), Govern (i.e. converting values and principles into processes and practices), Partner (i.e. creating meaningful value through strategic partnerships), Tell (i.e. adding communication strategies to the design process), Translate (i.e. implementing skills profiling), Bridge (i.e. leveraging prior learning assessment policies), Stack (i.e. adding incremental and embedded credentials), and Issue (i.e. leveraging credentialing metadata).

Table 4. Universal Micro-credential Framework design patterns

Design Pattern	
Frame	Assessing tolerance for risk and transformation
Trust	Evaluating trust in digital credentialing innovations
Embark	Implementing a strategic approach
Govern	Converting values and principles into processes and practices
Tell	Layering communication strategies through implementation
Translate	Implementing skills alignment and skills profiling
Stack	Adding incremental and embedded credentials
Bridge	Leveraging prior learning assessment policies
Partner	Creating meaningful value through strategic recognition partnerships

Design Pattern	
Issue	Leveraging credential metadata

The five foundational design patterns (Frame, Trust, Embark, Govern, Tell) address the specific needs of diverse stakeholders engaged in a cross-cutting initiative at an enterprise level. As institutions continue to engage design patterns, a catalogue of case studies are in development to provide the basis for models that can demonstrate how different patterns were implemented and what outcomes to expect.

Design patterns that more specifically address the Universal Micro-credential Framework include, in addition to the five foundational mentioned above, a set of three: Translate, Stack, and Bridge. In brief, Translate encompasses skills alignment, emphasising skills profiling. Stack describes the way skills mapping can identify gaps that the institution may want to address with micro-credentials, or enable those micro-credentials to stack with others. Bridge engages institutional policies that reduce friction for learners, whether it may be to recognise prior learning or transfer credits within the institutional system. Some educational institutions might elect to implement the Partner design pattern to ensure a more guaranteed employment path for learner-earners.

Why design patterns?

Those who have implemented micro-credential efforts across institutions know it can be challenging. The ease and appeal of designing a micro-credential initiative at the course level quickly becomes daunting when applied at the enterprise level. Fortunately, successful cases do exist. Extracting design patterns from these cases has helped simplify the complexity while staying focused on the many educational contexts in which the Universal Micro-credential Framework can be applied.

In other words, design patterns for micro-credentials are essentially a change management mechanism for guiding implementation of the Universal

Micro-credential Framework. They function in a similar way to technical drawing blueprints and are akin to templates that can be modified and adapted to different contexts. Design patterns provide a way to simplify implementation processes in what are often complex socio-technical systems with strong cultural norms and many diverse stakeholders. Design patterns for micro-credentials allow institutions to customise how skills profiling and other micro-credentialing initiatives will work across departments so that they reflect the institution's unique context, culture, and conditions.

The impetus for creating design patterns for credentialing innovations occurred in collaboration with Arizona State University's Trusted Learner Network (TLN). An overarching purpose of the Trusted Learner Network is to align the design and development of credentialing technologies with principles that are largely twofold: respect for institutional processes while centring new credentialing innovations around learner agency. These principles represent the collective input of diverse higher education stakeholders, which, "bring together diverse voices by recruiting leaders from community colleges, universities, and non-profit organisations to build a governance model that respects the institution, pushes agency to the learner, and creates a durable repository for credentials" (see https://tln.asu.edu/).

Because the Universal Micro-credential Framework considers different permutations and models for micro-credential implementation across the institution, it serves as a thorough framework to inform design patterns. For example, some institutions use micro-credentials to address enrolment and stop-out challenges, while others focus on lifelong learning and revenue generation. Some, like institutions focused on skills profiling in their curriculum, use micro-credentials to fill gaps in the curriculum where necessary. Different models invoke micro-credentials and skills profiling in different ways, engaging different institutional processes and diverse stakeholders respectively. Design patterns are a way to enact change management approaches that increase the chances of implementation success. Without them, institutions are also at risk of enabling the same fundamental structural issues to persist.

Past history reveals that the development of interdisciplinary learning and assessment paths for computing education and other disciplines comes with challenges. Some of these challenges can be resolved through the approaches outlined above (i.e. capabilities can be mapped to competencies; 21st Century skills can be used to bridge the chasm; skills profiling can be

used to personalise learning; the Universal Micro-credential Framework can be used to connect granular learning to existing formal education structures; and design patterns can be used to enable effective institutional change).

When implementation is successful in one context, it can be challenging to apply these particular successes in others, especially for educational institutions that may experience a high degree of decentralised leadership and diverse stakeholders. While design patterns cannot solve all challenges, they represent an informed start. Prescriptive, text-based guidebooks or 'playbooks', case studies, and other types of repositories of knowledge for the implementation of credentialing innovations provide useful information, yet they can fall short when it comes to the specific change management methods necessary for successful implementation to occur. Given the enduring complexity of implementing a Universal Micro-credential Framework in different education contexts, including different countries, and at different levels of scope and scale, and depending on varying degrees of difference in institutional tolerance for risk and transformation, the design patterns are deployed as a promising change management method that can guide research going forward and enable best practice to be more easily shared across and between institutions.

Conclusion

Whilst challenges remain in changing how we approach the use of micro-credentials within education and employment, the techniques of skills profiling, under the overall umbrella of the Universal Micro-credential Framework, enable us to bridge the capability-competency chasm and, in so doing, support personalised lifelong learner-earner journeys resulting in more efficient and effective development and use of human talent.

The benefits of such an approach for the global knowledge economy cannot be overstated. In order to realise these benefits, which include immediate improvements through quicker workforce adaptation, as well as longer term indirect improvements to health and well-being through greater fulfilment amongst learner-earners, the Universal Micro-credential Framework needs to be applied in diverse contexts and with diverse use cases. As these contexts and use cases are developed and shared, trust and

enthusiasm for change is likely to increase and narratives linked to the various design patterns will provide a rich environment for developing shared understanding and improved efficacy within the learner-earner ecosystem.

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CHAPTER FOUR

The practical messiness of integrating learning transfer in an online allied health curriculum: A conceptual analysis

THE PRACTICAL MESSINESS OF INTEGRATING LEARNING TRANSFER IN AN ONLINE ALLIED HEALTH CURRICULUM: A CONCEPTUAL ANALYSIS

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Editorial Comment:

This chapter presents ongoing research which explores how students transfer learning from studying a postgraduate sonography program at an Australian university to practical application during their industry traineeships. Insights into online learning frameworks and their potential to understand and enable learning transfer in online mode is presented in addition to how, educators can adopt existing frameworks and innovate ways to foster students' ability to integrate knowledge transfer and apply complex knowledge in real-world contexts.

ABSTRACT

Learning transfer is the ability to effectively apply learning from one context to another and correlates with important outcomes for students, including academic achievement and work readiness. Learning transfer is a key factor in student success in education and the workplace but it is relatively under-researched, especially in higher education online contexts. With the rapid expansion of online degrees post-COVID-19 available in higher education globally, educators need a better understanding of learning transfer to explore ways of integrating it effectively. In this chapter, we discuss several trends in learning transfer and then analyse key online learning frameworks focusing on embedding learning transfer. We conclude by recommending evidence-based suggestions for online educators to facilitate learning transfer in students based on our ongoing research in a postgraduate allied health program at an Australian University. Despite the complexities of overlapping concepts, educators can adopt these frameworks for integrating learning transfer in online contexts.

Keywords: Learning transfer, Higher-order thinking, Self-regulated learning, Online learning, Higher Education

INTRODUCTION

With a surge in online degrees, the post-pandemic era has witnessed innovative transformation in work and learning. Although the course conversion to online mode can occur through live or recorded lectures and online resources, creating and implementing relevant, meaningful learning content and tasks can be challenging even for experienced educators. A key assumption by educators is that learners will be able to transfer the skills and knowledge learned in one instructional setting and apply them to problems in a different setting, but this is often incorrect (Wisneski and Ozogul, 2019). Learning transfer is the ability to apply knowledge and skills learned in one context to another (Salomon and Perkins, 1989). Despite transfer being a fundamental educational goal, researchers and educators have struggled to understand the factors needed to promote transfer and the role of the educator and student in the process (Bransford and Schwartz, 1999; Haskell, 2001).

A prominent theory for learning transfer is the near and far transfer (Salomon and Perkins, 1989). Near transfer is when learners apply a relatively small skill set to a new learning situation. It is characterised by integrating newly learnt skills into one's thought process. Far transfer is when learners apply higher-order skills to perform optimally in a new situation (Detterman and Sternberg, 1993) and is characterised by the intentional transfer of critical thinking from one learning context to another. Development of transfer requires both direct instruction and adequate opportunities to practice applying newly learnt skills to novel situations (Reece, 2005). Perkins and Salomon (1992) advocated for educators to strive to create purposeful opportunities to support transfer. This is relevant today for online pedagogy with its unique challenges. Learning transfer

within a course can be considered as near transfer, such as when students solve complex problems set within the course. As complex problem-solving is a higher-order thinking skill, we argue that both near and far transfer require higher-order thinking skills. Far transfer typically occurs outside the course (Chew and Cerbin, 2020), for example, applying learnt knowledge from the course to the workplace or traineeship. Evidence of "near" transfer is more evident in literature than "far" transfer, possibly due to deliberate cognitive effort and reflection for far transfer (Perkins and Salomon, 1992).

Researchers have also described learning transfer in terms of inputs and outputs (Fauth and González-Martínez, 2021; Hansen, 2008) in organisational training. Input factors are related to individual characteristics, training design features, and work environment. Output factors are learning outcomes and retention. In higher education, considering the transfer process as an input-output system, inputs are course design and delivery. At the same time, outputs are student outcomes, which could be influenced by the method of delivery (input) (Hansen, 2008).

In contemporary education, with the learner-centred constructivist approach, students are self-regulated learners who seek and synthesise information to construct meaningful understandings (Tagg, 2003). Although the aim for students is to demonstrate cognitive skills and motivation and to evolve as life-long learners, the onus lies in the educator's ability to design tasks and relevant assessments and to facilitate the online educational experience (Maranna et al., 2022). Educators need an improved understanding of facilitating higher order thinking skills, including knowledge transfer in online contexts, so that students learn relevant content needed for their profession. Learning transfer is a key factor in student success in higher education and the workplace, yet it is relatively under-researched.

Consideration of existing literature on learning transfer.

Learning transfer is the process where learners successfully and continuously apply knowledge, skills, and attitudes acquired in training (Blume et al., 2010). In other words, the study of transfer aims to understand to what extent training encourages learning that can be applied effectively and continuously in a work context (Baldwin, Ford, and Blume, 2017). Various theories and models have been proposed in the transfer literature for

employee organisational training. However, there are a few emerging studies in higher education as shown inTable 1.

Table 1. Learning transfer frameworks and models with their key features

Transfer model or theory	**Salient features of the transfer model or theory**
Theory of common elements (Thorndike and Woodworth.1901)	Learning can be transferred from one activity to another (e.g., performance training) if the two activities are highly similar and share many common elements.
Huczynski and Lewis (1980)	Illustrates the interaction of course content, individual motivation, and the work environment. This model identified three training phases: 1. the pre-course phase, characterised by training needs identification and motivation initiation 2. the learning phase, characterised by the delivery of instruction 3. the post-course phase, characterised by management of the work environment to promote transfer.
Modified learning transfer system inventory (LTSI) (Bates, Holton and Hatala, 2012)	Considered 16 factors likely to influence the transfer of training in the workplace. Most widely used to evaluate organisational training. The LTSI is an instrument that diagnoses the factors affecting learning transfer and assumes that outcomes are a function of ability, motivation, and environmental influences at three outcome levels: 1. learning 2. individual performance 3. organisational performance
Framework for transfer (Baldwin, Ford and Blume, 2017)	The framework includes training input factors, training outcomes, and conditions of transfer.

Transfer model or theory	Salient features of the transfer model or theory
Kirkpatrick's transfer evaluation model (Kirkpatrick and Kirkpatrick, 2006)	The transfer evaluation model has four levels: 1. Reaction: The degree to which participants find the training engaging and relevant to their jobs 2. Learning: The degree to which participants acquire the intended knowledge, skills, attitude, confidence, and commitment based on their participation in the training 3. Transfer: The degree to which participants apply what they learned during training when they are back on the job 4. Results: The degree to which targeted outcomes occur because of the training initiative and subsequent support.
Course Assessment for Skill Transfer (CAST) (Fischer et al., 2022).	A suite of conceptual tools to aid course designers, instructors, or external evaluators in assessing which essential skills are being taught and to what extent. The framework supports skills transfer from classroom to the workplace. CAST consists of four parts: 1. Identify Skills: Identify the skills intended to be taught or practiced in the course 2. Review Course: Review the extent to which identified skills occur in the course 3. Assess Outcomes: Assess the extent to which students acquire identified skills 4. Check for Transfer: Verify the identified skills have been transferred beyond the course.

Transfer model or theory	Salient features of the transfer model or theory
The four-component instructional design model (van Merrienboer, Kirschner and Kester, 2003).	Transfer environments for complex tasks are described in four components: 1. Learning tasks: must be based on real-life tasks 2. Supportive information: made available to learners helps them to problem-solve and justify. 3. Procedural information: helps learners to perform 4. the routine aspects of learning tasks. Part-task practice: to provide learners with additional practice
Five stages of transfer in complex situations (Eraut, 2004)	As new situations are less familiar and more complicated, transfer is challenging and involves five interrelated stages: 1. Extraction of potentially relevant knowledge from the context(s) of its acquisition and previous use 2. Understanding the new situation, a process that often depends on informal social learning. 3. Recognising what knowledge and skills are relevant. 4. Transforming them to fit the new situation. 5. Integrating them with other knowledge and skills to think/act/communicate in the new situation.

According to the common elements theory (Thorndike and Woodworth, 1901), near transfer is more likely to occur than far transfer. In their meta-analysis, Sala et al. (2019) reported that near transfer occurs more frequently than far transfer. Students often find it challenging to apply knowledge to a novel concept (Detterman and Sternberg, 1993; Sasson and Dori, 2012). This may be because the expected transfer does not happen without deliberate strategies employed before and during the transfer process (Hajian, 2019). Research on learning transfer in higher education has proposed ways to enhance transfer ability in trainees and students. For instance, Hansen (2008) compared transfer between conventional and online courses for students studying the marketing process. The transfer was measured by student grades. Online course delivery was reported as superior to face-to-face learning

transfer (Hansen, 2008). Barak, Hussein-Farraj, and Dori (2016) compared on-campus and online students and reported that online students demonstrated a greater degree of knowledge application. This supports the claim that providing students with relevant instruction and opportunities can enhance their transfer skills (Sasson and Dori, 2012).

Sibthorp et al. (2011) investigated learning transfer in students participating in an experiential education program and reported that active learning, time to practice tasks, goal setting, and extending learning are important for enabling transfer. Instructors played a central role in mediating transfer by offering support as role models and delivering instruction (Sibthorp et al., 2011). Lim et al. (2022) highlight the need for a platform that facilitates continuous, timely, and bi-directional needs assessment and feedback, suggesting this should occur early in the knowledge transfer process. Both interpersonal and inter-organisational challenges were identified: mismatched expectations, learning new knowledge beyond one's profession, barriers to applying knowledge in new environments, and cultural differences (Lim et al., 2022). Forrester (2018), in a study on music education, implied that teaching for transfer relies on the learning conditions created by the teacher. For learning transfer, deliberate and systematic instructional strategies are necessary through goal-oriented instruction. Among the evaluation models to measure training outcomes, Kirkpatrick's model is widely accepted (Bhatti and Kaur, 2010). These can be adapted to online higher education contexts following research and evaluation of practicality and feasibility (see Table 1). However, notably, this has not yet been researched in online environments; hence, our research explores the development of learning transfer within the community of inquiry (CoI).

Study Context

In our ongoing exploratory research (Maranna et al., 2024), we have evaluated quantitative and qualitative data (questionnaires, interviews, and learning management system data) to explore the relationship between higher-order thinking (cognitive presence from the community of inquiry framework), self-regulated learning and learning transfer in online contexts. The participants were students enrolled in an online second-year postgraduate diploma sonography program at an Australian University. The

co-requisite required students to be in an industry traineeship. A traineeship is 'on-the-job' training with an employer at the same time as students study and get paid (www.apprenticeshipcareers.com.au, n.d.). This work-integrated learning (traineeship and online coursework) requires students to apply theoretical knowledge into practice and hence provides a conducive platform to explore the transfer process.

In our research (Maranna et al., 2022), we used the CoI framework (Garrison, Anderson and Archer, 2000), which proposes three essential interdependent presences for a successful educational experience: cognitive presence, social presence and teaching presence. Cognitive presence refers to higher-order thinking skills and is defined as the ability of students to construct and confirm meaning through sustained reflection and discourse in a virtual learning environment (Garrison, Anderson and Archer, 2000). It has four phases: Triggering, Exploration, Integration, and Resolution. In the Triggering event, a problem is identified, initiating the inquiry process. In Exploration, learners explore relevant information, individually or in collaboration with peers. In Integration, learners construct meaning from generated ideas and share these within the community. In Resolution, learners apply or defend potential solutions to the problems with new ideas (Garrison, Anderson and Archer, 2001). Integration and Resolution represent the higher levels of cognitive presence where learners build on each other's ideas and synthesise information to provide real-world solutions. Shea and Bidjerano (2012) claimed that Integration and Resolution are related to learner self-regulation in online environments. The main criticism of the CoI has been the lack of consideration of the role of the learner in their framework. Shea and Bidjerano (2012) proposed the inclusion of 'learning presence', which included co- and self-regulation and motivation for learners to actively participate in the online mode. In our research, we have used the online self-regulated learning questionnaire to consider this aspect.

Observations and Discussion

The key contribution of our research is identifying the link between the resolution phase of cognitive presence and internal or near transfer in online contexts (Maranna et.al., 2025). In the community of inquiry (CoI) literature, Resolution is achieved when learners create solutions or new insights

through practical applications, such as decision-making, case presentation or experiments (Garrison, Anderson and Archer, 2001). In the learning transfer literature, the near transfer can be evidenced when students solve complex problems within the course (Bransford and Schwartz, 1999; Chew and Cerbin, 2020). As Resolution is the learners' ability to test knowledge application in real-world situations, it is essentially near transfer in online contexts. Increased cognitive presence increases students' ability to apply learnt knowledge. In the following section, based on key findings in published literature and findings from our ongoing research, we discuss several key online learning frameworks that educators can adopt to integrate learning transfer tasks for students in Table 2.

Table 2. Online learning frameworks and the potential to integrate learning transfer.

Online learning theory	**Key concepts**	**Potential to integrate and evaluate learning transfer**
Community of Inquiry framework (Garrison, Anderson and Archer, 2000**)**	The framework proposes three interdependent dynamic presences (teaching presence, social presence and cognitive presence) required for a successful educational experience.	The final resolution phase of cognitive presence refers to applying learned knowledge for resolving problems by critical evaluation of the solution.
E-tivities, e-Moderation and the 5-stage model (Salmon, 2011**)**	The model provides a scaffold of five stages (access and motivation, socialisation, information exchange, knowledge construction and development) to organise course content and structure, integrating stage appropriate E-tivities, to meet the individual online pedagogy learner needs.	The final development phase requires students to demonstrate critical thinking through cumulative knowledge to new situations and self-reflection.

Online learning theory	**Key concepts**	**Potential to integrate and evaluate learning transfer**
Technological pedagogical content knowledge (TPACK) (Mishra and Koehler, 2006)	Technological knowledge must integrate with the content and pedagogy that are unique to any specific content area	Context-specific transfer tests can be integrated through understanding teaching practices which are content-driven, pedagogically-sound, and technologically sustained.
Anderson's interaction equivalency theorem (AIET) (Anderson, 2003)	This integrates and examines interactions between learners, teachers and content within the CoI model.	Teacher-content and student-content interactions provide potential for embedding transfer-related tasks and tests.
Multimodal Model for Online Education (Picciano, 2019)	Provides seven key pedagogical objectives and activities which can help drive the approaches used by educators.	Content, evaluation/assessment and reflection allows for transfer tasks to be integrated.

Online learning theory	**Key concepts**	**Potential to integrate and evaluate learning transfer**
How people learn (Bransford, Brown and Cocking, 2000**)**	This framework proposed four aspects, namely, learner-centred, knowledge-centred, community-centred and assessment-centred.	The knowledge-centred and assessment-centred aspects provide potential for inclusion of transfer-related tasks and tests. It allows the learner to synthesise new information and to apply these understandings to novel situations.

Determining the impact of traineeships on learning transfer would be ideal for the exploration of far transfer, however, resource and time constraints prevented us from doing so. Nevertheless, our research has provided important insights for educators. Despite overlapping theories and complexities in understanding and enabling learning transfer in the online mode, educators can adopt existing frameworks and innovate ways to foster students' ability to transfer learning. Factors can be broken down as those relating to design, learner characteristics and the work environment. As learning transfer cannot be researched in isolation due to its overlapping concepts with higher-order thinking skills and self-regulation (Cassidy, 2011; Maranna et al., 2023), we have explored student perspectives of cognitive presence, self-regulation and learning transfer to gain insights into sustainable online course design. We have outlined a few suggestions to focus on enhancing near transfer or transfer within the course and for future research.

Ways to enhance near transfer in the online higher education context

- Align learning content and tasks to learning outcomes and training needs.
- Training design, content and instructional strategies must be related to the objective of transfer, whether near or far transfer, for learning transfer to occur (Lim and Johnson, 2002).
- Provide sufficient opportunities and time for students to practice the task in a safe environment (Haskell, 2001; Lim and Johnson, 2002)
- Use real-life examples in lectures and interactive discussions (Anderson and Beavis, 2018; Maranna et al., 2022)
- Assessments must provide the potential for testing and evaluating contextual work-related learning objectives, for example, case studies based on real-life scenarios.
- Learning tasks based on real-life tasks act as a backbone for the training program (van Merrienboer, Kirschner and Kester, 2003).
- Educators must focus on strategies at the time of learning that will later help students think flexibly and apply general principles from the course content to solve novel problems (Bransford and Schwartz, 1999).
- In organisational training, supervisor support has the highest and most consistent relationship with learning transfer concerning the work environment (Blume et al., 2010). This appears to be true even for higher education content.
- The influence of prior learning on subsequent learning achievements must be considered and utilised (Fauth and González-Martínez, 2021).

Future directions

Despite the consensus that transfer of learning is a fundamental goal of education (Forrester 2018), researchers and educators have grappled with how transfer occurs, the factors and infrastructure needed to promote transfer of learning, and the role of the teacher and student in the process (Bransford, Brown and Cocking, 2000; Haskell, 2001; Perkins & Salomon, 1992). We have hence analysed a few main transfer models and online frameworks in this chapter to aid educators in adopting them to suit their needs and the student contexts. Several suggestions that warrant further research are discussed below.

Evaluation of transfer is lacking empirical evidence. Kirkpatrick's measures are suggested to be useful for evaluating training outcomes, as they are simple yet comprehensive. The first three levels of the Kirkpatrick model are vital for evaluating the transfer process's results (Bhatti and Kaur, 2009). The changes and transformations in students due to their participation in a training program must be evaluated (Fauth and González-Martínez, 2021). It has been suggested that in transfer research, evidence must be sought around students acquiring the knowledge which then guides their performance, followed by evidence on the application of the new skills and adapting them to a variety of situations (Fauth and González-Martínez, 2021). Understanding how the course delivery method could influence inputs and outputs requires investigation (Hansen, 2008). Evidence of transfer can be assessed both qualitatively and quantitatively through transfer tests and tasks (Bransford and Schwartz, 1999; Fischer et al., 2022). Claims on transfer are considered more complex to measure than claims about immediate course outcomes. One reason is that students are no longer accessible, and evaluation relies on alumni. Other methods to evaluate skills transfer are through surveys, interviews, or focus groups with alumni, who can report back (using automated systems) to what degree and under what circumstances they were able to apply specific skills in a new setting (Fischer et al., 2022). Formal evaluation on transfer could involve observations at the workplace, journaling, or employer/supervisor assessments. In limited ways, analysing online profiles of alumni on LinkedIn or other online profiling sites might provide insights but need to be interpreted with caution due to inconsistencies around the degree to which individuals author themselves on these sites.

Conclusion

Facilitating and understanding learning transfer in the online mode is a challenge for educators. Although further research is warranted to understand learning transfer in online higher education contexts, educators can adapt existing online learning frameworks to innovate ways of integrating learning transfer to enable work-integrated learning. Strategies that cultivate learners' higher-order thinking, self-regulation and transfer should be developed, examined, shared, and recommended.

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CHAPTER FIVE

Text-to-image generative AI to produce photographic quality medical illustrations for education: potential uses and challenges with a focus on facial representation

TEXT-TO-IMAGE GENERATIVE AI TO PRODUCE PHOTOGRAPHIC QUALITY MEDICAL ILLUSTRATIONS FOR EDUCATION: POTENTIAL USES AND CHALLENGES WITH A FOCUS ON FACIAL REPRESENTATION

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Editorial Comment:

This chapter is co-authored by a professor and third-year medical students at a UK university, exploring the potential role of generative AI in addressing both the opportunities and challenges of creating novel, high-quality medical illustrations. It is argued that AI-generated images can enhance medical education by providing diverse, high-quality visuals. While legal and ethical considerations need to be considered, AI text-to-

image generation offers a promising approach to enrich learning and expand access to medical resources.

ABSTRACT

MEDICAL ILLUSTRATION HAS been crucial to medical education since early history. Photography has enhanced this in the last hundred years by providing accurate depictions of medical conditions. However, photos can be limited by issues of consent and confidentiality, especially when images of the face are required. Generative AI, using text-to-image production, can create high-quality images which may be useful for medical illustrations without needing identifiable patients. Tools like Midjourney, DALL-E, GLIDE, and others show promise, although some limitations exist. Such tools understandably have restrictions on production of certain images. This can inadvertently make the production of medical education images more challenging. Despite this, AI-generated images can support medical education with diverse, high-quality visuals. Legal and ethical considerations are important and at this current date are still not entirely resolved. However, AI text-to-image generation offers a way to enhance learning while respecting individual patient privacy and broadening access to medical resources.

Keywords: Artificial Intelligence/AI; Text-to-image; Medical illustration.

INTRODUCTION

ILLUSTRATIONS PLAY A key role in education, and this is especially true for medicine and its many specialties. Since times of antiquity, medical illustrations have been used in teaching and the use of illustrations is known to provide an important adjunct to learning for students of medicine (Gajjar et al., 2024; Hajar, 2011). For over a hundred years, the use of photography of patients has been used to illustrate medical conditions for medical students, doctors in training, and other healthcare professionals, providing an accuracy of depiction, which is important in safe medical training (Gajjar et al., 2024). The use of such photography, however, presents a number of challenges. The condition in an individual patient may not show a classic form, or might not be easily shown in a photograph.

Of extreme importance are the requirements of consent and confidentiality when seeking to obtain and use photographs of patients in medical education. The area of the body that is photographed can have relevance to the views of patients in this regard. For example, whilst almost 95% of serveyed patients were willing to consent to medical photography, 20% fewer agreed for photography of facial conditions (Pasquali et al 2019). This presents challenges for documenting specific conditions, such as Horner's Syndrome, which require full face photos for accurate representation and assessment. Maintaining confidentiality can be challenging when considering digital storage of patient photographs, yet there are no universally agreed guidelines on such photo storage (Rimoin et al 2016). Even when patient photographs with consent are limited to an individual publication, the ultimate dissemination of the article maybe unclear at outset, especially if the publication is made available online Hooda et al 1998).

We will review the current role generative AI may have in addressing these challenges in producing novel high quality medical illustrations which

are not based on individual patients, both in terms of potential and challenges.

Generative AI utilises deep learning algorithms to train neural networks using large datasets of millions of images paired against accurate descriptors (Frolov et al., 2021; Burr et al 2024). These datasets incorporate publicly available pictures and textual descriptions, accessible via the Internet and public repositories. LAION-400M and LAION-5 (with 400 million and 5,850 million image-text pairs respectively), are among the most frequently used image databases used in the training of text-to-image AI generation (Vartiainen & Tedre 2023). Despite this, data scarcity is still an ongoing concern in image datasets given the near limitless variety of text prompts for image production (Laith et al 2023). To help overcome such obstacles, emphasis has been placed on stable diffusion models such as Guided Language to Image Diffusion for Generation and Editing (GLIDE) in generative AI development (Nichol et al 2022; Zhang et al 2015). These diffusion models can portray high quality images which are not present in the image set used for the training of the program (Vartiainen & Tedre 2023; Dhariwal and Nichol 2021). Widely available tools such as DALL-E, Midjourney, Stable Diffusion and others, provide readily accessible text-to-image AI generation.

The images resulting from such text-to-image AI generation do not need an identifiable patient and yet can be of sufficient quality to greatly aid medical education.

History of Medical Illustrations

The 20th century marked a shift from manual to computer-enhanced medical illustrations, a trend that continues today. However, the history of medical illustrations dates back much further, especially in teaching anatomy. The Edwin Smith Papyrus (1600 BCE) and Sushruta Samhita (600 BCE), are early examples, depicting detailed illustrations of the nervous system and demonstrating neurosurgical knowledge (Stiefel et al., 2006; Banerjee et al., 2011). A millennium ago, Abu al-Qasim al-Zahrawi (936-1013 AD) produced text and illustrations on operations and surgical instruments and may have been the first surgeon to use illustrations in teaching (Rubalcava & Gadepalli, 2020). During the Renaissance, Leonardo da Vinci, Donatello,

Michelangelo and other artists created life-like depictions of the human figure, utilizing their anatomical knowledge. Andreas Vesalius' "De Humani Corporis Fabrica" (1543) featured over 600 woodcut illustrations, revolutionizing our understanding of human anatomy (Splavski det al., 2019). In the 19th century, Henry Gray's "Gray's Anatomy" (1858), illustrated by Henry Vandyke Carter, provided detailed dissection notes and advanced illustrations (Gajjar et al., 2024). Max Brodel (1870-1941) further transformed medical illustration with pioneering methods, depicting cross-sectional views of the brain and spinal cord, setting a new standard for medical professionals and students (Gajjar et al., 2024). The advent of photography in the 1800's dramatically broadened the availability of medical illustration production, no longer only limited to specialist artists (Roger 2023). The current rapid evolution of AI generated text-to-image generation has the potential to match the advances that photography had previously brought to the field.

The use of Text-to-image generative AI to produce medical illustrations for education.

A number of recent articles have explored the potential of text-to-image generative AI to produce medical illustrations for education. Amri and Hisan investigated the potential of DALL-E models in producing medical education illustrations of X-rays, diabetic ulcers and ECGs (Amri and Hisan 2023). The chest X-Ray quality was deemed to be under the anticipated standard and not all images showed the lung, heart and diaphragm as expected. One out of four produced ECG figure was close in accuracy but no usable images for an "Ischemic Foot Ulcer of a Diabetic Patient" were obtained (Amri and Hisan 2023). Hisan and Amri remarked that, despite these challenges, DALL-E showed great promise in medical education due to its ability to successfully simulate patient-doctor interactions in a safe environment (Amri and Hisan 2023). A similar issue was noted when using text-to-image generative AI in paediatric dermatology were inaccurate and unsatisfactory in all tested conditions barring acne (Lim et al.,2024).

An alternative text to image model is GLIDE which can produce photorealistic results yet can also produce incorrect results, such as generating an image of a gravestone when asked for a histopathological

image of Grave's disease, a medical condition with an overactive thyroid gland (Kather et al., 2022). GLIDE was deemed to reach a score of 3 out of 4 in terms of accuracy in generating histopathology images, showing great promise of potential future use in medical education, a view also seen in dermatology image production (Kather et al.2022; Shavlokhova et al.2023).

There has been significant development in natural language processing over the last few years. This has ensured the production of copious amounts of data from newer language-generative models, pathway language models (PaLM) and large language models (Singhal et al 2023) . There have also been recent advances in multimodal processing in deep learning that has helped with the processing of computer visual data by large models. Resultant newly developed and refined AI models can now create images from spoken language and vice versa (Kim et al., 2024). Despite this progress, limitation in the accuracy of produced images still remains an issue with either omission of crucial details or addition of inappropriate features. For example, when producing detailed images of the skull via DALL-E in (Noel 2024), there was a clear lack of suture lines with missing alveolar processes and inaccurate presentation of teeth. Such problems can sometimes be circumnavigated by re-running the request many times until a satisfactory image is produced. This however requires specialist knowledge to decern the images correctly.

A well-recognized feature used to distinguish AI-generated facial images from real faces is the appearance of the eyes (Miller et al 2023). Despite improvements in AI text-to-image generation, the eyes remain a key factor in differentiating the two. One notable characteristic observed across various AI generation tools is the tendency of some face images to show small, excessively white, areas in the conjunctiva (the 'whites' of the eyes). This appearance gives the appearance of excessive shine or glaring of light on the conjunctiva and can range from being subtle to being very pronounced. Figure 1 illustrates this phenomenon using images created with Microsoft Copilot (which in turn utilises DALL-E 3) but we have seen them from other text-to-image AI generation tools as well. These images are therefore representative of generic AI-generated images and not meant for tool comparison.

Figure 1: Illustration as a generic example of the excessive conjunctival white appearance commonly seen in AI text to image generation (arrows). This illustration was produced using Microsoft Copilot/DALL-E 3 but is not specific to any one AI generator tool and only serves here as a generic example which can be seen with other AI text-to-image generating tools. Prompt used: ‘Draw a detailed human face’ Produced with Copilot/DALL-E 3 22/2/2025

Figure 2 shows the best 9 of 20 consecutive results, (as judged by TY on anatomical grounds), following the prompt "Draw a detailed human face." The best 5 images did not show any significant abnormal conjunctival white patches and were of very good quality. Of the best 9 images, the majority exhibited the conjunctival excessive white patches.

Figure 2: Excessive white areas on or around the conjunctiva as illustrated in 5 of the best 9 images taken from a total of 20 consecutive images in response to the prompt: "Draw a detailed human face." Produced with Copilot/DALL-E 3 22/2/2025

The prompt "Draw a detailed human face" produced at least 3 images of very high quality out of 20 sequentially produced images and these are shown in the top row of Figure 2. To try and further improve the proportion of very high-quality facial images, we tested an alternative prompt: "Draw a detailed human face without any shine or glare." The results are shown in Figure 3 shows. Again, a number of very high-quality images were produced, as shown in the top row of Figure 3. However, this additional prompt alone was insufficient to eliminate the issue with significant conjunctival excessively white areas seen in a similar number of the resultant images to that seen with the original prompt where no specification about shine or glare was made:

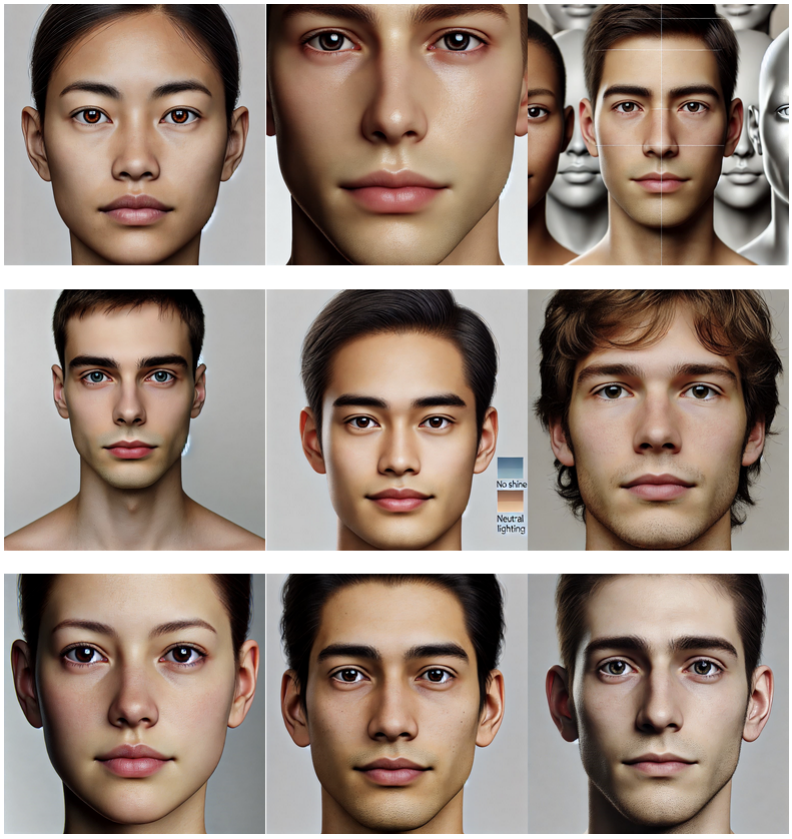

Figure 3: Excessive white areas on or around the conjunctiva as illustrated in 4 of the best 9 images taken from a total of 20 consecutive images in response to the prompt: "Draw a detailed human face without any shine or glare appearing in the image." Produced with Copilot/DALL-E 3 22/2/2025

We then tried requesting in the prompt for text-to-image generation that the face be wearing glasses. Our hypothesis was that reflections confined to the glasses' 2-D surface would be more achievable than reflections on a 3-D eyeball. With the use of the prompt "Draw a detailed human face wearing glasses", none of the resulting images had any significant abnormal conjunctival shine. Indeed, the eyes in their entirety had a very good appearance in all the resultant images. The top 9 out of the 20 images produced sequentially to this prompt are shown in Figure 4. All 9 images were felt to be of very high quality with only one demonstrating any significant excessive white-and this was in association with the skin under the rim of the glasses, not near to the conjunctival area (bottom right image Figure 4).

Figure 4: No excessive white areas on or around the conjunctiva were seen in any of 20 consecutive images in response to the prompt: "Draw a detailed human face without any shine or glare appearing in the image." The best 9 images of those 20 are shown here and all were deemed to be of very good quality. Produced with Copilot/DALL-E 3 22/2/2025

Our findings suggest that adding a prompt about wearing glasses may markedly improve the quality of the eye appearance in the resulting AI-generated images, reducing the risk of excessive conjunctival glare appearance. In our 20 consecutive produced images to such a prompt, none showed the appearance of excessive conjunctival glare. We are not aware of any previous literature having demonstrated that this simple modification could benefit the subsequent fidelity of the eye appearance-and by virtue of this the quality of the whole face-with AI text-to-image production.

A number of articles have been published within the last two years demonstrating the potential of text-to-image AI generation in medical education. These have included images including the face-such as a dilated pupil a generic medical scenario of neck swelling (Burr, Kumar and Young 2024) using DALL·E 2 and Midjourney. They generated 120 images depicting a middle-aged Caucasian woman with the facial features of hypothyroidism, with the best image deemed by the medically qualified authors to meet required standards (Kumar, Burr and Young, 2024). However, text-to image GenAI generated inadequate medical images in asymmetrical conditions such as Horner's syndrome even when 120 images were generated, and secondary editing was necessary for the image to reach a sufficient standard (Kumar, Burr and Young, 2024). These inaccuracies likely stem from a limitation of GenAI's training datasets, which may not contain clinically accurate examples. Current GenAI tools rely on generalised image data that may not capture the precise details in medical presentations. Another study using ChatGPT's DALL·E 3, evaluators deemed that only 2.5 percent of 110 cardiac images were anatomically accurate with only 1.2 percent deemed to be useful (Mohamad-Hani Temsah et al., 2024).

Using GenAI to generate images of medical conditions or presentations is not the only way it can be used in medical education. There is potential to generate images for other uses, such as narrative medicine in understanding important concepts. This is highlighted by Huston and Kaminski, who generated an image of "an expressive oil painting of the lungs and the earth" to convey the idea "we are what we breathe" (Huston and Kaminski, 2023). Another study addressed the sensitive topic of bullying in nursing education by using GenAI to create a meaningful graphic (Tran et al. 2024), demonstrating the uses of GenAI outside clinical imagery. These uses were described in a literature review, ranging from images being used as 'icebreakers' to images being used to 'brighten' a topic (Norris, 2012).

Challenges associated with text-to-image generative AI

Despite the great potential of text-to-image generative AI, several key concerns do need to be considered. Diversity in medical illustrations is imperative to represent the spectrum of patients encountered in clinical practice. This is particularly significant in fields like dermatology, where

conditions can manifest differently depending on skin colour. Yet medical textbooks often fall short in representation, with over 90% of images in textbooks in a European-based study depicting white and fair-skinned individuals (Fitzpatrick skin types I–III). Comparable disproportionate representation of white skin colour were shown in separate study using the prompt 'face of a doctor in the United States' (Lee et al. 2024). If existing databases lack examples of certain skin conditions in darker skin tones, AI may be constrained in its ability to produce accurate and diverse images. This underscores the need for a broader and more representative dataset to support AI-generated imaging.

There are important legal aspects to text-to-image generative AI which can overlap with ethical questions of use of images of self or images produced by others. If copyrighted materials were used to train the models used in generative AI image production both this, and resulting image outputs, might represent a copyright infringement (Kivus 2024). The current United States (US) Copyright has been in existence since the beginning of 1978 and is broad in what might be deemed original work, although current interpretation excludes work produced by generative AI unless there has been significant additional input (editing) by a human author (Kivus 2024).Thus it may seem that there is a potential double jeopardy for existing text-to-image generative AI. On the one hand, there is the danger of encroaching the copyright of others depending on the training material used, yet on the other hand, images produced, even though they represent new data, are free of copyright themselves unless there has been significant human editing. The legal ramifications may gain clarity in the next few years depending on the outcomes various legal cases. As of early 2024 cases based on the use of copyrighted input material have not yet been successful, but there is an increased focus on claims based on the output of generative AI (Kivus 2024).

With such concerns it might be concluded that the risks of using text-to-image generative AI outweigh the benefits. However, there are counter arguments. The issue of diversity appears to largely reflect the existing perpetuations of stereotypes and inequalities. Given that text-to-image generative AI can be adjusted by varying the text input, this could be an opportunity for such images to highlight existing inequalities in representation and tackle these. Regarding the legal concerns, it may be that existing laws might potentially be used to justify copyright fair use on the

grounds of use in teaching (Kivus 2024). It might even be argued that the training of AI image generating tools using multiple existing images mimics the process of many human artists who may perfect their artistic output through viewing numerous works of art by others as they learn their skill. Finally, there is a reality that some educators might be tempted to simply perform an internet search for an image and use the most appropriate image that comes up. That might be allowable in certain circumstances with appropriate referencing. However, it would still be direct use of an original work whereas the use of text-to-image AI generation appears to be at least one step removed from that. Given the widely available nature of these tools, their use may allow greater access globally to medical education in areas where access to paid medical journals or textbooks may not be readily available (Haragi, Ishikawa and Kiuchi, 2019). Finally, it is important to remember the many patients who selflessly consent for their images to be used in medical education. The use of text-to-image generative AI may avoid the need to ask them to make such a decision and might in turn help students of medicine to use the resulting new images to learn to recognise many vital physical signs that make up clinical medicine.

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CHAPTER SIX

Science Beyond the Syllabus: Undergraduates' Perspective of Scientific Sources and Teaching Methods that Support Continuous Learning

SCIENCE BEYOND THE SYLLABUS: UNDERGRADUATES' PERSPECTIVE OF SCIENTIFIC SOURCES AND TEACHING METHODS THAT SUPPORT CONTINUOUS LEARNING

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Editorial Comment:

This chapter presents preliminary findings from a study conducted across several UK universities, investigating the sources bioscience undergraduates use to access scientific information and the teaching methods they consider most effective. Gaining insight into students' perceptions enables teaching methodologies to evolve alongside advancing technologies, supporting a more effective and adaptive future of education.

ABSTRACT

Science teaching and science communication has seen dramatic changes in recent years. Bioscience undergraduate students navigate through numerous sources of scientific information from both within and outside of the classroom. Survey analysis identifies that students continue to value traditional methods of teaching, but student demographics such as gender and disability status can influence perceived effectiveness of various teaching methods. In addition to receiving scientific information from academic sources, students frequently utilise less traditional sources, such as YouTube or social media, to aid their understanding. Use of these sources is influenced by topic and level of complexity of information required. As educators, it is important to be aware of how students prefer to gain information and provide them with the tools to utilise these sources appropriately.

Keywords: Science communication, Science education, Pedagogy, Higher Education

INTRODUCTION

SCIENCE COMMUNICATION, BOTH within and outside of academic settings, has seen dramatic changes in the last five years. The COVID-19 pandemic thrust science into the global spotlight, with an overwhelming influx of scientific information from diverse sources, many of which lacked reliability. Misinformation was widely spread, with social media platforms catalysing the dissemination of false and inaccurate information (Ferreira Caceres et al. 2022). In April 2020, Higher Education (HE) institutes in 185 countries were closed, affecting over 1.5 billion students (Marinoni et al. 2020). This abrupt shift demanded rapid adaptation in teaching, with a heavy reliance on technology and online platforms. Traditional face-to-face teaching methods were replaced by online video calls and virtual learning environments, where asynchronous learning became common. However, students studying in these asynchronous settings described a lack of peer-centred activities and a lower overall satisfaction with the teaching semester (Fabriz et al. 2021). As higher education institutions are now settled into a post-pandemic phase, flexible and blended learning environments have become more prominent. This raises the question: has the optimal balance between pedagogy and technology for supporting lifelong learning been achieved?

The evolution of teaching methods within higher education has seen a marked shift. Traditionally, lectures and textbook-driven learning were dominant, but the rise of digital tools, interactive platforms, and flipped classrooms has changed the way students engage with course material (Castañeda and Selwyn 2018; Akour and Alenezi 2022; Baig and Yadegaridehkordi 2023). Online learning resources such as videos, interactive online quizzes, and virtual ‘dry’ labs have become common, offering opportunities for self-paced learning (Pichardo et al. 2021; Francis et al. 2022). However, despite the convenience and accessibility of these

resources, the increasing reliance on technology calls for careful consideration of how these tools complement the role of more traditional methods in guiding students through their learning journeys.

Simultaneously, students in today's educational landscape are exposed to an ever-expanding range of 'scientific' sources, both from within and outside of the classroom. Educational websites, blogs, podcasts, news articles and social media platforms all present a vast array of scientific information and may utilise tactics such as humour and attention-grabbing phrases to entice their audience (Yeo et al. 2021; Kiernan et al. 2023). While some of these sources may be considered trustworthy, others may present inaccurate or biased information. The rapid spread of misinformation has raised concerns about students' ability to critically evaluate the scientific content they encounter (Puig et al. 2021). With the abundance of information available, it is essential for educators to equip students not only with the skills to access relevant and credible sources but also to critically assess scientific information from a variety of platforms.

Understanding how undergraduates access, evaluate, and utilise scientific information, as well as their perceptions of effective teaching methods, is crucial for the future of higher education. This knowledge will inform the development of educational strategies that can better prepare students to navigate an increasingly complex information landscape, both within academia and beyond. Furthermore, such insights can guide the design of curricula that blend the best aspects of traditional and digital learning approaches to foster critical thinking, information literacy, and lifelong learning skills.

This chapter presents the preliminary findings of a PhD project aimed at identifying the sources from which bioscience undergraduates obtain scientific information and exploring the teaching methods they perceive as most effective. By examining students' engagement with traditional and digital scientific resources, as well as their learning preferences, this study seeks to contribute to the ongoing conversation about how to best equip students for the challenges of navigating scientific information in the 21st century.

Methodology

A survey was designed to provide a broad understanding of student utilisation of sources of scientific information and their perception of common HE teaching methods. It has been designed to serve as a precursor to a series of interviews which build upon the survey themes in more depth. To maximise participant engagement, the survey was designed to remain as succinct as possible to minimise completion time. A range of question styles were used, including multiple choice questions, rating scales, free text responses and Likert questions. The use of Likert questions offers many benefits: they are very quick to answer, the questions do not take up a lot of space in the survey, and they can allow more powerful statistics to be used when analysing the results (Harpe 2015). The survey was divided into sections: Demographic Background, Receiving Scientific Information, Topics of Scientific Discussion, Understanding of Biosciences and Teaching and Learning.

The survey was disseminated via email to bioscience undergraduate students, firstly to Cardiff University and then to an additional 53 UK universities. From the 459 responses, 77% were from Cardiff University, and the remainder were from a further 8 Universities. 95% of respondents were aged 18-24, and the demographics were highly representative of the UK undergraduate population. Statistical analysis was performed in R Studio version 2024.9.0.375 (Posit Team 2024).

Thematic analysis of free text, open-ended comments was performed using the method outlined by Braun and Clarke (2006).

Results and Discussion

Perception of Teaching Methods

The Teaching and Learning section of the survey focussed on university teaching methodologies and asked students to rate their impact on supporting their learning. Pre-recorded lectures flipped learning and small-group workshops were all rated similarly, with approximately 70% of respondents rating these as at least somewhat effective (Figure 1). Live lectures were rated very highly, with 91% of respondents rating this method of teaching as at least somewhat effective. Although the traditional didactic teaching used in

lectures does not support active learning, numerous active teaching strategies can be incorporated into the lecture to increase engagement and support deeper learning (Graffam 2007; Revell and Wainwright 2009; Hailikari et al. 2022). In-person practical teaching, such as practical lab work, was rated as the most effective teaching method, with 92% of respondents regarding these as at least somewhat effective (of which 75% rated this very effective). Practical teaching encourages 'learning by doing' and promotes active learning through student collaboration and discussion. However, it is relevant to note that both live

lectures and laboratory sessions are considered the traditional way of teaching science, and this is how many students expect to be taught at university. Therefore, this may influence their perception of learning. Indeed, in a randomised controlled experiment by Deslauriers et al. (2019), college students were shown to learn more through active learning than passive learning but actually perceived themselves to have learnt less, possibly due to the increased cognitive load active learning requires.

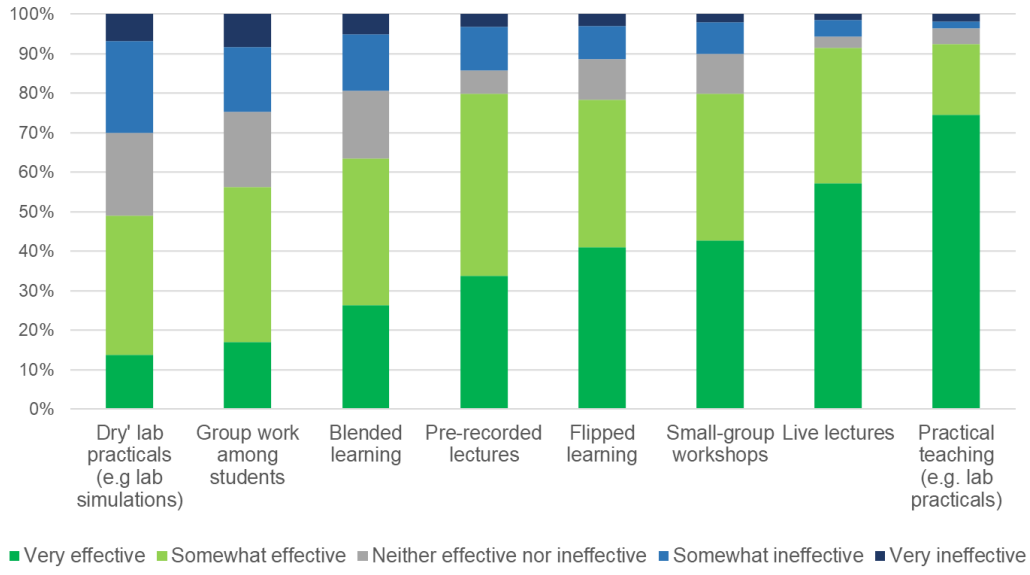

Figure 1: Perceived effectiveness of teaching methods. Rated by UK bioscience undergraduate students.

The responses highlighted that our students' perception of learning does not always reflect the known benefits of different pedagogical practices. For

example, ‘dry’ laboratory practical sessions (such as lab simulations) and group work were rated as the least effective methods of teaching relative to the other methods outlined in Figure 1, although 49% and 56% of respondents rated them as at least somewhat effective respectively. However, both methods are highly conducive to active learning and offer the potential for a deeper understanding of the topic compared to more traditional didactic methods of teaching (Rutherford 2015; Francis et al. 2022). An interesting observation, at least at the author’s home institution, is that these methods of teaching are relatively infrequently used and raises the question of whether there is a correlation between perceived value and frequency of exposure.

Chi-squared tests were performed to determine whether the perceived effectiveness of teaching methods was influenced by gender or students’ disability status. Although the influence of gender was not significant for the majority of teaching methods, males rate group work as being significantly more effective than females ($X^2 = 11.23$, $p < 0.05$). Furthermore, students who identified as disabled rated small group workshops significantly higher than non-disabled students ($X^2 = 11.76$, $p < 0.05$). This reinforces the importance of using a variety of teaching methods to support the learning requirements of all students.

Have you experienced this, and would you trust it?

The Receiving Scientific Information section of the survey aimed to identify participants’ perceptions of, and trust in, information sources. Respondents were presented with various scenarios which had been designed to reflect experiences from which they may have received scientific information. They were asked if they had experienced a similar situation, whether they would trust the source of information, and whether this experience would have a large impact on them. When asked if they had seen a self-identified doctor on YouTube, giving medical advice on YouTube, 55% of respondents claimed to have seen such a source, and of those, 77% would trust this information source. Almost all respondents had seen a national healthcare advert on social media and a nature TV documentary by a well-known presenter, Sir David Attenborough, (96% and 94% respectively) and 89% of respondents would trust each of these situations. Therefore, it is clear to see that our students are heavily impacted by scientific or medical sources outside of the

classroom. Somewhat reassuringly, 94% of respondents reported that they would trust a lecturer or researcher giving a lecture.

Frequency of Source Use

The next area of focus in the survey was assessing the frequency of use of different resources. Respondents were asked how frequently they would utilise each source to specifically gain scientific information (Figure 2). Although we know that social media features heavily in young people's lives (Ofcom 2024), the majority of respondents do not use short videos on social media specifically for scientific content, however, 41% would use it at least occasionally. In comparison, YouTube videos are used more frequently, with 70% of respondents using them at least occasionally. Encouragingly, our students most frequently use peer-reviewed scientific articles as their scientific sources, closely followed by textbooks and through discussions with qualified experts.

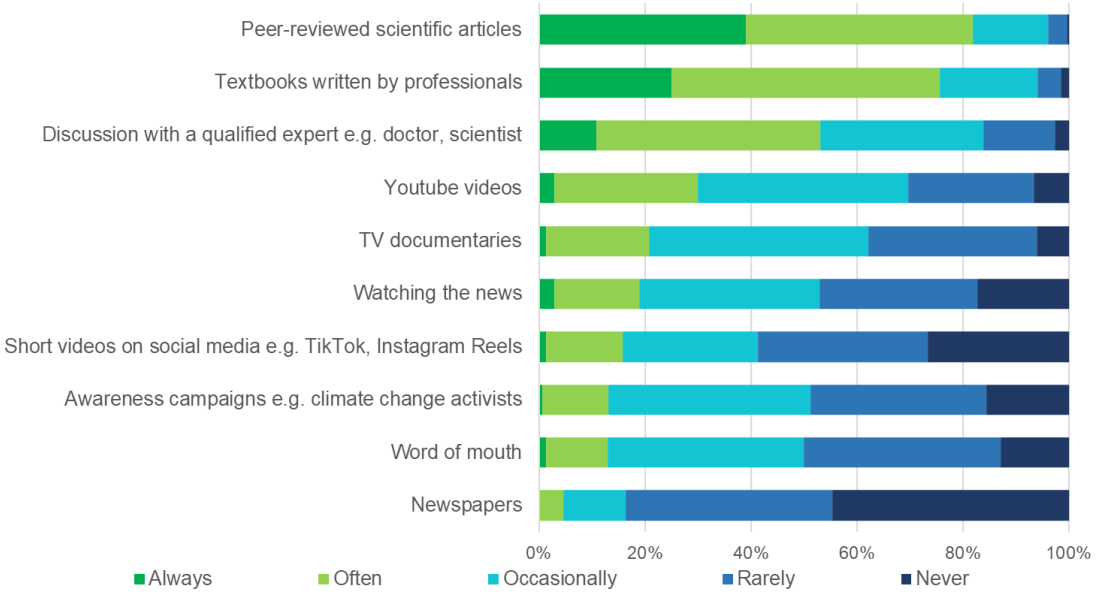

Figure 2: Frequency at which respondents utilise sources for scientific information.

Chi-squared tests were performed to determine whether frequency of source use was influenced by gender. Interestingly, males utilise YouTube videos more frequently ($X^2 = 11.89$, $p < 0.05$), whereas females are more likely to discuss the topic with an expert ($X^2 = 10.34$, $p < 0.05$) or read a textbook on the subject ($X^2 = 13.06$, $p < 0.01$).

What source(s) when?

Respondents were given a free-text option to clarify their use of scientific sources and identify any additional sources not previously mentioned. Following thematic analysis of these comments, some interesting themes emerged (Table 1). Notably, respondents would utilise a particular source for a specific topic; for example, information about climate change and environmental issues was commonly gained from TV documentaries. Secondly, social media and YouTube were often utilised to gain general information on a topic, however, if the student was particularly interested in the topic or questioned the reliability of the source, they would turn to peer-reviewed articles for more information. It is important to note here that one does not necessarily actively seek information from social media, it is very easy to fall into the trap of 'doomscrolling', whereby an algorithm aims to capture your attention by showing you content tailored to your interests, which is itself associated with social-media addiction (Satici et al. 2023). In this case, if a respondent sees something interesting, it may inspire them to actively seek more information from another source.

Table 1. Respondents' usage of sources of scientific information.

Source	**Usage**	**Example**
Scientific articles	Commonly used to further knowledge in a specific area.	"I read journal articles if I want to have a more in depth understand of a certain area of research."
Lectures and lecturers	Used for the majority of scientific information and to highlight current research.	"I get the most of my scientific knowledge from lectures given by professionals." "I often gain insight into ongoing research from lecturers."

Source	Usage	Example
YouTube	Commonly used to gain background information or overview on a subject or as a revision aid.	“I watch YouTube videos when I don't understand a topic and want to have a better structure of the concepts.” “…in addition to watching videos on YouTube, which I tend to do for most topics as I find it easier to digest.”
Textbooks	Reading educational textbooks written by professionals in a particular subject.	“I get most of my scientific information from reading textbooks.”
TV	Predominant use of TV relates to documentaries being used specifically for climate or environmental information.	“I learn some more about topics like climate change and similar impacts of other issues on the environment from media such as TV documentaries or news articles.” “I get most of the climate change knowledge I receive now is from TV documentaries.”
Social media	For example, Instagram, TikTok. Commonly used for environmental or health related topics. This may inspire further research.	“So for climate change I'm more likely to learn from sources such as social media (Instagram, specifically).” “I often see scientific ideas floating in tv documentaries, social media streams and awareness campaigns which then inspire me to do further research myself.” “COVID-19 I got a lot of my information from the news and social media.”

Source	Usage	Example
Science websites	For example, science-specific news websites or educational websites.	"Websites like medical news today." "Sometimes I'll use science websites, particularly for anatomy/disease etc."
Peers or students	Discussion with students on the same course, students from other courses or with peers.	"Discussion with current students studying similar topics." "Talking with my housemate/friends who also study bioscience."

By understanding when and how students utilise sources of scientific information, relevant support regarding critical examination of the source can be implemented. For example, educators may wish to encourage students to think about the relevance and age of the information, the expertise of the author and the purpose of the source, or direct students to resources such as Web Literacy for student Fact-Checkers (Caulfield 2017).

Conclusions

Traditional teaching methods continue to be perceived as most effective

In general, students rate the effectiveness of common teaching methods utilised in Higher Education highly. Whilst some elements of education can be successfully altered to an online or asynchronous format, bioscience undergraduate students greatly value in-person lab sessions and lectures. However, it is difficult to judge 'lectures' as a singular method of teaching, as each lecturer provides varying levels of passion, enthusiasm and engaging elements to the lecture. For example, integrating short consolidation exercises, pop quizzes and 'think, pair, share' type activities can promote active learning within a traditionally didactic setting (Revell and Wainwright 2009). It is important to note that there is no 'one size fits all' approach, as student demographics, such as gender or disability status, influences how effective students perceive a particular method of teaching to be.

Although the respondents to this survey were bioscience undergraduates, the demographics of the respondents were highly reflective of the whole UK undergraduate population and therefore these results may provide insight to a broader range of undergraduate disciplines. By understanding the perceptions of undergraduates, teaching methodologies can evolve alongside changing technologies for an enhanced future of education.

Education continues beyond the classroom

Students also are heavily influenced by sources of scientific information from beyond the classroom. It is important to acknowledge the ever-increasing exposure to social media and the positive and negative potential this has to influence daily lives. It is our role as educators to equip students with the knowledge and skills to effectively evaluate the authenticity and reliability of these sources, so that students may continue to utilise them with confidence to support their taught curriculum and enhance their lifelong learning.

Utilisation of multiple sources for different topics or levels of knowledge allows students to gain a more holistic approach to learning; for example, unexpectedly viewing a video on social media which has been targeted specifically to catch the viewer's attention may, in itself, be of questionable nature, but this may inspire the learner to undertake further research using peer-reviewed sources. Viewing the landscape of scientific sources through the lens of an undergraduate student allows the educator to tailor their teaching to acknowledge and encourage the appropriate use of external sources of information for a future-proof education.

Future Work

This chapter report outlines the preliminary stage in a longer-term project. Subsequent work has involved qualitative data from interviews to gain a deeper understanding of why students have particular preferences of receiving scientific information, and the process they undertake to evaluate the reliability of that source. A wider aim is to broaden this study out to members of the public, to assess their source use in comparison.

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CHAPTER SEVEN

A step change in education: Generative AI, Ethics and Transformation for Higher Education

A STEP CHANGE IN EDUCATION: GENERATIVE AI, ETHICS AND TRANSFORMATION FOR HIGHER EDUCATION

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Editorial Comment:

Generative AI is here and an active part of students' lives. Instead of attempting avoidance, the authors encourage acknowledging and even using AI, alongside reorienting and redesigning assessment. This new approach encourages teachers and students to engage, think, and actively demonstrate their knowledge while embracing technology.

ABSTRACT

Generative AI systems such as ChatGPT, Gemini and Llama, are transforming higher education by introducing opportunities for enhanced learning and personalised education. These systems are disrupting traditional pedagogical approaches while presenting ethical dilemmas around academic integrity, equity, and intellectual property. This paper examines the impact of generative AI on higher education, addressing its disruptive potential, ethical challenges, and pathways for responsible integration into teaching and assessment. The focus of this paper is on the impact in Higher Education, though most of the issues are relevant to earlier stages of education and reflect wider issues for society.

Keywords: Generative AI; Higher Education; Technology Enhanced Learning; Ethics

INTRODUCTION

The advent of generative AI tools has marked a new era in education. Unlike earlier technologies such as search engines, these tools autonomously generate comprehensive responses to user prompts, producing content that ranges from essays to code, pictures, and videos. These tools can generate content from many perspectives, even creating entirely fabricated descriptions and critical reflections of work (not) done. This innovation challenges conventional teaching and learning methods, meaning that educators must rethink instructional strategies, assessment models, and ethical considerations. However, the rapid iteration of AI technology poses significant challenges for educators. They not only require time to understand and master the effective use of AI tools but must also constantly adapt to changes or relearn skills caused by the swift pace of technological advancements.

Generative AI, as a transformative force, offers the promise of personalised and efficient learning experiences. However, it also disrupts traditional pedagogies, creating widespread concerns and challenges including academic integrity, overreliance on generative AI, safety and data privacy, ethical risks of use and fairness in resource access (DfE, 2024).

In higher education, generative AI offers new paradigms for teaching, learning, and assessment. While these AI systems have the potential to enhance accessibility, efficiency, and creativity, they also raise pressing concerns about equity, intellectual property, and academic honesty. There are concerns about the accuracy of the results, with these systems often producing non-specific generic content or hallucinating to offer incorrect, yet plausible, responses (Lo, 2023). There is also an implied duty on education to prepare our students for living and working in an AI facilitated world.

These challenges necessitate a careful, ethical approach to integrating generative AI into academic settings. This paper explores the profound impact of generative AI on higher education, with an emphasis on ethical and practical considerations (Hutson et al, 2022).

Generative AI and Higher Education

The evolution of computer technology in education

Over decades, educational technology has progressed from the use of basic computing tools to advanced AI systems. Key milestones include:

- The rise of the internet, enabling global access to information.
- The proliferation of search engines, simplifying fact-finding.
- The emergence of AI-assisted platforms for automated tutoring and grading.

Generative AI systems outdo these advancements, fundamentally altering the landscape of education. Tools like ChatGPT and Llama, coupled with AI-integrated word processors and media creation platforms, can enable students and educators to generate increasingly sophisticated outputs effortlessly. These capabilities disrupt traditional learning paradigms, rendering established assessment practices insufficient for gauging genuine understanding and effort.

A Step Change in Learning Technologies

Generative AI marks a departure from its predecessors in several ways:

1. Autonomy in Output Creation: Unlike search engines that return existing content, generative AI is trained on existing content to produce new responses, tailored to specific prompts. Whilst there is ongoing debate on the level of this originality, and in recognising the origin in terms of intellectual property(ipr), the content can appear both original and relevant. Prompt engineering is a growing area, where experience and

shared practice, as well as improved platforms themselves, means that the likelihood of receiving useful results is improving.

1. Integration Across Platforms: These tools are increasingly embedded within commonly used software in the way that spelling and grammar checkers have long been added to word processors. This means the process of creating content is changing, and the separation between the author and the tool is becoming less clear.

1. Potential for Personalisation: AI systems can adapt to individual learning needs, providing customised feedback and support. With the potential to personalise existing AI models, train bespoke large language models (LLMs) based on resources, and utilise AI based avatars, there is now scope to offer 24/7 artificial support to students directly based on their learning, freeing up staff resources from answering simple queries.

These advancements challenge traditional educational frameworks, particularly those reliant on summative assessments like essays and exams, or where the assessment relies on a particular artefact such as an image, a report or software.

Observations

Why is Generative AI such a disruptive technology for education?

Whilst established search engines, such as Google, Bing and Yahoo, offer easy access to resources, they still require that the user (e.g. the member of staff or the student) collate and marshal the information into their own structure and words. Whilst it is possible to potentially find and use a full document or contract someone to generate it through an essay mill, it is reasonable to assume that a student doing that would understand they are committing some level of academic malpractice. However, with generative AI, the user can have a slightly different perception: since they create the

questions and prompts, and the output is unique, they may feel they own the outcome and can use it as their own work. This alters the dynamics and is causing questions across society in terms of who should be recognised for content from generative AI systems, and how should that be acknowledged.

Revolutionising Educational Practices

Generative AI enables a shift from passive to active learning by:

- Allowing students to explore complex ideas interactively.
- Supporting educators in designing innovative course materials.
- Offering immediate feedback on assignments, enhancing the learning process.

For example, tools like GitHub Copilot assist in coding assignments, while DALL-E facilitates creative projects in design and media courses. These tools empower students to focus on higher-order skills, such as problem-solving and critical thinking.

The range of generative AI systems, such as ChatGPT, Gemini and LLaMA, and other AI platforms such as Dall-E and Midjourney for images, or AlphaCode and GitHub copilot for programming, and the increasing integration of these systems into search tools, word processors, software development environments, document management systems, and emerging multimedia tools further obscures the idea that they are distinct from a user perspective. They can be seen as akin to built-in clip art or other samples and templates that software has offered in the past. However, generative AI can create entire solutions with relatively little user prompting, and this will only get more effective as the larger models are launched. They can also explain answers as they provide responses that follow the patterns that have been established for answering questions. For example, ask a generative AI system to solve a problem, and rather than simply giving a solution it will outline its approach, provide a solution, and summarise what it did. It may also give alternative options and comprehensively compare and contrast the approaches. This sort of material may well be sufficient to pass assessments, and also could guide a student in how to explain the work they submit without the student understanding the work: this offers the potential for rote learning of the what and the why.

Challenges in Assessments

Traditional assessments are vulnerable to AI misuse. Essays and reports, once considered reliable measures of student understanding, can now be generated by AI with minimal input. This raises questions about the validity of these assessments and the authenticity of student work (Tenakwah et al, 2023). Examples of potential misuse:

1. Generated Essays: Students may submit AI-generated essays without engaging in the underlying research.

1. Solution Automation: In technical fields, AI can generate code or solve mathematical problems, bypassing the learning process.

1. False Representation: When assessing work done via a report or presentation, AI can generate a narrative which appears to be genuine but does not reflect the student's actual engagement.

1. Teachers find themselves in a dilemma, particularly in the context of ambiguous or lack of assessment policies for AI-generated contents, making it challenging to conduct scientific, rational, and fair assessments.

The ethical challenge of Generative AI in learning and teaching

As mentioned, there are many potential problems or challenges for educators and for students. There is the general ethical use of such models, then there is the question of potential bias in the models. The models may present content that is open to legal dispute. The use of these systems may mean that data is

inappropriately shared, for example proprietary or personal data can be used. Furthermore, they can hallucinate and produce fake results.

The ethics of this is challenging – some academic staff say they have used generative AI to create lecture content, quizzes, exam questions, and even programme specifications all using AI - all without acknowledging it. So, it is hardly surprising that students may pursue a similar path. If we use generative AI, trained on content created by others, to create novel content, who really owns the output? If we generate images, or computer code, then whose property is that and can we claim originality?

Another ethical question is on equity and fairness. For instance:

- Representation Bias: Generative AI systems inherit biases from their training data (Mhlanga, 2023); AI may perpetuate stereotypes present in its dataset.
- Access Inequities: Premium AI features, often gated by paywalls, create a divide between students with different financial means.

LLM algorithms can reflect societal biases and issues, since they are trained on large datasets that can embed and cement societal inequity. Another issue here is on access to these systems: whilst some are free, others are paid for or offer better facilities if paid for. This new digital AI-divide could affect student work and their outcomes. These issues undermine the principles of fairness and inclusivity that underpin higher education.

A framework for the ethical use of generative AI in teaching and learning

As generative AI systems become increasingly prevalent, the idea of banning them is not tenable. Some of the specific ways we are addressing this, and that others could adopt are:

1. Acknowledge the use of AI to create content.

- Clearly state when and how AI tools were used.
- Cite AI contributions in assignments and research, treating them as co-creators.

Many academic institutions now have guidance for students and staff on how to cite the use of these tools. Staff should ensure flag material as having "synthetic content," and/or explicitly cite the Generative AI source for material whether text, images, code, or other media. Similarly, students should be trained in how to effectively and appropriately use such tools.

2. Design assessment allowing for the use of AI:

Educators need to move away from traditional summative assessments and adopt models that emphasise process and understanding. Traditional assessment such as an end of module essay or report are susceptible to the worst side of these tools. Focussing on process, where students develop a solution, explain how they got there and provide evidence of the process can be a more authentic and effective way to allow for the functionality of these systems and their impact on students.

Examples include:

- Iterative Projects: Tracking student progress over time.
- Interactive Assessments: Requiring students to explain their work, ensuring comprehension.
- Scenario-Based Tasks: Designing assignments with real-world constraints that challenge AI capabilities.
- The Joint Council for Qualifications (JCQ, 2023) published guidance and best practices in preventing and identifying potential malpractice in non-examined assessment in the context of AI use.

3. Optimise AI use within activities.

Rather than banning AI tools, institutions should teach students to use them responsibly. For instance:

- Using AI for brainstorming and ideation.
- Encouraging critical evaluation of AI outputs to identify errors or biases.
- Integrating AI as a collaborative partner in group projects.
- Validating work using AI and prompting further, deeper engagement.

By designing learning and assessment activities that encourage and require appropriate use of AI, these tools can function as critical friends, artificial partners, or even virtual tutors, when developing solutions. These generative AI tools, alongside more traditional AI approaches, should open new opportunities for truly flexible learning. Part of the focus then will be on how we train students in how to report their engagement with these AI systems.

4. Revising curricula to allow for the use of AI.

Generative AI should be considered when specifying degrees and modules now, so that learning outcomes and competencies focus on the human aspects of learning and recognise that some traditional outcomes have a different level of importance and form. For example, knowledge recall and the organisation of knowledge become quite different for education in a generative AI context. Curricula should prioritise competencies that AI cannot easily replicate, such as:

- Ethical reasoning and decision-making.
- Creative problem-solving.
- Interpersonal communication and teamwork.

These skills ensure that graduates remain relevant in an AI-driven workforce.

Case Studies of Generative AI in Practice

Case Study 1: AI in Programming Education

In coding courses, tools like GitHub Copilot provide real-time code suggestions, enabling students to experiment with different approaches. However, this can lead to over-reliance on AI, reducing opportunities for foundational skill development.

Solution: Implement larger, authentic assessments that require students to explain and debug AI-generated code, fostering a deeper understanding of

programming concepts.

Case Study 2: AI in Creative Arts

Design students using DALL-E can generate complex visuals from simple prompts. While this expands creative possibilities, it raises questions about originality and authorship.

Solution: Encourage students to document their creative process, including how they refined AI-generated outputs to meet specific project goals.

Case Study 3: AI in Business Education

Generative AI tools like ChatGPT are increasingly being used in business simulations, helping students draft reports, analyse market trends, and develop strategic plans.

Solution: Require students to critique AI-generated analyses, identifying strengths, weaknesses, and potential improvements.

Conclusions

Where next for education in a Generative AI world?

The emergence of AI means that we need to consider the role of educators, what and why we teach, and how this is managed.

Redefining the Role of Educators

Educators must transition from being sources of knowledge to facilitators of learning. Their role will involve:

- Guiding students in using AI tools effectively.
- Encouraging critical thinking and ethical behaviour.
- Designing assessments that measure competencies beyond factual recall.

Preparing Students for an AI-Augmented Workforce

As generative AI becomes integral to various industries, higher education must prepare students for this reality. This includes:

- Training students to collaborate with AI systems.
- Emphasising lifelong learning to adapt to evolving technologies.
- Teaching ethical frameworks for using AI responsibly in professional settings.
- Training students with AI literacy (UNESCO, 2024; Mills et al., 2024) and AI-related skills for future AI-driven job market.

Policy and Collaboration

Policymakers, educators, and technologists must collaborate to:

- Develop guidelines for AI use in education which are applied consistently across providers.
- Ensure equitable access to AI resources.
- Monitor the long-term impact of AI on learning outcomes and societal equity.

If AI systems fulfil some of the current expectations, they can become routine aids in a wide range of traditionally knowledge-based roles, including that of lecturers and teachers. These AI systems have the potential to improve the efficiency of content creation, and of giving feedback and marking. However, they create a range of ethical challenges for all who use them: at least to acknowledge their use, but more so in determining where the

credit and ownership of that content lies, whether in teaching materials that educators present, or in assessments that students submit!

Generative AI is more than just a software tool; it can be a catalyst for rethinking education. Its integration into higher education offers immense potential to enhance learning and teaching but also demands a reimagining of ethical and pedagogical frameworks. By addressing the challenges of academic integrity, equity, and bias, and by fostering collaboration among stakeholders, institutions can harness the transformative power of AI while safeguarding the principles of education.

The solution in education may be to avoid trying to adapt existing teaching approaches, with courses, modules, and various assessments, but to adopt an entirely novel approach to teaching. For example, using synoptic assessment across a semester, year, or longer period. Learners could be supported with learning materials delivered in various formats and platforms, with the main role of the academic as a supervisor, to discuss the student's approach, to monitor and to guide their development and the development of their work, and assess the process, not the outcome. This new AI-supported era requires a rethink in how teaching is resourced, how assessment is conducted, and what we are attempting to achieve through a degree or other academic qualification.

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CHAPTER EIGHT

In search of 'Responsible' Generative AI (GenAI): future-proofing education for all

IN SEARCH OF 'RESPONSIBLE' GENERATIVE AI (GENAI): FUTURE-PROOFING EDUCATION FOR ALL

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Editorial Comment:

The authors present a compelling case for the responsible use of artificial intelligence in education, emphasising the importance of maintaining a critical and analytical perspective on the rapid rise and impact of generative AI. They explore its potential costs to individuals, the environment, knowledge integrity, and future employment, while also offering practical solutions, strategic approaches, and a GenAI checklist to support its effective and responsible integration into educational practice

ABSTRACT

The use of GenerativeAI (GenAI) continues to expand across education. Our aims to 'future-proof education' must consider its full impact on educational practices and policies. This chapter argues for 'responsible AI' as one necessary basis for effective future-proofing.

To date, debate about the legitimate educational use of GenAI has tended to focus on questions of 'ethical' practice (i.e. ensuring students do not use GenAI to 'cheat'). This is important but not sufficient. We need to debate, define and recommend *'responsible'* use of GenAI.

Our starting point is to acknowledge and debate the costs of using GenAI as an individual, to the environment, to knowledge, and to future jobs. We can then develop specific guidance to enable GenAI use which is effective, ethical AND responsible. Ensuring that all staff and students can benefit from GenAI requires the strategic and collaborative focus advocated in this chapter.

Keywords: Generative AI, GenAI, Responsible AI, Impact of AI, Artificial Intelligence

INTRODUCTION

Our position regarding GenAI in Higher Education is that we *must* incorporate and adapt to it. We deliberately avoid the common suggestion to 'embrace' GenAI as this implies rather uncritical acceptance. We need to maintain an analytic and critical perspective on GenAI's use, impact and rapid growth. Although only two years old, ChatGPT now has over "400 million weekly active users globally … a significant increase from 300 million in Dec2024" according to a ChatGPT query on 25/2/25). New versions of ChatGPT have appeared with astonishing speed, including specialist versions (e.g. ChatGPT Gov for Government departments) and new models (e.g. 4.5, announced February 2025, (Rogers, 2025)).

In late 2024/early 2025, other significant technical developments in GenAI suggested Large Language Models (LLMs) promising 'improved reasoning' and enhanced multi-modality; autonomous 'agents' based on LLMs; updates to image and video generators promising improved performance and facilities; and apps where the AI effectively controls your desktop (such as Claude's 'computer use').

Also in February 2025, we experienced what was described as a 'Sputnik' moment, (Hetzner, 2025) remembering the period where the presumed superiority of American technology was challenged by the first satellite in space – the *Russian* Sputnik. The equivalent 2025 challenge was the release of the *Chinese* LLM – DeepSeek - claiming many advantages over OpenAI's best model:

- equivalent level of performance.
- significantly reduced cost to run.
- significantly reduced development costs.

DeepSeek was also acclaimed as:

"genuinely open source … It's distributed under the permissive MIT licence, which allows anyone to use, modify, and commercialise the model without restrictions." (Naughton, 2025)

The market reaction was dramatic. Investment in companies producing chips and hardware for American LLMs took an immediate hit. Nvidia, best-known for their advanced GenAI chips, recorded the "Biggest market loss in history"; their stock lost nearly $600 billion in one day (Saul, 2025).

At the time of writing (February 2025), the dust has not settled, and DeepSeek V2 has just been announced!

At first sight, the arrival of cheaper and more efficient software/hardware should mean a welcome reduction in issues like GenAI's environmental impact. But several commentators have highlighted 'Jevon's paradox' (Moulton, 2025), which characterised previous technological transformations. This paradox is that technical advances can lead to *more* rather than fewer negative outcomes, Significant *increases* in use of the technology mean that negative outcomes have increased impact. As a result, we can suggest that increases in the efficiency of GenAI models will lead to *significant increases* in their use. This will in turn lead to an *overall increase* in all the negative byproducts from GenAI, like environmental damage.

Another reaction to DeepSeek has been to recognise its technical innovation while continuing to maintain that ever-more-powerful 'compute' is the key to further progress - getting closer to the 'ultimate prize' of Artificial General Intelligence (AGI) where the software "can match or exceed the cognitive abilities of human beings across any task." (Bergmann and Stryker, 2024).

So, we need to monitor these developments and respond to the whole range of implications emerging from GenAI:

- educational value (e.g. Acar, 2023; Beckingham et al, 2024; Chan and Colloton, 2024; Clark, 2024; Furze, 2024; Khan 2024),
- likely impact on our students' futures (e.g. Beetham, 2024; Marr, 2024; Suleyman, 2023), and
- growing impact on society more generally (e.g. Barrat, 2023: Harding, 2024).

Our starting point

We start from fundamental questions for all educational institutions:

- What counts as 'responsible' GenAI use?
- Are there strategies and techniques which can guarantee that our use of GenAI will satisfy the criteria for responsible use, e.g. minimal environmental impact?
- Are the typical policies and strategies currently recommended in universities for the 'effective and ethical' use of GenAI sufficient to guarantee its responsible use?
(we don't think so)
- What can we do to ensure and support applications of GenAI which are effective, ethical AND responsible?

What counts as 'responsible' use of GenAI?

In search of a clear definition of 'responsible use', we have become increasingly concerned by several current trends:

- Increasing advocacy to 'embrace' GenAI at all levels of education (Fitzpatrick et al, 2023), in our everyday life (Collins, 2024) and at all times, e.g. Ethan Mollick's recommendation to 'Always invite AI to the table' (Mollick, 2024, p.47). This advocacy often ignores or neglects the issues raised here.
- Unethical practices across the GenAI industry.
Major GenAI companies have used exploitative employment practices (Murgia, 2024), some questionable technical approaches (e.g. legal battles on music copyright which were recently headline news in the UK (Tabahriti, 2025) and can 'over-hype' products (Narayanan and Kapoor, 2024).
- Increasing environmental impact, e.g. Luccioni et al (2024a) highlight very significant differences between specific types of GenAI use.
- Lack of transparency and perpetuation of 'careless speech' (Wachter et al, 2024).

- Increasing access to ‘cheap’ or ‘free’ GenAI apps which disguise the background costs.

We need practical definitions of responsible GenAI practice which allow students and staff to make best use of the software in ways which are effective and efficient without exacerbating major known problems.

Unfortunately, we may not have access to the data to make sensible calculations of cost and consequences when current trends in GenAI favour rapid and virtually unlimited expansion.

GenAI industry trends

The GenAI ‘industry’ now includes main providers of both general-purpose and specialist software which our students rely upon. For example, Higher Education Institutions (HEIs) in the UK typically use standard office applications from Microsoft or Google for both students and staff. Most of these HEIs also use a Virtual Learning Environment like Blackboard which also incorporates GenAI. Many also use ‘add-on products’ with similar plans like Grammarly.

Companies like Microsoft are not slowing down their plans to expand GenAI. These organisations are committed to the ‘race’ to develop Artificial General Intelligence (AGI).

This race is intensifying. It has received ‘official blessing’ through formal national plans. For example, AGI is identified as an important aim in the latest policy/strategy documents and action plans from governments in the UK, USA, and India. The UK has outlined 50 commitments in the ‘AI Opportunities Action Plan’ (Gov.UK, 2025); the USA announced the Stargate project, described as “America’s $500 billion AI power play to dominate the future” (Zanon, 2025).

These plans seem to accept certain assumptions which have become commonplace such as so-called ‘Scaling Laws’, suggesting that GenAI improvements depend upon continuing increases in computing power (‘compute’) and ‘good-quality’ data. The validity of some of these ‘axioms’ is potentially challenged by DeepSeek and similar innovations.

What does GenAI cost us?

We need to consider different costs, ranging from: economic costs (e.g. subscriptions to specific apps); costs arising from GenAI's environmental impact; costs in terms of the quality of knowledge we access and can trust; and finally implications of future employability and the skills we need to develop. Staff and students need to understand the full range of possible damage and, more importantly, how we can minimise it. Figure 1 suggests specific issues for each area of cost which we discuss below.

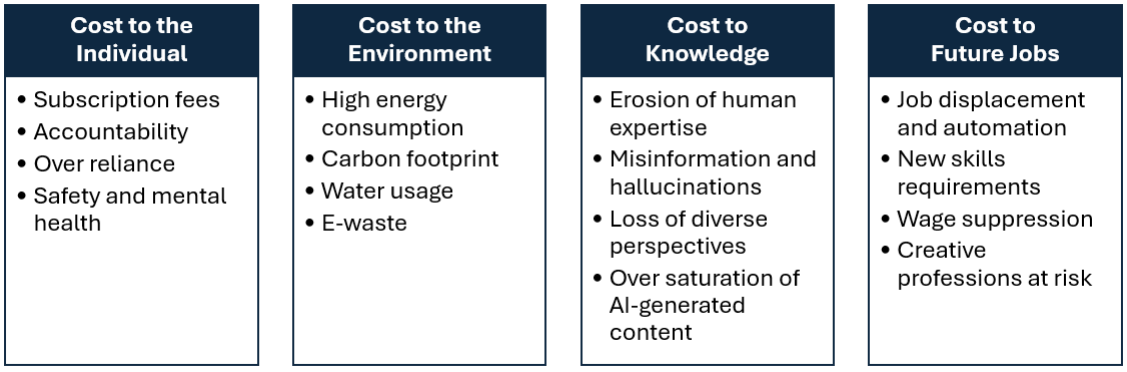

Figure 1. Cost of Generative to the individual, environment, knowledge and future jobs

Costs to the individual

Issues

In the UK, we are now accustomed to some 'free' access to leading GenAI. OpenAI's 2025 announcements mentioned above confirm this will continue for ChatGPT.

However, apps like ChatGPT offer premium models, offering improved performance and/or facilities. Some, e.g. enterprise AI assistants, have costs that limit access to businesses or high-income users

With GenAI's growing access, we need guidelines and principles about what is acceptable and what we can (or not) share with these tools. Individuals are accountable for shared information, but without prior training it may not be evident where this information is stored and if it is used for further training. Education about data privacy needs to be in place.

A review of recent research studies by Hardman (2025) concluded that "more and more research suggests that generic AI models are not only suboptimal for human learning — they may actually have an actively detrimental effect on the development of knowledge and skills." However, this review also concluded that "if we take a "pedagogy first" approach to building AI models and products, the impact of AI on human learning could be exponentially positive" (Hardman, 2025). The important principle here is that the outcomes for learning are critically dependent on how the apps are used.

Students need to be aware of these issues. If they rely too heavily on AI-generated content they can make poor decisions.

Potential solutions

Will free access to effective GenAI continue indefinitely? We cannot offer a definitive answer to this question. We already have the alarming prospect of a growing digital divide where only some students have access to the 'best' (subscription) versions of specific apps.

In relation to overuse and over-reliance on GenAI, clear guidance is required. Users need to balance use with social engagement and critical fact-checking.

Cost to the environment

Issues

Climate change is one of the world's biggest challenges. Ethical, legal and societal implications must be considered, and responsible innovation is vital (Genus and Stirling, 2018). The infrastructure used for training and deploying Large Language Models (LLMs) requires millions of GPU hours to train, and

in the process emits carbon (Luccioni et al, 2022a). Water consumption for cooling in the data centres equates to millions of gallons per day (Ren et al, 2024). We need to consider the development of the technology and the emissions that occur in mining, manufacturing, transport and recycling processes (Bossert and Loh, 2025).

A further concern is GenAI's e-waste**.** Hazardous and toxic materials such as lead, barium, arsenic and chromium are present in components within LLM servers. Obsolete servers can generate substantial toxic emissions as e-waste if not recycled properly (Wang et al, 2024). The World Health Organization (2024) reported that e-waste is one of the fastest growing solid waste streams in the world. In 2022, an estimated 62 million tonnes of e-waste were produced globally - only 22.3% was documented as formally collected and recycled. Whilst this extends beyond LLMs, it highlights a spiralling concern.

Outputs of LLMs are now multimodal, capable of creating audio, video, as well as images and text: "It's estimated that a search driven by generative AI uses four to five times the energy of a conventional web search." (Crawford, 2024). Luccioni et al (2024a:29) identified that on average, image generation uses over 60 times more energy than text generation.

Potential Solutions:

It is difficult to offer specific practical advice here, but we can highlight increasing concern and relevant investigations. For example, Sasha Luccioni is Climate and AI Lead at Hugging Face and has been described as "perhaps the most prominent researcher focused on exposing the outsized climate impact of large language models." (Lapowsky, 2024).

Her recent TED talk provides an excellent introduction to major issues in this area (Luccioni, 2024a) and her substantive contributions so far include:

· co-creating a tool for developers to estimate the carbon footprint of whatever they're building and (hopefully) find ways to reduce that impact (Luccioni, 2024b).

· Helping to set up Climate Change AI (CCAI), "composed of volunteers from academia and industry who believe that tackling climate

change requires concerted societal action, in which machine learning can play an impactful role." (CCAI, 2025)

- Numerous research outputs and publications.

Unfortunately, she also comments in her TED talk on the difficulty of finding accurate and useful information on the full costs of specific GenAI apps and facilities. However, we do know that some costs are changing. New generations of tools are swiftly emerging and the cost to run is decreasing. For example, Mollick (2025) notes the original cost of GPT-4 as around $50 per million tokens. It now costs around 12 cents per million tokens to use more capable models.

Further research is now prioritising renewable energy sources, new cooling technologies, sustainable components and e-waste.

The best practical advice we can offer at the moment is to advise students (and staff) to use GenAI selectively and focus on important tasks/applications.

Cost to knowledge

Issues:

Data used to train ChatGPT comes from three sources of information: information publicly available on the internet, information acquired from formal partnerships with third parties, and information that their users or human trainers and researchers provide or generate (OpenAI, 2025). As we well know, what is 'publicly available' covers a very broad spectrum, including indiscriminate data scraping from blogs, social media, and news sites, coupled with text entered by users of LLMs which can result in 'regurgitation' of personal data. (Privacy International, 2024)

During the training process, there are ethical concerns about the lived experiences of those employed in data annotation and content moderation of text, images and video to remove toxic content (Muldoon et al 2024). Algorithmic bias and discrimination where LLMs inherit social patterns (Johnson, 2021) may be unintentional but still exists. This further perpetuates

discriminating stereotypes relating for example to gender, race, disability and protected characteristics (D'Ignazio and Klein, 2023).

Potential solutions:

This is potentially the hardest area to pinpoint solutions due to the process of using open data and limitations/weaknesses in content moderation.

The key practical point is to ensure that students (and staff) *always* review and fact-check outputs from GenAI and adopt a critical mindset to uncover examples of bias and discrimination in the outputs (e.g. Marcus, 2024).

Cost to future jobs

Issues:

There are obvious concerns about job losses. The WEF (2025a:4) Future of Jobs Report 2025 highlights that GenAI is "reshaping industries and tasks across all sectors". 86% of employers surveyed suggested AI and information processing technologies will drive business transformation, enhance human skills and performance. This poses the risk that these technologies will replace rather than augment human work, leading to increased unemployment and inequality.

Potential solutions:

Many if not most of our students will look for employment in sectors where AI is expanding. AI's uneven impact on job prospects will continue. Precise estimates of impact are difficult as this depend on the pace of technological innovation.

Reskilling and upskilling in AI and big data top the list of fastest-growing workplace skills, followed closely by networks and cybersecurity, as well as technology literacy. WEF suggest that "In the next five years, 170 million jobs are projected to be created and 92 million jobs to be displaced", …"a structural labour market churn of 22% of the 1.2 billion formal jobs in the

dataset being studied." They anticipate "a net employment increase of 7%, or 78 million jobs." (WEF, 2025a)

Questions arise: will AI create scalable solutions, matching job seekers and organisations in recruiting new staff? Will new apps accurately identify skills and align them with market needs? (WEF, 2025b).

Strategies and techniques for GenAI in education

We see a clear agenda to position GenAI as a central and essential 'companion', offering support *at all times* (24/7) to everyone at every stage in their career. These quotes from a recent interview with a Microsoft executive illustrate this suggestion, that the AI companion will be:

> *"a companion in the sense that you trust it, you feel it's more personal"...*
> *"that kind of voice and influence will change how you use AI"*
>
> (Bloomberg, 2024)

This framing of our future relationship with this software is echoed by other software producers. So we cannot rely upon a static set of principles to inform its use. This is why we focus on the notion of responsibility, incorporating both individual and social elements. We have individual responsibility to ensure that our personal use of GenAI meets ethical and equity standards, but we also have a broader social responsibility to engage in and influence GenAI applications in our context.

Enabling GenAI use which is effective, ethical AND responsible: practical steps to take us forward

We suggest *everyone* should:

1. Understand the software, how it developed and where it is going.
2. Understand and explore what can and cannot be done with GenAI.

3. Develop and improve their own skills with GenAI to use in learning, research and assessment.
4. Recognise GenAI's issues and develop strategies to respond to them.
5. Contribute to co-developing and implementing effective department, course and university-wide strategies.

All these factors are best approached collaboratively - encouraging staff and students to engage fully in debates surrounding GenAI and encouraging them to question areas where we do not yet have the full evidence base to enable realistic decisions.

To prepare students and staff, we recommend using tools like the GenerativeAI CHECKLIST (Beckingham and Hartley, 2024) in group discussions (See Figure 2).

The Generative AI CHECKLIST

C - CLARIFY CONTEXT/OBJECTIVES

Set clear learning goals
Explain as clearly as possible what you aim to achieve by using GenAI, e.g. gather information; create summaries; analyse data; generate ideas, or proofreading assistance.

H - HONE YOUR REQUESTS

Make questions and requests as specific as possible
Use well-structured, explicit and comprehensive prompts, supplemented by dialogue wherever possible.

E - EVALUATE RESPONSES

Critically assess all information from GenAI
Check that the AI-generated content meets your objectives. Check for accuracy, relevance, and potential biases.

C - CROSS-CHECK & VERIFY

Check and confirm information with other sources
Validate with research or trusted sources to ensure the information is correct and reliable. Make sure all authors and references are accurately cited.

K - EXPAND YOUR KNOWLEDGE

Broaden and deepen *your* understanding
Use the AI content as a starting point. Continuously learn and adapt – use a broad range of insights gained from multiple sources.

L - LINK CONCEPTS

Connect ideas
Use GenAI to help draw connections between different concepts and subjects, enhancing your overall understanding.

I - IMPLEMENT RESPONSIBLY

Use GenAI responsibly
Be conscious of when and how often you use GenAI, balancing its benefits with the need to reduce unnecessary power consumption and environmental impact.

S - STUDY SKILLS DEVELOPMENT

Use GenAI to develop more effective learning habits
For example, you can use GenAI to suggest tasks and quizzes which can test your learning. Do not become too dependent on GenAI – use other resources and tools that can enhance your learning process.

T - TRACK & LOG PROGRESS

Record useful takeaways
Keep a log of the most valuable insights and ideas generated by GenAI as well as your reactions to the app. Track your progress so you can revisit and review important information later.

Figure 2. The Generative AI CHECLIST (Beckingham and Hartley, 2024)

We also invite tutors/facilitators to use our 5-step model and checklist (and any other new/emerging tools) so that *every* course/module develops awareness to take account of both 'good' and 'bad' news about GenAI's impact.

As one final 'takeaway', we suggest the following 'golden rule':

Before using GenAI, we should *always* stop and consider if it offers the most appropriate (and least damaging) technology from the alternatives available.

Conclusion

GenAI's growing impact and technical progress poses issues which we cannot resolve just by endorsing general principles. More detailed investigation of emerging and specific practices and use cases is needed. We need to resolve important issues of defining and operationalising 'responsible use' to achieve future-proofing.

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CHAPTER NINE

Exploring Equity and Inclusion in the asynchronous text-based virtual discussion forum through the Universal Design for Learning lens

EXPLORING EQUITY AND INCLUSION IN THE ASYNCHRONOUS DISCUSSION FORUM THROUGH THE UNIVERSAL DESIGN FOR LEARNING LENS

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Editorial Comment:

This chapter argues the need for innovative pedagogical approaches that promote equity and inclusion when using a discussion forum. The findings of a case study of a Postgraduate Certificate in Practice Education programme in a UK University are shared utilising the Community of Inquiry theoretical framework and through the lens of Universal Design for Learning principles.

ABSTRACT

In today's digital age, innovative pedagogical approaches that promote equity and inclusion in education are essential. This study examines the Community of Inquiry (CoI) informed design of the Virtual Learning Environment's (VLE) discussion forum in the Postgraduate Certificate in Practice Education through the Universal Design for Learning (UDL) lens. The findings from researcher-participant observations and focus group discussions show that the intentionally-designed virtual space fostered accessible, equitable and inclusive learning opportunities enhanced learner agency - the goal of UDL. The students who engaged with the asynchronous, text-based virtual space manifested teaching, social and cognitive presences, the intersecting elements of the CoI confirming that intentionally designed spaces reduce barriers, enabling every learner to engage in challenging, meaningful learning. To ensure all learners have a positive educational experience in a socially constructed virtual space that complements the physical space, this study should be extended to another cohort and other programmes offered over a period longer than a year for all to thrive.

Keywords: Universal Design for Learning, Community of Inquiry, Equity, Inclusion, Learner agency

INTRODUCTION

Background and Context

In an increasingly digital world, the need for innovative pedagogical approaches that promote equity and inclusion in education has never been more critical and their importance has gained significant attention in recent years. The shift to online and blended learning environments during and post COVID-19 pandemic presents unique challenges and opportunities for educators with many digital learning environments still struggling to address the diverse needs of learners, particularly those in postgraduate studies with institutional, situational and dispositional challenges (Cross, 1991).

Much attention and interest have been focused on better understanding how students communicate and interact in online contexts. According to eCampus Ontario (n.d.), arguably, discussion boards are one of the most common strategies used to support student interaction and communication in online learning environments. Laurillard (2002) explains that discussion helps students express their thoughts, have them challenged and refine their ideas by resolving discrepancies – an essential process for developing clearer and more articulated expressions of their thoughts and an excellent way to "surface" diverse points of view that might not be expressed in a physical classroom. Underpinned by Vygotsky's social constructivism, discussions highlight learning as a social process enhanced by collaboration, interaction and feedback and cognitive engagement (Yang and Niu, 2023; Oyarzun and Martin, 2023). It can be argued that constructivism is a key driving theory behind principles of online learning (Liangshi, 2024; Beynon and Russ, 2003); it emphasises active, student-centred learning and community building supporting lifelong learning by fostering autonomy and experiential learning.

Discussion Forums (DF) integrated in Blended Learning (BL) programmes where synchronous on campus teaching is complemented with synchronous virtual teaching and asynchronous DF as the third space (Whitchurch and Healy, 2024) are essential for maintaining social interaction and student engagement in constructivist online environments for successful learning outcomes. Moreover, virtual DFs play a crucial

role in promoting equity and inclusion ensures that diverse perspectives are represented and valued, fostering a richer learning experience for all participants. Additionally, the flexibility of BL programmes allows students to engage with the material and their peers at their own pace, accommodating different learning styles and needs, which is fundamental to achieving equitable educational outcomes.

This study presents the findings of a case study of a Postgraduate Certificate in Practice Education (PgCPE) programme in a UK Higher Education Institute (HEI). The Community of Inquiry theoretical framework (Garrison, Anderson and Archer, 2000) with its three intersecting elements of teaching presence (TP), social presence (SP) and cognitive presence (CP) underpins the design of all aspects of this BL programme for inclusion of all students and equity of learning opportunities to ensure all can participate and succeed (UNESCO, 2017). Through the lens of Universal Design for Learning (UDL) principles (CAST 2024), this study answers the following questions:

- How do the cognitive, social, and teaching presences in the DF contribute to equity and inclusion in the asynchronous text-based virtual DF (ATVDF)?
- How do students perceive equity and inclusion in the ATVDF?
-

Drivers for the study

In addition to aligning with UNESCO's Sustainable Development Goal 4 (SDG4) (UNESCO, 2024) to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all", this study is driven by my institution's DRIVE for Excellence (Dynamic, Responsible, Inclusive, Visionary, Empowerment) values (2022) and Advance HE's "V2 promote engagement in learning and equity of opportunity for all to reach their potential" (PSF 2023), this study provides students' perceptions of equity and inclusion, contributing to the development of more inclusive virtual learning environments.

Literature Review

Equity and Inclusion

Equity Higher Education (HE) refers to the principle of fairness in providing access to, participation in and outcomes from HE. It ensures that personal and social circumstances do not hinder a participant's educational potential (Amaral, 2022) recognising and addressing the specific needs and barriers of participants to create an inclusive and supportive educational environment (Gonzalez et. al., 2020)

implying inclusion in all aspects of learning activities. Moreover, professional body policies on equity and institutional guidelines provide the necessary resources and support for all to succeed through welcoming and supportive learning environments (OECD, 2023) that foster belonging in the academic community - crucial for their engagement and success. Finally, while equity gives learners what they need based on their unique starting points and circumstances through culturally responsive teaching, inclusion involves adopting pedagogy that respect and incorporate these diverse cultural backgrounds, making the learning experience relevant and accessible to all (Learning Mole, n.d).

Intentionally designing for inclusion ensures more power sharing in decision-making with various perspectives respectfully heard. Tulsiani's research (2024) also shows that prioritising equity and inclusion in learning environments leads to improved student engagement, retention, and outcomes. This study explores equity and inclusion in the CoI-informed design of the ATVDF through the UDL lens (CAST, 2024).

Community of Inquiry (CoI)

Garrison, Anderson and Archer (2000) constructed the CoI conceptual framework "which was designed to capture the educational dynamic and guide the study of online learning effectiveness in higher education" (Garrison and Akyol, 2013). Through 'a dynamic process of thinking and learning collaboratively' (Garrison, 2018), CoI focuses on the relationships and interplay between the course instructor(s), the students and the course content within a virtual space comprising three interdependent elements –Social Presence (SP), Cognitive Presence (CP) and Teaching Presence (TP) (Fig.1) explained in Table 1. It posits that effective online learning occurs through the interaction of these three presences collectively contributing to the overall learning experience. CoI emphasises the process of learning, creating a deep and meaningful (collaborative-constructivist) learning experience including the development of critical thinking skills. The goal of education is to teach students how to think and reason (Dewey,1938) and critical thinking and higher-order reasoning are essential components of higher education (Quitadamo et al., 2011).

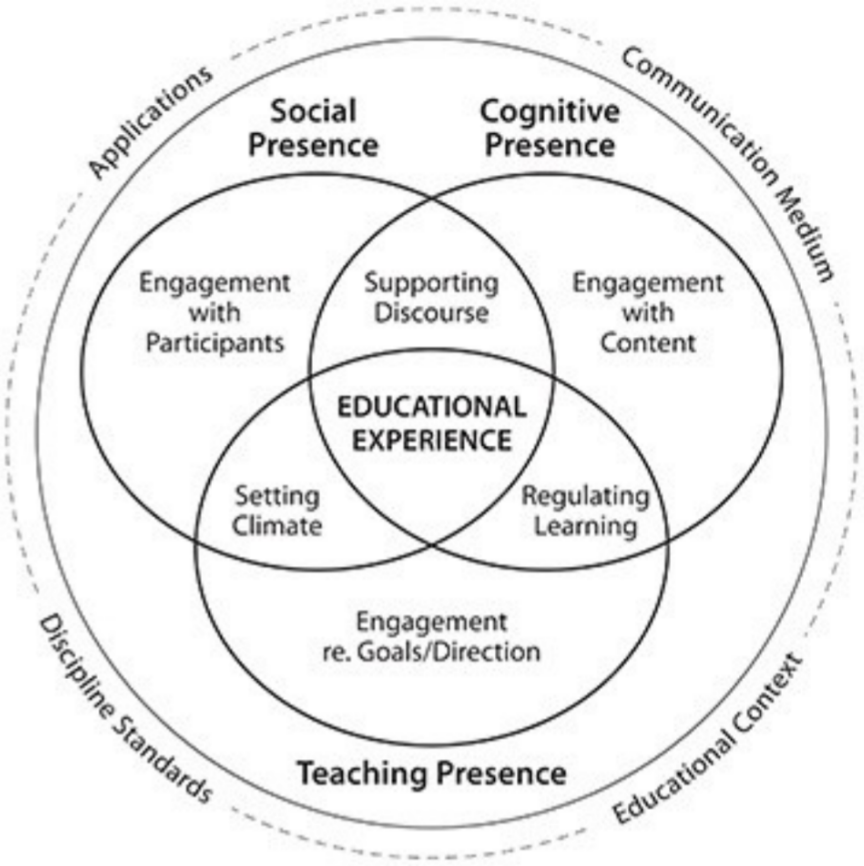


Figure 1: The Community of Inquiry framework. Image used with permission from the Community of Inquiry website and licensed under the CC-BY-SA International 4.0 license

Table 1: Summary of the description of the presences (Garrison, Anderson and Archer, 2000)

Presence	**Definition**	**Components**	**Role**
Social - SP	The ability of participants to identify with the community, communicate purposefully, and develop interpersonal relationships	* Affective expression * open communication * group cohesion	Fosters a sense of belonging and community, encouraging open and respectful communication among students

Presence	Definition	Components	Role
Cognitive - CP	The extent to which learners can construct and confirm meaning through sustained reflection and discourse	* Triggering event, * Exploration * Integration * resolution	Supports critical thinking and knowledge construction through continuous engagement and reflection
Teaching - TP	The design, facilitation, and direction of cognitive and social processes to achieve meaningful learning outcomes	* Instructional design and organisation, * facilitating discourse * direct instruction	Ensures the course is well-structured, guides discussions, and provides feedback to support learning.

CoI has become one of the most accepted theoretical frameworks in studies on text-based discussions in online educational contexts (Breivik, 2016; Weltzer-Ward, 2011); CoI- informed design of the DF places the student's educational experience at its core, emphasising the DF's role as the communication medium in fostering a sense of community and contributing to student learning experiences. However, to enhance the sense of community through SP, CP and TP where critical thinking and higher-order reasoning are developed, an equitable opportunity to engage and succeed is crucial. Therefore, this study utilises UDL, an instructional framework as the lens to examine the ATVDF for equity of opportunity and inclusion of all the participants in the Postgraduate Certificate in Practice Education for successful learning outcomes.

Universal Design for Learning (UDL)

UDL originated from the concept of universal design, which initially aimed to ensure physical access to educational opportunities (Fovet, 2021) which expanded to include social, psychological and cognitive access, prompting curriculum reforms by the Center for Applied Special Technology (CAST). Initially for students with disabilities or language needs, UDL is now a key focus in HE's inclusive education movement (Ewe Plantin and Galvin, 2023; Timus et al., 2024). The framework aims to enhance teaching and learning for everyone based on scientific insights into human learning. UDL emphasises proactively addressing diverse learner needs rather than

making reactive, individual adjustments later for accessible learning (Qu and Cross, 2024). This approach creates inclusive environments benefitting all students, not just those with disabilities (Tobin, 2021; Fovet, 2020) and is seen as a sustainable method to support a wide range of learners. The UDL principles of the why, the what, and the how of learning are illustrated in Fig. 2 below.

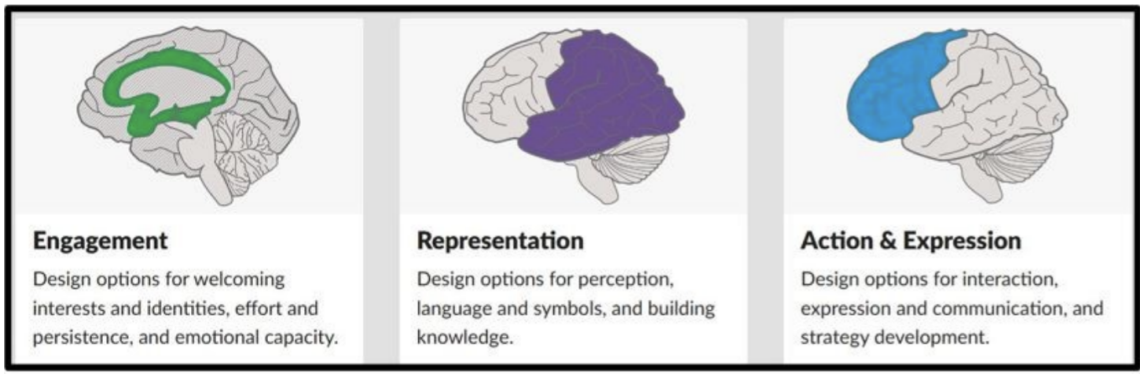


Figure 2: The principles of UDL (CAST, 2024)

This study identifies specific UDL principles manifested in the CoI-informed design of ATVDF. Overall, UDL aims to create self-directed, motivated, and adaptable learners who can navigate and succeed in diverse learning environments.

Context of the study

The participants in this study were 38 multi-professionals in the Postgraduate Certificate in Practice Education (PgCPE) 2023/24, a three-term, ten-week/term part-time programme delivered in blended learning mode as shown in Table 2.

Table 2: Summary of PgCert PE programme and its aims

Term	Week	Mode of delivery	Programme Aims
1 Autumn 2 Spring 3 Winter	1	6 hours Synchronous on-campus	1. Develop practice educators who are equipped to promote inclusivity in a society committed to equality, diversity and inclusivity 2. Provide a framework for the development of educators from a variety of settings that promotes engagement with relevant theory, professional standards and advanced scholarship 3. Establish a space for cross-disciplinary engagement with a range of contemporary educational issues among practitioners from a range of contexts 4. Develop resilient practice educators who are equipped to navigate a challenging and evolving professional landscape
	2	3 hours Synchronous virtual on ClassCollaborate	
	3	Guided, independent study	
	4	6 hours Synchronous on-campus	
	5	3 hours Synchronous virtual on ClassCollaborate	
	6	Guided, independent study	
	7	6 hours Synchronous on-campus	
	8	3 hours Synchronous virtual on ClassCollaborate	
	9	Guided, independent study	
	10	Assessment	

The blend in the PgCPE comprised synchronous classroom and virtual timetabled and the ATVDF to facilitate discussions and interactions actively contributing ideas and discussing them together in a virtual community of learners. The blend is therefore believed to enhance the students' experience, because students learn in a variety of methods (Masie, 2002). Harnessing opportunities for added interaction and peer-to-peer learning, evidence suggests that BL spaces improve learning outcomes (El Messaoudi, 2024; Han, 2024; Kintu, Zhu and Kagambe, 2017).

All PgCPE students were required to refer to at least one post whether it was their own contribution or a comment from others in their assignments to demonstrate their engagement although the discussion posts were not graded. This study focusses on the learning in ATVDF throughout the programme.

Methodology

Research Design

The following qualitative methods (Table 3) were utilised to gather rich, detailed data to evaluate the equity and inclusion aspects of the CoI-informed design of the asynchronous, text-based DF answering the research questions:

- How do the cognitive, social, and teaching presences in the DF contribute to equity and inclusion in the asynchronous text-based virtual DF (ATVDF)?
- How do students perceive equity and inclusion in the ATVDF?

Table 3: Data Collection methods and description

Data Collection method	**Description**
Participant Observation	Researcher observed engagement levels, the quality of contributions, and the frequency of participation.
Performance Dashboard	Number of posts and replies per student * Frequency of logins to the ATVDF * Length and quality of posts * Time spent reading and interacting with posts
Focus Group Discussions (FGD)	Conducted three one- hour virtual FGDs in MS Team on 9, 16, 23 August 2024 with ten consenting volunteers in to explore collective experiences and perceptions of equity and inclusion in the DF. The participants comprised 5 who actively engaged with the DF, 3 intermittently engaged and 2 lurkers in the cohort environment. FGDs were recorded and transcribed for thematic analysis.

The triangulated data ensured validity of the data collected from October June 2024.

The university's Ethics Committee approved this study in January 2023.

Findings and Discussion

F2F and discussions in the ATVDF throughout the course aimed to encourage connection and critical thinking fostering reflection, investigation and application of concepts. The findings from researcher as participant observation and the VLE's performance data which examined equity and inclusion of these opportunities in the ATVDF through the UDL lens are summarised below under the themes of SP, CP and TP.

Social Presence

The key elements of SP manifest the ability of students to identify with the community, communicate purposefully, and develop interpersonal relationships. The characteristics of each element is summarised in Table 4.

Table 4: Evidence of equity and inclusion fostered by SP
Cognitive Presence

Elements	**Affective Expression**	**Open Communication**	**Group Cohesion**
Characteristics	Expressing emotions	Enabling risk-free expression	Encouraging collaboration
Alignment with UDL principles	Multiple Means of Engagement, Multiple Means of Representation	Multiple Means of Engagement	Multiple Means of Engagement, Multiple Means of Action and Expression
Evidence	Individuals expressed their emotions and feelings in the ATVDF; e.g. using humour, sharing personal stories, and showing enthusiasm (Garrison and Arbaugh, 2007). as ATVDF fosters an emotionally supportive and motivating environment, helping sustain students' interest and allowing diverse emotional and cognitive needs to be met.	Demonstrated through the free exchange of ideas and information among participants, involving active critical reading, respectful dialogue, and sharing diverse perspectives (Garrison and Arbaugh, 2007). by promoting an inclusive space where all perspectives are acknowledged, enhancing engagement and participation.	Demonstrated by the sense of belonging and connectedness among members of a learning community. Encouraging group activities and collaborative projects helps cater to different strengths and preferences, building a supportive and collaborative environment (Garrison and Arbaugh, 2007). creating a sense of community and belonging, which enhances motivation and participation, supported by the study of Jones, Pino-Pasternak, and Volet (2022).

CP is the

1. Integration of reflection and interaction
2. The relating of prior experience to current learning
3. Constructing new ways of knowing.

The key elements of CP were manifested in the extent to which the students constructed and confirmed meaning through sustained reflection and discourse. The characteristics of each element with related evidence is summarised in Table 5.

Table 5: Evidence of equity and inclusion fostered by CP

Elements	**Triggering Events**	**Exploration**	**Integration**	**Resolution**
Characteristics	Sense of puzzlement	Exchanging ideas	Connecting ideas	Applying new ideas
Alignment with UDL principles	Multiple Means of Engagement	Multiple Means of Representation	Multiple Means of Action and Expression	Multiple Means of Action and Expression
Evidence	Fig.3 Capturing students' interest and motivated them to engage in discussions by promoting student participation and interest. Diverse perspectives and learning preferences represented	Fig.4 choice of posting responses asynchronously to the weekly trigger questions in the cohort or small group DFs; also lurked ATVDF, read referred to others' posts in assignments. by allowing access to information in various formats,	By providing opportunities for students to express their understanding in different ways, such as written posts, diagrams, or multimedia. Synthesised information through continued discussion, connecting new	By allowing students to demonstrate their learning through various forms of expression, . ensuring effective communication of their understanding. Applied their synthesised knowledge to address learning

Elements	Triggering Events	Exploration	Integration	Resolution
	through varied content formats. Reading materials were related to not only Health and Social Care professions where most of the student PgCert PEs hail from but also Medicine and School teachers reflecting the background, professions and cultures of all the participants some of who are professionals in schools and HEIs.	catering to diverse learning preferences. responded to initial posts by sharing ideas, resources, and perspectives, engaging in brainstorming and information gathering.	knowledge with existing understanding and collaboratively developing explanations.	outcomes in assignments, referring to DF posts

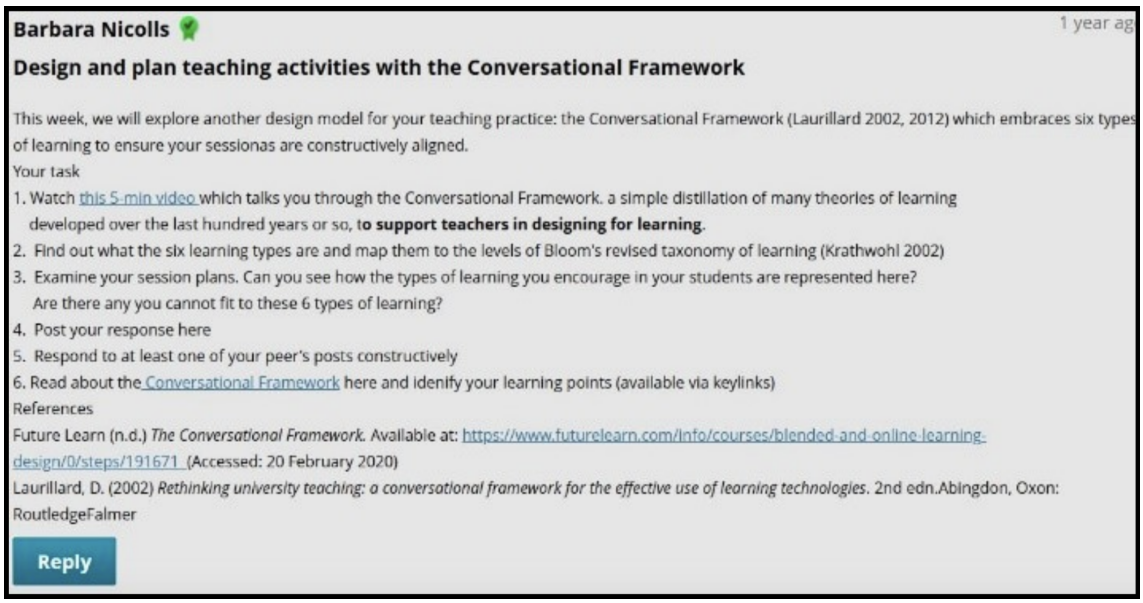


Figure 3: Instructions in DF including video, text and examples

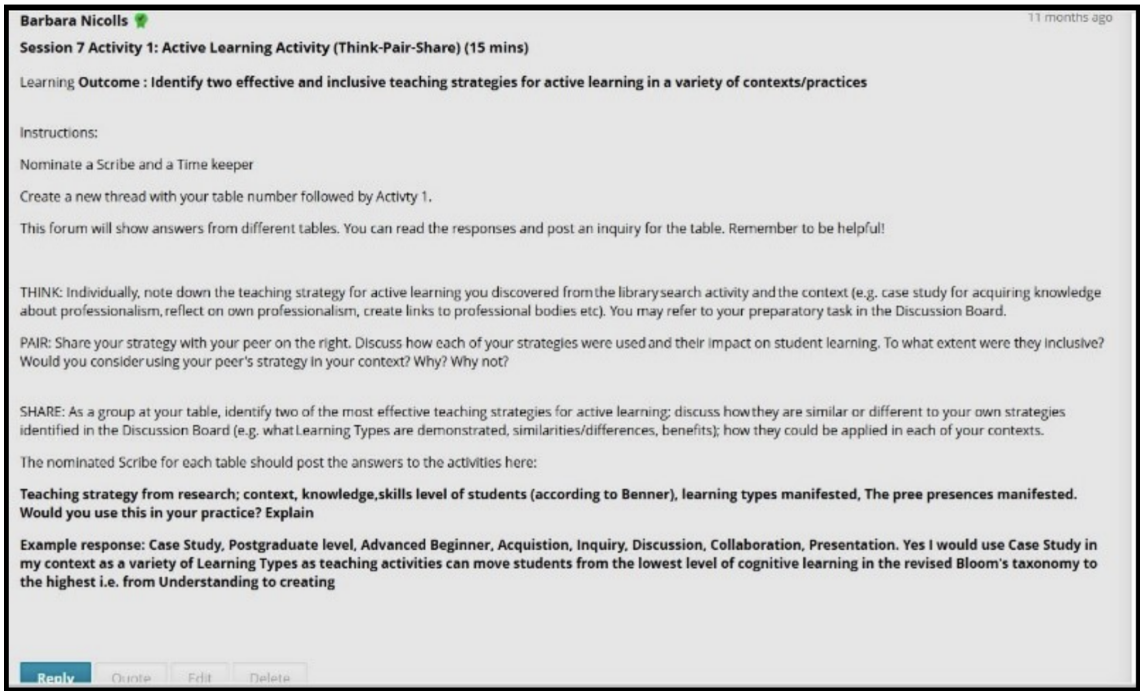


Figure 4: Clear instructions in DF for collaborative work

Teaching Presence

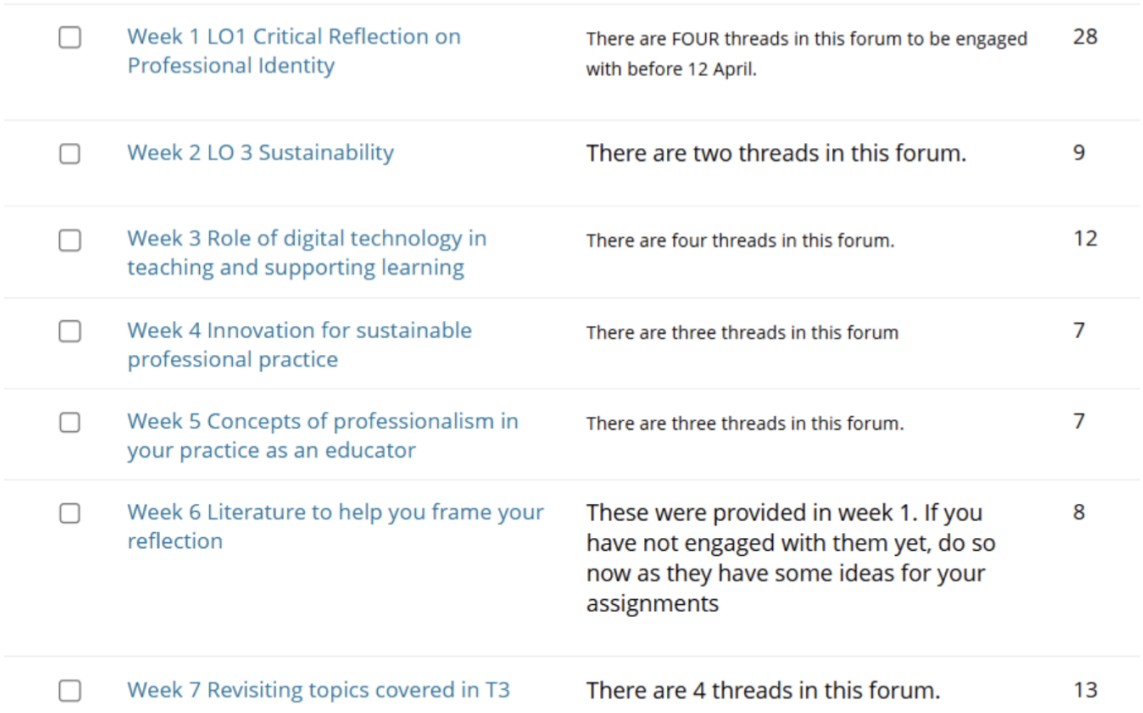
Learning in the ATVDF is an interactive, learner-centred process where the students and myself as the educator shared the responsibility for the learning experience. My role was manifested in the design of the ATVDF, facilitation of dialogue and direction of cognitive and social processes to achieve meaningful learning outcomes The characteristics of each element with the evidence is summarised in Table 6.

Table 6: Evidence of equity and inclusion fostered by TP

Elements	**Design and Organisation**	**Facilitation Dialogue**	**Direct Instruction**
Characteristics	Setting curriculum, methods	Sharing personal meaning	Focussing discussion
Alignment with UDL principles	Multiple Means of Representation	Multiple Means of Engagement	Multiple Means of Engagement
Evidence	Fig.5 ATVDF followed the published teaching schedule, with discussion topics matching weekly topics. structured and accessible information, catering to diverse learning needs. Accessibility accommodated the diverse needs of all learners, rooted in the social model of disability (Dalton, 2017).	Fig.6 Active participation in weekly discussion forums fostered by collaborative and interactive learning environment, motivating active participation. guiding conversations, asking probing questions, and encouraging interaction.	Fig.7 improved understanding fostered by supportive learning environment (timely, constructive feedback) with my non-conventional interactive presence increasing engagement and performance, especially in discussions involving the application of concepts to practice (Darabi et al., 2013).

As shown in Fig. 5 on average 6-7 students who accessed the weekly forums reflected on the topics discussed in class and related them to their practice. There were some who discussed in their small groups (Fig 10a). This access option was appreciated by most students as it narrowed down the number of posts they needed to scroll through for inclusion in the assignments.

Although there was no expectation to make a certain number of posts to the weekly forum, the fact that there were at least three threads per week enabled choice. This allowed those with limited time to respond, to interact with others' posts with new ideas.



☐	Week 1 LO1 Critical Reflection on Professional Identity	There are FOUR threads in this forum to be engaged with before 12 April.	28
☐	Week 2 LO 3 Sustainability	There are two threads in this forum.	9
☐	Week 3 Role of digital technology in teaching and supporting learning	There are four threads in this forum.	12
☐	Week 4 Innovation for sustainable professional practice	There are three threads in this forum	7
☐	Week 5 Concepts of professionalism in your practice as an educator	There are three threads in this forum.	7
☐	Week 6 Literature to help you frame your reflection	These were provided in week 1. If you have not engaged with them yet, do so now as they have some ideas for your assignments	8
☐	Week 7 Revisiting topics covered in T3	There are 4 threads in this forum.	13

Figure 5: ATVDF structure of cohort weekly forums

NAME	GROUP SET	ENROLLED MEMBERS
Alpha	EDU7010	4
Beta	EDU7010	3
Delta	EDU7010	4
Gamma	EDU7010	4
Kappa	EDU7010	3
Omega	EDU7010	5
Sigma	EDU7010	4
Theta	EDU7010	5
Zeta	EDU7010	5

Figure 6: ATVDF small group discussion

Thanks KB. This is great start to this activity. Can you clarify whether this is your reflection on your Professional Identity development by joining the BACCN? Or is this through the networking? LO1 also requires examples of WHAT, WHY HOW this factor transformed your practice - an example in the WHAT could be a specific session and WHY you felt it transformed your practice, HOW did it transform your practice and the impact it had on your learning as well as on your stakeholders. That is what the Professional Conversation is about, KB. Attempt another factor incorporating the above guidance.

Figure 7: Timely feedback in supportive environment

Nonetheless, student engagement in the three terms showed increased access to the ATVDF

In summary, TP was the influencing element of the CoI framework in designing ATVDF underpinned by social constructivism and connectivism. This was confirmed by the FGD responses discussed below.

FGD participants noted that with regard to SP, f2f interactions foster a stronger sense of connection and engagement compared to those in the ATVDF though the latter was valued for their flexibility, asynchrony offering diverse perspectives and peer support despite the lack of visual and verbal cues. Overall, both modalities were seen as complementary, enhancing the learning experience through different means. This suggests that while f2f interactions are crucial for building relationships, online forums provide valuable opportunities for continuous engagement and support evident in the facilitation element of TP.

The respondents agreed that the ATVDF provided the advantage of written instructions that could be revisited. Participants found facilitated critical thinking and debates stimulating and beneficial for understanding different perspectives. The structured discussions and evidence-based resources enhanced cognitive presence and overall learning.

The ability to go back to the discussions in an online forum is another advantage noted by students who try to recall something said in a classroom discussion but cannot. Despite the fact that they couldn't be face--to--face with other students, they knew that their representation of themselves online had implications on how others perceived them. Representation also became an important issue since discussions could be permanently recorded in the ATVDF. Respondents appreciated structured sessions with clear outcomes and opportunities for peer and researcher clarification. This underscores the need for guidance in managing online group dynamics.

Respondents valued the ATVDF for its revisitable written instructions and discussions. They felt that structured discussions and evidence-based resources stimulated critical thinking benefitting understanding different perspectives enhancing cognitive presence and overall learning. This may have raised their awareness of their online representation's impact on perceptions. The permanence of recorded discussions highlighted the importance of representation. However, I found that the ATVDF's threaded discussion was lacking which could be attributed to the structure of the course and the number of weekly topics to achieve the module learning outcomes.

Overall, the respondents which comprised 5 who actively initiated at least one post/week and responded constructively to another and 4 who intermittently contributed agreed that the CoI-informed design of the ATVDF offered equitable and inclusive learning opportunities despite the situational and dispositional challenges that adult learners encounter.

Future actions

Acknowledging, the respondents' positive perceptions of equity of learning opportunities and inclusion in the ATVDF and challenges to fully harnessing the affordances of the CoI-informed design of the space for all students to thrive and succeed, the following actions are being considered.

- Build capacity among teaching staff to promote equity and inclusion in the institution's virtual spaces specifically in blended learning programmes to harness the affordances of CoI-informed spaces strengthening the teaching presence
- Educate students of the benefits of regular engagement with the ATVDF including belonging, developing evaluative judgements, giving/asking for constructive feedback and elaboration
- Manage workload - focus on collective construction of knowledge in the virtual spaces allowing students to post in groups as opposed to individuals. This can encourage recorded group synchronous discussions in the VLE's ClassCollaborate Escape Rooms so there is an audit trail. Assign dedicated groups as weekly initiators and responders. This aligns with UDL's Multiple Means of Engagement and Multiple Means of Action and Expression.
- Maintain the current strategy of intrinsic motivation to engage with the ATVDF by referring to posts in the assignments as this aligns with UDL's Multiple Means of Engagement

Conclusions

This case study on the CoI-informed design of the AVTDF revealed how TP influences the design for collaborative, socially connected environments but examined through the UDL lens demonstrated its equitable and inclusion characteristics which should be extended for all learners to fully benefit from it.

Future research should explore the long-term impact investigating the effectiveness of specific strategies for enhancing equity and inclusion in digital learning environments, particularly in relation to different disciplines and learner demographics.

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CHAPTER TEN

Reskilling the higher education workforce for digital transformation

RESKILLING THE HIGHER EDUCATION WORKFORCE FOR DIGITAL TRANSFORMATION

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Editorial Comment:

This chapter contextualises the Higher Educational response to the introduction of AI and highlights specific areas, specifically the 'reskilling' that needs to take place. The author stresses the need for both awareness and knowledge, and presents and discusses practical strategies. The inclusion and integration of critical inquiry, practical wisdom and conversation and dialogue into the educational context will prepare students and graduates for their (and our) future.

ABSTRACT

This paper focuses, not on the current largely incremental response by universities to the challenge of generative artificial intelligence (GAI), but on how it can support actual, as opposed to nominal, institutional and sectoral transformation. It is a huge challenge to consider transforming universities and their environments from a pure discipline-based knowledge focus to transdisciplinary thinking and practise, especially where trust in traditional universities is declining and scope for digital augmentation has recently dramatically increased. It is necessary and urgent to promote a holistic perspective towards all technologies, but at the same time place an increasing emphasis on humanistic dimensions with significant input from arts and humanities. The paper draws on experimental work on how urgent reskilling of the whole HE workforce for GAI might be approached through less conventional pedagogies.

Keywords: Generative AI, Digital transformation, Reskilling, Transgressive pedagogy

INTRODUCTION

Many of the GAI product announcements and upgrades in 2025 have been the result of the intrinsic technology sector hype arising from funding needs, but there can be little doubt that that very funding is itself fuelling genuine enhancements in GAI functionality. There are ever-increasing claims that Artificial General Intelligence (AGI) is imminent, even though most of the sector definitions of AGI are geared up to the strengths of GAI, not their weaknesses relative to generally accepted definitions of human intelligence. Set against that, there is a parallel but less well-publicised litany of ethical and safety concerns about the unchecked proliferation of GAI and both narrow and societal risks arising from future AGI. This sets a high-octane backcloth to the specific concern in this chapter with the implications of GAI for reskilling in higher education.

The underlying assumption behind this chapter is that the impact, even of currently available GAI technology, is already profound for all three components of research, teaching and administration. The higher education response, certainly in the UK, has been predominately reactive, seeking incrementally to mitigate the impact on the most obviously challenging areas such as assessment practices. This is an approach that has historically appeared to serve higher education well; the COVID crisis was addressed in this way by intense focus on the essential pivot to online learning. But unlike COVID, GAI is not a short-term operational challenge. GAI has already challenged multiple assumptions about the nature of knowledge, including those held dear by this author. Since universities' core business is the creation and sharing of knowledge, the challenges cannot be resolved through historically validated operational policies and practices. Almost all forms

of knowledge work are being challenged, and addressing that, not least through reskilling, is now unavoidable in the higher education context.

The organisational forms of most contemporary universities are built on the late 20th century frameworks of many leading businesses: hierarchical structures, management by objectives, formal planning. Even though businesses have tended to move away somewhat from those frameworks, allowing for more fluid and agile approaches, the hierarchical form has continued in higher education, in no small part because both research and teaching can both appear to follow closely the highly compartmentalised discipline-based approach. This is partly fuelled by research funding and research quality (publications) historically being heavily discipline based. The discipline-based university is partly structurally intrinsic, but often also has come to reflect and underpin a mindset of disconnected incrementalism at all levels.

The challenges of GAI for universities are generic across all disciplines, and because they are fast-moving, incrementalism is not, and is not likely to, cope with such challenges. There is an urgent need for experimentation and indeed risk taking. Some traditions, discussed below, are already in urgent need of non-incremental change. This chapter argues that such change needs to embrace the entire higher education workforce. It is essential to invest in reskilling to take advantage of the benefits of GAI. But much less recognised is the parallel essential need to reskill to amplify existing non-technological approaches which provide a challenge and potential antidote to the unthinking embrace of contemporary technology.

Reskilling to benefit from AI and to be aware of ethics and safety issues requires urgent investment, which will not be forthcoming at the ideal scale and pace needed. So, an "ideal" approach needs to be replaced at least in part by a "just good enough" approach. But for both the workforce as well as students, there needs another reskilling investment. This is in the non-AI and mostly non-technological approaches which explicitly address the areas where GAI, though an excellent mimic and simulator, literally cannot embody essential human qualities. At least three areas need to be addressed to reconsolidate the essentially human dimensions of thought and action in an era of GAI:

a) Critical Inquiry - this is broader than "critical thinking" as promulgated by GAI vendors themselves. A particularly useful perspective from Chatfield (2025)

b) Dialogue/Conversation/Conflict resolution in all contexts - domestic, work, citizenship

c) Analogue/physical approaches involving embodied learning and drawing heavily from the arts and humanities

The prevailing managerial mindset of UK higher education is in itself insufficient to cope with the dimensions covered above. There are several alternative pathways for those actively seeking to cope with the full implications of GAI, and these are summarised below in the chapter conclusion.

Introduction

The need for transformation

Perceived international consensus/accommodation (even if never a reality) since World War 2 has been steadily eroded and at points has broken down. Continual high levels of inequalities, nationally and globally, remain. The planet faces an existential environmental crisis. The erosion of democracy, in part amplified by instant global communications and active exploitation of misinformation, has proliferated. (Wals, 2021). As far as the UK is concerned, V-Dem (Nord et al, 2025) publishes a league table with 29 countries in the top division (liberal democracies). Interestingly, the UK is only in the second division (electoral democracies), suggesting that more work is needed in the UK, compared to many neighbouring countries, to sustain and enhance democracy.

In this context, human critical inquiry and creative skills are increasingly understood as vital, especially where GAI inevitably leads to machine-human knowledge cooperation (Mollick, 2024a). We argue the need to augment the information and knowledge foundations of higher education with the often-overlooked Aristotelian virtue of practical wisdom (Flyvbjerg, 2001; Flyvbjerg, Landman and Schramg, 2012)

A recent excellent text on GAI in HE by Pretschke (2024) is based on contemporary progressive pedagogies, and her ultimate transformational proposals are undoubtedly radical. Our argument though is that there is a further stage beyond the radical-progressive, namely, explicitly to support transgressive pedagogy, and to accelerate its introduction, not least in reskilling the workforce.

Johnston et al (2018) make a strong case for transgressive approaches in the UK to address authentic digital transformation. Though produced long before ChatGPT went public in November 2022, their work acts as a ready-made manifesto challenging the supposed digital transformation of HE, heavily shaped by external commercial interests and internal lack of appetite for radical change.

Methodology

This paper is partly based on a study commenced in October 2023 with a core theme being to identify and collate pedagogic change stimulated by GAI implementations worldwide, not specifically in the management core discipline, but in education for the professions generally. One narrow strand has involved tracking senior executives, including CEO's, personal uses of GAI. Our concept of everyday-any day use, explained below, arose from this strand. A wide variety of curricula for reskilling the higher education workforce have been examined. Another key strand has been addressing what was initially called "resistance to GAI change", with resistance now replaced by "reluctance". In parallel, well over 200 instances of both live and experimental ChatGPT's have been created, with exemplars relating to the 10 UNESCO teaching roles for GAI. **(**Sabzalieva and Valentini, 2023)

Reskilling the workforce for generative artificial intelligence

A useful framework for AI literacy (Sharples, 2023 and Sharples, 2024) involves 6 dimensions:

- AI Concepts
- AI Pedagogy
- AI Creativity
- AI in Society

- AI Ethics
- AI Careers

Unfortunately, the necessary resources to implement such important re-skilling fully will never actually be made available, unless by the unlikely voluntary labour of the workforce. This is for both explicit reasons, such as shortage of funds and other top-down priorities, and also for implicit reasons for individuals within the workforce, (time, energy, attention), who are already under massive challenge from retrenchment and the post-COVID HE environment. This is compounded by the exceptional speed of current technological change where books and courses can or will most likely be outdated even before they are published. Some action must be taken to adjust workload models explicitly to include GAI re-skilling. But a core need is institutionally and nationally to implement bottom-up learning approaches. And since genuine transformation will face stiff opposition, it is important to examine transgressive types of reskilling as advocated by Illich and Freire in particular.

The problem of the traditional doctorate

In relation to assessment generally, the traditional uninvigilated essay is the most obvious point of weakness, and this has been widely acknowledged by being a primary focus of GAI activity in almost all universities. The problem at the time of writing is that classic methods of detecting plagiarism have broken down. Any moderately technically literate student or, indeed, researcher, can readily mask their work being GAI-generated in whole or part. In relation to doctoral programmes, this has profound implications. Recent innovations such as OpenAI's Deep Research, are being claimed to be able to replicate PhD literature reviews in under an hour. Even leaving aside the questionable assumptions made by those making these claims, there is little doubt that the writing process in research is being challenged by GAI. (Bechky and Davis, 2025). Maynard (2025) concludes:

"..we are rapidly heading toward a point where we will have to critically rethink the purpose and value of a non-AI augmented PhD"

Of parallel concern in both teaching and research is that the close reading process also could be at risk. On a positive note, there are now innovative approaches to doctoral programmes which are explicitly addressing both

exploiting the benefits of GAI in research, while replacing the classic but vulnerable literature reviews and theses with forms of continuous digital profiles.

A clear-cut example has been developed recently by the EPSRC funded Centre for Doctoral Training in Diversity in Data Visualization (DIVERSE), joint between City St Georges and the University of Warwick (2024), involves:

"..using an interactive digital notebook for recording, reflection and reporting which becomes a "thesis" for examination, in lieu of the traditional doctoral thesis, and in line with current best practice in data visualization methodology"

Wood (2024) amplifies that the digital thesis is a journaling, reflective and synthesizing tool:

"The artefact that encapsulates a student's learning and contribution is the 'digital thesis'. Unlike a traditional (printed) thesis, this is a potentially non-linear living document developed throughout a student's path through the PhD"

Alternative pathways for university policy makers

There will always be a diversity of approaches to digital transformation sought across higher education, and four broad approaches are summarised in Table 1. It should be noted that although the text of Iosad (2020) is based on digital transformation, relatively little emphasis is place on the need for leadership to consider radical change to themselves, compared to the Progressive and Transgressive approaches. The degree of transformation implied in this chapter sees both the progressive and transgressive as viable pathways for the type of radical change needed.

Table 1: Broad alternative approaches to digital transformation

Approach	**Key authors**
"Reactionary"	Hirsch (2020)
"Incremental"	Iosad (2020)
"Progressive"	Pratschke (2024)

Approach	Key authors
"Transgressive"	Johnston et al (2018)

Practices developed to support transgressive pedagogies

We explore the transgressive pathway in particular and draw on 3 transgressive authors: Illich (1973), Freire (1974) and bell hooks (1994, 2009); also see Kahn & Douglas (2007). Illich introduced the ideas of deschooling and of non-hierarchical learning webs. Freire proposed and actually introduced critical consciousness in Brazil before he was exiled. hooks, an associate of Freire, saw education as "the practice of freedom", with a profoundly emotional dimension and like Illich, capable of happening anywhere.

Reskilling

Our emphasis here is on the whole workforce of the university from vice chancellors to frontline operational workers. A classic description of a university divides research from teaching, learning and assessment, and from administration. One of the interesting features from our own research into business and academic use of generative AI is that functional silos in organisations are underpinned by another type of information/knowledge work which we call "everyday-any day" use of AI. Even if they are not used every day, like email, the entire workforce needs to be ready to use these functions any day. Generative AI is not only serving the obvious functional needs of the three silos, but also highly specific needs of individual workers at any point in the workforce, and indeed their own non-work needs in addition.

There are various key roles involved in the proposed change process. Firstly, there are the active experimenters. As part of their rapid learning from experiments, they need to be networking nationally and globally and rewarded for that. For the second layer of early adopters, their focus is likely to be institutional and locally based and there what is crucial is the development of active local communities of practise, and those who are genuinely active need again to be visibly rewarded for that. Unfortunately,

the practical experience to date of online forums within organisations and even professional communities is that they often fizzle out. Yet vehicles such as X, Reddit and Discord readily support Illich-style webs of active, sharing informal non-hierarchical learners. Creating the motivation for online sharing within an organisation or profession remains largely elusive.

A third layer is small-scale hands on passing on of knowledge. GAI is very amenable to a hands-on learning approach, but not at scale due to lack of personalisation for the absolute beginner who in our experience is much more impressed by addressing their specific problems than common but generic ones. We have been particularly influenced by Mollick's (2024c) argument that everyone needs 10 hours of hands-on playful experimentation with generative AI. We are currently prototyping a 5 week email based approach, with one prompt per working day needing 24 minutes attention (10 hours in total). Once again, this this needs to be acknowledged formally even if not rewarded through workload, and would benefit from a parallel online community of learners.

Functional use of GAI will be probably equalled by everyday-any day use by the entire workforce. It is interesting to note the now widespread exploitation by house repairers and technicians of low-cost tablets to refer to manuals, chat groups, and problem-solving methods online. It is only a small step to see such important frontline workers at last recognised and valued for not only their tacit knowledge but also their ability to exploit generically available global knowledge through GAI.

Technology alone is insufficient to develop practical wisdom

The greater emphasis which is placed on digital technology in higher education, we argue that the more urgent it becomes to protect and expand wholly non-technological pedagogic approaches which will meet humanistic needs and also support critiquing of both traditional and technology-based approaches. Optimistically, any time released by GAI co-production is needed for the now critical promotion of practical wisdom at all levels of the workforce. This can be enhanced by GAI, but it needs to be initially learned through explicitly non- technological methods. It is already the case that some of the most imaginative approaches to transform traditional pedagogy are through wholly analogue methods initially developed in the arts (King,

2024). Conversational and dialogical skills become of a very high order of importance. GAI may reduce the need for operational dialogue, but this provides a space where richer human to human dialogue can flourish. One especially imaginative example is the field of engineering management from Chile where Osvaldo Garcia (García De la Cerda et al, 2018) has developed the CLEHES workshop framework: The initials represent Body (Cuerpo), Language, Emotion, History, Eros, Silence. This approach which echoes the work of bell hooks, merits more attention, and we have found it useful in discussing curriculum re-design. Investment in GAI, without corresponding investments in dominantly analogue methods needed to develop practical wisdom, will lead to an unwelcome imbalance. This is, of course, an imbalance in favour of technology being sought by vendor-oriented perspectives.

Conclusions

Institutions need an urgent and not necessarily long-term adjustment to workload models to fund immediately reskilling resources for training in GAI and the essential non-technological areas such as critical inquiry, practical wisdom and conversation and dialogue. Finally, we accept that even the most ardent supporters of internally driven transformation may well struggle to deal with the challenge of transgressive pedagogies. But they provide a different if untested way forward than the top-down change management methods that themselves have already largely failed to provide the hoped-for level of benefits for both the workforce and learners.

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SECTION TWO: PEOPLE

CHAPTER ELEVEN

A case study analysis of embedding kindness in higher education curricula

A CASE STUDY ANALYSIS OF EMBEDDING KINDNESS IN HIGHER EDUCATION CURRICULA

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Editorial Comment:

Moving forward from the pandemic, many students showed the need to both connect and to be treated compassionately. The authors have systematically gathered case studies of how kindness has been integrated into the student experience across HE institutions in the UK. Themes and best practice are discussed.

ABSTRACT

The last decade has witnessed a significant increase in higher education students experiencing mental health challenges. This has resulted in a call for universities to exercise a duty of care in supporting students not only to do well academically but to support their mental well-being. One opportunity to action this is for universities is to employ acts of kindness as part of creating a more compassionate learning environment. Using a case study approach this research set out to collect and discuss examples from across the UK where higher education institutions have embedded kindness within their curricula. From the eleven case studies, key themes included the need to provide opportunities for students to positively connect with each other, their tutors, and the university as well as providing opportunities for self-reflection during their studies. These case studies provide practical examples of the way that kindness can be integrated into higher education curricula.

Keywords: Kindness, Compassionate pedagogies, Curriculum, Student mental health

INTRODUCTION

Recent years have witnessed an increasing prevalence of mental illness and distress among young people and students in the UK (Sinclair et al., 2017; Thornley, 2017; Balaam and Harris, 2021; Apgar and Cadmus, 2022; Moore, Veletsianos and Barbour, 2022). While this increasing prevalence pre-dates the COVID-19 pandemic, studies have highlighted the consequences that the pandemic had on students' mental health, wellbeing and academic performance (Burns, Dagnall and Holt, 2020; Cao et al., 2020; Elmer, Mepham and Stadtfeld, 2020; Beutel et al., 2021; Khan, 2021; Stock, Helmer and Heinrichs, 2022). Of additional concern has been the heightened levels of suicidal ideation, depression, anxiety, and loneliness seen amongst university students (Pierce et al., 2020; Wetherall et al., 2022). The statistics in this area further reflect this situation with the Higher Education Statistics Agency (HESA), recording 122,760 students with self-reported mental health issues in 2022/2023 (HESA, 2024). What is clear is that while the social distancing measures implemented during the COVID-19 pandemic increased isolation, known to adversely affect mental health, students were already at high risk prior to the pandemic and continue to be at risk (Browne, Munro and Cass, 2017; Apgar and Cadmus, 2022; Moore, Veletsianos and Barbour, 2022; Stock, Helmer and Heinrichs, 2022).

Given the rise in student mental health issues, there have been calls for universities to recognise their duty of care as 'caregiving organisations', and to nurture compassionate pedagogies to enhance student well-being (Waddington, 2018). However, the neoliberal, competitive environment of higher education is thought to foster isolation and increase vulnerability to mental health issues (Keltner et al., 2014; Slavich, 2020; Gilbert, 2022). In the current higher education context of increasing competition and marketisation and where student success is regarded to be the achievement of

good academic grades, the place for universities as supportive institutions has become obscured (Waddington, 2018) and difficult to navigate.

While multiple research studies indicate that fostering a sense of belonging is crucial for students' academic success and retention (Pedler, Willis and Nieuwoudt, 2022), there is far less research on the role that compassionate pedagogies can have. As a compassionate pedagogy, kindness is defined as being "a behaviour driven by the feeling of compassion" and when we "act on this feeling of compassion in a helpful and caring way, this behaviour becomes an act of kindness" (Long, 1997, p. 243). Studies suggest that kindness can stimulate neuroplasticity and promote emotional well-being, which is essential for effective learning (Campling, 2015; Gilbert, 2017). There is growing recognition of the value of compassion, which can include acts of kindness in university curricula to enhance students' mental health and wellbeing (Gibbs, 2017; Gilbert, 2017). Despite the recognition of the importance of embracing compassionate pedagogies, such as acts of kindness, there are limited practical examples available of how this can be embedded in UK university curricula.

The study presented in this chapter set out to explore and capture practical examples from UK universities where kindness has been integrated into higher education curricula answering the two following questions:

1. What examples are there of specific approaches used by UK universities to integrate kindness into their higher education curricula?
2. How do academics at UK universities perceive the impact of embedding kindness in their teaching practices?

Methodology

This constructivist study employed a case study design, inviting UK academics to contribute examples of where they had embedded kindness within their curricula. Case studies are particularly suited for qualitative research, enabling the integration of diverse evidence sources such as interviews, documents, and field notes (Yin, 2018). The research was conducted by an interdisciplinary team from Edinburgh Napier University (ENU), which involved academics from Business, Media and Humanities, and Healthcare. The study was funded by an internal ENU teaching fellow

grant. Ethical approval was obtained from ENUs Research Integrity Committee (N4608).

A call for case study contributions was made through teaching networks including the Staff and Educational Development Association (SEDA), individual Universities, teaching fellow networks, and the National Teaching Fellow (NTF) network. Additionally, snowball sampling helped the researchers reach further academics, resulting in eleven case studies being submitted in 2019. Participants received a project information sheet and were asked to complete a consent form. They were then invited to summarise their work on embedding kindness in their curricula and share this with the project team. Researchers met with three of the academics to discuss their case studies in further depth. Field notes from these unstructured discussions contributed to data analysis.

The research team used Reflexive Thematic Analysis as outlined by Braun and Clarke (2006, 2022) to analyse the case studies and field notes, acknowledging that the teams' own interpretation of the data is from the perspective of experienced educationalists within the UK higher education context. Each case study was coded by the individual team members who then met several times to discuss and agree on four main themes. In 2023, the lead author contacted the original case study contributors for updates or additions. Eight academics responded, and their case studies were still found to be relevant. The original themes were revisited and found to remain applicable in 2023 and were consistent with pre-COVID findings.

Findings

Eleven case studies (hereafter CS) were captured and are detailed in Table 1. Four main themes were identified from the analysis of these cases (Figure 1): "Connect with Self," "Connect with Peers," "Connect with Tutors," and "Connect with University." Each theme will be discussed in the following section linking the finding to the relevant case studies.

Table 1: Summary of case studies

Case Study Number	**Educator's Role**	**Case Study Example**

Case Study Number	Educator's Role	Case Study Example
CS1	Emeritus Professor, Department of Learning and Teaching Enhancement	Utilising kindly caring in online tutoring
CS2	Principal academic in Socio-emotional intelligence (SEI) and Service Excellence	Supporting UG students transitioning to University
CS3	Senior Lecturer in Psychology Associate Professor & Reader in Emotion Science, Psychology	Compassionate micro skills of communication (CMSC)
CS4	Course Leader, BA(Hons) Dance	Development of creative dance performance
CS5	Head of Law	Listening scenario, role play and debrief in relation to humanity.
CS6	Senior Lecturer, Academic Development	Mindfulness, yoga, wellbeing, non-judgemental compassion, PhD workshops

Case Study Number	Educator's Role	Case Study Example
CS7	Associate Professor, Learning and Teaching, CAE; Academic Skills Tutor School of Humanities	Compassionate micro skills of communication (CMSC)
CS8	Lecturer in Nursing	Compassion-based intervention (CBI) for student nurses and midwives participating in degree programmes
CS9	Lecturer in Language and Literacy	Research into students' experiences of Academic Advising provision. Reflections to support the embedding of personalised kindness and wellbeing support into university curricula.
CS10	Senior Lecturer in Early Years Education	Philosophy for Children (P4C) approach in an undergraduate teacher education course
CS11	University researcher in student mental health	Identifying the key purposes of the curriculum and meanings of 'mental health' and 'wellbeing' and embedding what counts as 'good pedagogic practice' in relation to wellbeing.

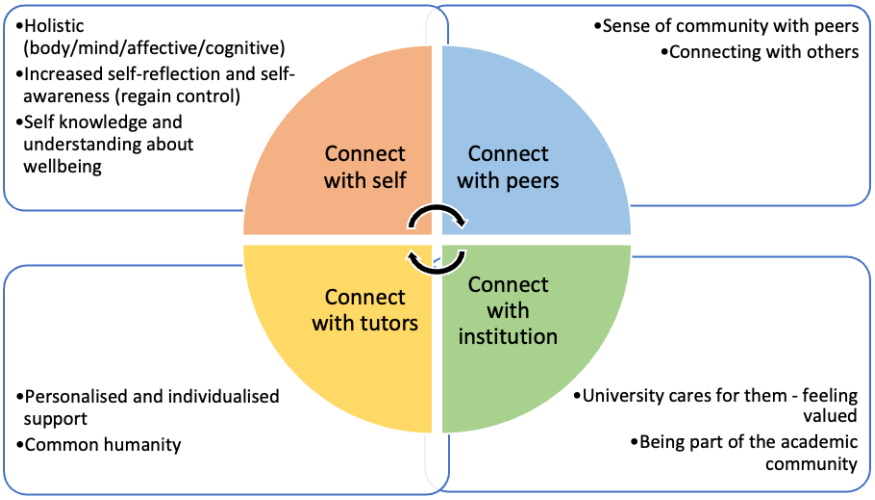

Figure 1. Identified Case Study Themes

Connect with Self

Several institutions highlighted the importance of holistic student support to foster individual growth. For instance, in CS2 the interviewee cited Schreiner (2010), emphasising the importance of helping students thrive, rather than merely survive, in academic settings. Schreiner posits that thriving students achieve higher academic success and develop a sense of community and psychological well-being, enhancing their persistence to graduation. To facilitate holistic development, this institution has created a self-help toolkit focused on four pillars: arrival, socio-emotional intelligence development, study skills, and thriving. This toolkit was designed to aid students' transition from secondary education to university life. In another case study (CS9), academic advisors were encouraged to address students' broader needs by acknowledging personal pressures and opportunities. This approach reinforces the notion that holistic support underpins academic success.

Several of the case studies highlighted the importance of fostering students' self-reflection and self-awareness. For example, in CS5 role-play exercises were used to enhance law students' self-awareness in how they interacted with others. Similarly, in CS6 well-being groups were facilitated that promoted mindfulness, compassion, and self-awareness through workshops. The themes of compassion and non-judgement for others when

feedback was also facilitated through these workshops and students were encouraged to reflect on times they had received or given feedback both negative and positive.

Case studies from multiple institutions stressed the value of self-knowledge in promoting well-being. The self-help toolkit developed at CS2's institution included resources such as infographics, quizzes, and vlogs as well as information on activities such as sports, arts, clubs and societies which were accessible to support students' holistic development. It was argued that through engagement with these resources students would develop a greater sense of belonging, encouraging greater self-awareness and a more effective and meaningful approach to learning. Similarly, in case study CS8 a compassion-based intervention (CBI) was available for nursing students, based on Paul Gilberts (2010) Compassionate Mind Training (CMT) approach, to improve self-compassion and psychological well-being. Research from a 2019 meta-analysis supports the evidence of CBIs effectiveness in enhancing psychological health and promoting well-being (Kirby, Tellegen and Steindl, 2017; Ferrari et al., 2019).

A recurring theme across all the case studies was the emphasis on socio-emotional intelligence, with programmes supporting active listening, empathy, and interpersonal skills. At case institution 2 socio-emotional intelligence development was incorporated into the self-help toolkit, aiding student's transition and promoting their well-being. In CS7 compassionate communication skills were introduced to student groups which emphasised inclusivity and cooperation, thereby fostering group dynamics grounded in empathy and shared understanding.

Connect with Peers

Encouraging students to support each other was seen as an approach which would help to foster community and kindness within the university curriculum. Various case studies emphasised the importance of students pooling their resources and ideas, building on each other's strengths, and engaging in reflective dialogues. In CS4 students were encouraged to offer each other support through collaborating on group topics which linked

directly to them as people. CS9 talked about recommendations for university teachers to emphasise fostering these supportive learning communities between students.

In helping students to connect with others CS6 discussed making use of activities within PhD workshops that encourage students to share advice and stories, to assist in forming connections that extend beyond the classroom. “They often arrive looking nervous and not talking to each other but leave having formed bonds, going on to form a support network outside of the classroom” (CS6).

In CS7 they discussed their introduction of compassionate micro skills teaching of communication (CMSC) with undergraduate students which aims to encourage compassion within group dynamics. This approach was part of a 12-week module where students worked in small groups to prepare and present a group study task each week. To prevent cliques and enhance social connections, the study groups were changed for the first six weeks, allowing students to collaborate with various peers. In weeks 7-12, students formed fixed groups for assessments. The goal is to encourage students to be more attentive to the distress or disadvantage of others and to nurture compassion as a motivation to care. The training includes strategies for managing unhelpful group behaviours, like using eye contact and inclusive body language, with an aim to apply these practices beyond the classroom. It is argued that this approach formalises the development of 'cognitive competencies' essential for genuine compassion (Gilbert et al., 2018)

CS10 involved adopting a Philosophy for Children (P4C) approach in teacher education, enhancing thinking through an enquiry-based, dialogical pedagogy known as the 4Cs (critical, caring, collaborative, and careful thinking). This method encourages compassionate dispositions by fostering reflective, inclusive dialogues that embraces kindness. An example is where following a group task, students were asked to reflect on the conversations they had had asking “did we listen to each other? Did we build on each other’s ideas?” This approach is argued to enhance students’ kindness and compassion towards each other through creating an opportunity for self-express and connection.

Connecting with Tutors

Many of the case studies stressed the importance of university tutors providing individualised support to students (CS1, CS5, CS9 CS11). In CS4 they highlighted the value of students being assigned a pastoral tutor who can get to know the student to support both their personal and academic needs. CS9 discussed the implementation of a new academic advising system which was developed based on previous student feedback. This feedback had highlighted the limitations of the existing personal tutoring system, which primarily focused on pastoral care. Students had reported facing academic challenges that extended beyond this scope, and were looking for guidance in selecting study modules, career planning, and utilising assessment feedback for academic improvement. It was also highlighted through the case study that academics should set aside dedicated time for students to discuss concerns or achievements directly. Small actions, like timely email check-ins, were also viewed as valuable in reassuring students that staff cared for their well-being through being attentive to their needs. Additionally, fostering a sense of value through collaborative opportunities, such as assisting students in publishing their work or engaging in relevant social media communities, was felt to be crucial for making students feel appreciated and valued.

CS6 highlighted the importance of cultivating trust between educators and students. In their interactions with PhD candidates, CS6 emphasised modelling trust to encourage students to replicate this with their future mentees, arguing that "without meaningful relationships, lifetime learning will remain out of reach for many students" (Mckinney and Berube, 2018).

Some of the case studies emphasised the importance of leading by example, through modelling personal values in teaching practice. For others, such as in CS1 and CS9, they reported that tutors sharing their own personal experiences in response to students' academic challenges is pivotal. They would discuss with students how they themselves had coped, or failed to cope, with similar university situations, showing their own humanity and vulnerabilities. Finally in case study CS1, they further discussed facilitating sessions with "empathy and unconditional positive regard."

Connection with the Institution

Several case studies stressed the importance of students feeling connected to their universities, providing reassurance that the university was ‘there for them’. For instance, in CS2 they reported positive student feedback after

trialling a self-help toolkit to support learners as they transition from school to university, with students appreciating the assurance that "the university cares for them."(CS2).

In CS9 they commented on the value they perceive students have from knowing they have an academic tutor assigned to them. They went on to highlight the importance for students of their being informed about what is happening in the department or wider university which is relevant to their course in helping them to feel connected with the university. They recommended creating opportunities for discussion between tutors and students where the pressures and opportunities within the university could be raised, as this can help students to feel valued as a member of the academic community.

Discussion

In our findings we identified four key themes which highlighted the role of kindness in fostering a supportive university environment through creating opportunities for learners to connect with themselves, with their peers, tutors, and with the institution itself. Holistic support was identified in all the case studies as essential for promoting student well-being and helping individuals thrive. Self-reflection and self-awareness were central to this holistic support, echoing previous research that has emphasised reflection as a critical tool for students to take ownership of their learning (Taggart, 2018). Studies in neurobiology reinforce this, suggesting that self-reflection integrates memory and emotional regulation, enhancing learning and resilience (Cozolino and Sprokay, 2012). Furthermore, the case studies in the current research highlighted that relational aspects within tasks, such as opportunities for reflection, play an essential role in fostering students well-being (Fitzmaurice, 2008).

Connecting with peers also emerged as a significant theme, with multiple case studies indicating that a supportive community enhances well-being and creates a culture of kindness. Prior research suggests that students who engage in meaningful peer relationships can foster a sense of belonging, which is critical in countering the isolation often exacerbated by the neo-liberalisation of higher education and the impacts of COVID-19 (Gravett, Taylor and Fairchild, 2021). In addition the emotional support among peers

helps individuals confront challenges without feeling overwhelmed (Haynes and Macleod-Johnstone, 2017).

The connection between students and tutors was seen as another pillar of a compassionate university culture. The academics in this study emphasised the value of assigned mentors and personalised support, viewing these relationships as vital to fostering a culture of kindness and building trust (Haddow and Brodie, 2023). Neurobiological studies further suggest that supportive educator-student relationships can help to facilitate learning by providing students with emotional security (Cozolino and Sprokay, 2012).

Creating a sense of belonging to the university itself was also highlighted as essential. Research suggests that creating a sense of care and value within institutions is critical for student engagement and well-being (Ajjawi, Gravett and OShea, 2023). However, fostering relational pedagogies must be balanced with the increasing pressures on staff, including marketisation and casualisation (Walker-Gleaves, 2019).

Following on from this study future research could follow up on several interesting areas to explore in more depth the benefits that embedding kindness in the curricula can bring. Firstly, it would be beneficial to conduct research focusing on the students' lived experience of kindness in their studies. Providing a more comprehensive understanding their perceptions. Secondly, it would also be beneficial to investigate the long-term effects of embedding kindness in the curricula on student outcomes, analysing areas such as academic performance, mental health and social skills. Finally, given the proliferation of digital tools and the shift to more blended learning we may also wish to explore further how technology can be used to support kindness being integrated into the curricula.

Conclusion

In conclusion, this research study has highlighted the importance of embedding kindness within higher education curricula as a means to foster a supportive and compassionate learning environment. By actively nurturing relational and kind environments, universities can seek to counter the competitive individualism that has been identified in the existing literature on higher education. In adopting a compassionate approach this not only supports students' mental well-being but also promotes meaningful

engagement and dialogue between staff and students. The findings from this study of UK wide case studies suggests that holistic support, self-reflection, and socio-emotional intelligence are fundamental components of a compassionate pedagogy. By connecting with oneself, peers, tutors, and the institution, students can have an opportunity to develop a sense of belonging and mattering to their institution which is thought to be critical to academic success and overall well-being.

Finally, the study spotlights the need for universities to adopt and to prioritise more compassionate pedagogies (despite the pressures of marketisation and competition). In doing so, universities can create a nurturing environment that supports students' mental health and fosters a culture of kindness and compassion.

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CHAPTER TWELVE

Communities of Practice: Finding spaces of resistance to influence the institutional discourse.

COMMUNITIES OF PRACTICE: FINDING SPACES OF RESISTANCE TO INFLUENCE THE INSTITUTIONAL DISCOURSE.

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Editorial Comment:

The concept of a Community of Practice (CoP) along with its benefits to the functionality and cohesion of a team is introduced and theoretically grounded. The applied case study of creating the CoP 'Spaces to Breathe' is presented and aspects of best practice are discussed, providing suggestions for development of CoPs at other institutions. The chapter also explores how Community of Practice theories are applied in practice amidst the challenges facing the higher education sector.

ABSTRACT

In an era where the call for a Community of Practice (CoPs) to become a vehicle for critical thinking and practical problem solving, it is paramount that as academic developers, we embrace all of the spaces available to use when we plan for collaboration, networking, critical thinking and of course learning.

In this chapter, our intention is to gently disrupt conventional ways of thinking how knowledge is made (and shared) and actively seek to gain insight into how to hear, value and embrace the diversity of voices within our membership. Two academic developers put educational theories to work to think through the possibilities of how a Community of Practice in Goldsmiths, University of London, can juggle the desire for community building against the threat of succumbing to the surveillance mechanisms that are frequently necessitated for standardisation / implementation of institutional strategy and policy.

Keywords: Academic developers, Community of Practice, Resistance, Praxis

INTRODUCTION

In what continues to be an increasingly challenging and alienating academic landscape (Hall, 2018), it is important to create opportunities to facilitate community building and networking. Working in centralised departments, academic developers are positioned well to explore and connect the "kaleidoscope of eclectic voices" (Bultoc in DevisRozental and Clarke, 2024, p90) which naturally exists within a Higher Education Institution (HEI). Academic Developers (AD) often work both with the micro level (individual and lecture room) and with key institutional actors at the macro level. Consequently, it is possible to both capture the expertise and energy to develop informed collective praxis at ground level and connect with the mechanisms for writing policy.

At Goldsmiths, we are coming to the end of the initial phase of establishing a Community of Practice (CoP) called 'Spaces to Breathe', where colleagues are supported to lead events and discussions using values of a principled (accountable) space. Co-constructing from multiple spaces requires complex and often invisible reconciliation work, and at times colleagues may feel challenged. This inevitably will bring about feelings of collegiate discomfort, making it essential that colleagues are supported in their vulnerability, and that psychological safety and wellbeing lies at the heart of our thinking.

The authors argue that by putting pedagogical theory to work, we can initiate a CoP that can gently disrupt conventional channels of communication. A CoP that can reveal the spaces available to listen out for and value the diversity of Excellence by Experience (EBE) that can all too easily remain hidden within our membership. We first frame the context in which the CoP will operate, before we open the 'black box' behind our contemporary understanding of CoPs. We then consider how, by planning

through an understanding of the intersection of key educational/social thinkers, such as Bourdieu (1977), Wenger et al (2002), Freire (1996) and hooks (2003), we can generate alternative possibilities as we weigh up options and organise our decision-making processes.

The challenging landscape of Higher Education in England.

Although it is not possible to fully untangle the implications within the remit of this chapter, we think it is worthwhile glancing at the challenging nature of the sector's landscape and revealing the implications for academic developers. Morale is low across the sector. Increased pressures (financial, demographic shift, political, rapid technological advancements and changing demands of the graduate, to name a few) requires navigation of oft-hidden complexities, whilst facilitating institutional change (Bultoc in DevisRozental and Clarke, 2024).

As academic developers, we operate within a contested 'third space' (Whitchurch, 2012) negotiating the gap between institutional strategies, policies and its operational implementation. Colleagues are caught within a precarious web of performing to the competing demands of conformity/uniformity and the demonstration of innovation and inclusivity (Hubbarb in DevisRozental and Clarke, 2024). In creating a CoP, we juggle the desire for community building against skepticism of, and succumbing to, the surveillance mechanisms that are necessitated for the standardisation/implementation of institutional strategy and policy.

The context at Goldsmiths

Goldsmiths, University of London, is a small university situated in Southeast London. With a diverse and vibrant community, socio economic challenges affect educational opportunities and outcomes of the local community. Goldsmiths has a proud history of developing creative, active citizens with critical thinking skills. As an Arts based university, the current culture of transformation has, over the past four years, been met with activism to maintain spaces to celebrate creativity and critical thinking. It is in this localised context that as academic developers, we have imagined a space that can embrace the love, passion and energy inherent within naturally occurring resistance (hooks).

The landscape in which we seek to define collective praxis in Goldsmiths is both challenging and risky. The top-down focus on securing performance indicators (league tables, graduate earning outcomes, student success) leaves little space (cerebral and time) for lecturers to take risks and negotiate shared values around institutional change. What, however, is perhaps unique to Goldsmiths is that as a result of industrial turmoil there is now recognition for the need for individuals to be able to process, express, share and find (or sustain) new meaning in work. There has of course not been a collective response to institutional change. Some individuals want to be offered a path through the transition, whilst others need time to reconcile their emotions as they move from academic freedom and siloed practices to shared projects tied to the strategic aims of the university. It is within this context that we have been authorised to co-construct a CoP to support identity / reparation work and collectively support navigating the changes within institutional culture.

Unpacking the concept of Community of Practice (CoP)

During the 1990s, Jean Lave, a cognitive anthropologist, published her observations of the power of situated learning in the context of apprenticeship schemes. From Lave's (1996) viewpoint, the power of situated learning was deeply entwinned within the need to belong to a community. The power in social learning, she posited, appeared strongest in a situation where new members (the apprentice) could legitimately operate at the periphery of the community (the workplace), but all-the-whilst remain fully emersed in the technical aspects of the role. She argued that rather than learning taking place when presented as abstract fact, contextualizing the newly acquired skills, knowledge and attributes afforded greater opportunities for the apprenticeships to both demonstrate competencies and undergo identity transformation. The coupling of situated learning with CoPs was developed with the support of educational theorist Etienne Wenger (Lave and Wenger, 1991), and whilst acknowledging that social spaces dedicated to learning have existed in many forms and by other labels across history and cultures, they coined the term Community of Practice.

In a search for a unicorn? Finding spaces of resistance within a CoP

In its first phase (Wenger-Trayner, 2015), a CoP was framed through the power of situated learning and primarily within the context of progressing effective teaching in apprenticeship schemes. Written as a 'living' framework, the Lave and Wenger (1991) definition remained loosely framed around a group of people who "share a concern or a passion for something they do and learn how to do it better as they interact regularly". By 1998, Wenger had significantly extended the framework, and CoPs are now understood as holding characteristics such as 'collective learning', 'shared histories', 'mutual engagement' and for effective practice, requiring 'the source of coherence of a community' (Arthur, 2016).

The concept of a CoP has enjoyed considerable political ascendency, and academics have long since talked of conceptual 'shifting' (Churchman and Stehlik, 2007) and 'slippage' (Tummons, 2012). By phase three, 2015, the current format of connecting (and mapping) professional identities to an organisation's strategy was firmly established as a role of a CoP (Arthur, 2016).

But what of establishing a CoP in a university?

Wenger-Trynner's (2015) premise remains concerned with a shared experience of learning, which seeks to support novice members (primarily operating at the periphery) through to belonging. Full membership is envisaged as occurring naturally through "a process of assimilation between newcomers and old timers" (Lave and Wenger, 1991). Arthur (2016) reminds us that universities, operate entirely differently from an apprenticeship scheme and helps us think through the implications. Universities are knowledge-based, where core competencies tend to be demonstrated through the production and articulation of knowledge, and in polar contrast to apprenticeship schemes, learning is primarily conceived as "(transference from) abstract theory to transdisciplinary problem solving" (Arthur, 2016, p4). In addition, universities are highly complex in their structure and tend to operate in conditions that are far from the clearly delineated and stable structures that were inherent within the original examples used by Lave & Wenger (1991).

Whilst it is fair to assume that in a well-functioning CoP operating within a university, new members will join to evolve their thinking, negotiate different meanings and positionings, learn from each other and establish as

sense of belonging. What polarises the conditions is the inherent complexities of relying on an assumed journey from 'novice to expert'. The pre-existing knowledge, skills and experience of university lecturers makes for complex and potentially volatile engagement at the periphery. New members are likely to jostle with 'old timers' for positioning, and recognition for being able to contribute and progress the CoP (De Freitas, 2008). In 2025, we now, more than ever, need to engage in contextual discussions about how, as academic developers, we can offer support for members to make sense of the multifaceted needs of the changing environment.

It is not all bad news! Bultoc (Bultoc in DevisRozental and Clarke, 2024, p88) argues that we are currently working in an era that prioritises flexibility, agility, collaboration and co-construction and with "undefined boundaries between the strategic level and operational and between autonomy and control". As academic developers, we have a strong evidence base that reveals the myriads of ways that grassroots CoPs can drive change, promote engagement, maximize internal resources, and leverage expertise to enrich the culture of our workplace. The question we really need to ask is, is it really possible to both remain visibly aligned with organisational performance *and* create the conditions for grassroots leaders to negotiate change by facilitating a collective praxis, and supporting identity (reparation) work?

Building Spaces to Breathe, a Community (of Practice) at Goldsmiths

Accepted by key actors within the transformation, 'Spaces to Breathe' is accepted as a necessary Community (of Practice) existing as a legitimate site at the periphery of Goldsmiths centralised academic unit. Spaces to Breathe offers a space for building grassroots leaders of change, *and* of collectively articulating a critical praxis that can potentially inform the ways in which policy is rolled out. Our purpose is to think differently about how we can create new conversations, embrace the complexities and messiness as we (re)make, (re)shape the student experience by revealing the rich tapestry and diversity of the shared knowledge within our community. We are at the end of the beginning phase, and our intent is to travel beyond traditional ways of thinking about CoPs, by embracing emancipatory pedagogues views of community. We achieve this by looking to hooks (2003)

"To build community requires vigilant awareness of the work we must continually do to undermine all the socialisation that leads us to behave in ways that perpetuate domination."

Why put theory to work?

To understand how we might use our C(oP) to bring about disruptive narratives, we start by borrowing from Askew and Carnell (2011) who posit Habermas (1970) as a platform to think through the nuances of different perspectives of the purpose in creating and sharing knowledge. Askew and Carnell simplify Habermas's framework as

- Domain one – Learning to act within an environment (skills and competencies).
- Domain two – Learning for personal meaning through social interaction.
- Domain three – Reflective learning leading to perspective transformation.

The disruption associated with the third domain may well promote the freedom for members to collaborate and ask questions of the normative assumptions that are embedded within the social norms of the group. However, emancipatory pedagogues will be inclined not to engage with Habermas. Rather they seek to dislodge, trouble, and dismantle generic understandings of the social world. hooks (2003) suggests that a member seeking to disrupt will most likely look to community action to create spaces that embraces vulnerability, humility, and trust.

It is also important to state that the above domains are by no means intended to be mutually exclusive. For many, effective learning incorporates elements from each domain. However, each domain holds a narrative landscape that is unique, and as such, shapes how we are likely to prepare the discursive grounds and activities for our C(oP) to develop. We argue, it is by looking at the nuances between the theories that we can extend our understandings of what can be sought. In short, we think that by putting theory 'to work', we can extend our social thinking and build a collective praxis to stimulate meaningful activism, particularly at a micro level.

How can we put theorise ‘to work’?

Here we look to the Advance HE (Lowe, et al., 2024) Teaching and Learning Communities of Practice Toolkit. The toolkit teases out how, by reflecting on the naturally occurring conversations, we as academic developers, can steer the discursive construction and therefore, the co-construction of the shared values. In terms of the remit of this paper, we offer a summary of the theories that we have found most useful to put to work in Spaces to Breathe.

What can a structuralist (Bourdieu, 1977; Skeggs, 2013) lens offer?

From a structuralist perspective, learning is fundamentally a social process. Knowledge is constructed within the social world, developed and made sense of through the participation (and/or exclusion) from social interaction. As such, this perspective aligns (although somewhat uncomfortably) with Habermas’s domain three. Uncomfortably, because Habermas and Bourdieu were both prolific writers in the same era, but neither theoretically engaged in each other’s work.

Bourdieu (1977) frames the individual as a player, who on entering a new situation (what Bourdieu refers to as the field, in this context the Higher Education sector) uses past experiences (habitus) to make sense of the rules of the social encounters in which she finds herself situated. On theorising the ways in which we encounter the social world (familial, work, study etc.), Bourdieu posits that we consciously, and subconsciously, internalise what we take to be our ‘natural’ place within the social order. De Freitas et al (2008) tells us that we, as community members, are continually judging and weighing up the positions that we have won and lost, categorising and reshuffling what it is that we value, and internally weighing up what we perceive to be the worth of our continued participation. Through a Bordieuan perspective, our lived experiences, and especially our previous encounters with education are entangled with how we interact with members of our community of practice.

We anticipate that if the lead of an event in Spaces to Breathe C(oP) is asking naturally occurring questions that focus on the interplay between individual agency and structural constraint, then during the planning phase, we would, where appropriate, suggest extending thinking to include the emancipatory pedagogues. We think this might prompt the leader to think

through how fostering hope might mobilise critical consciousness and empower an individual to change or to facilitate change within a community.

- Discussions tend to draw attention to how individuals come to learn the social rules, navigate social norms, and to understand the ability or barriers that leverage cultural capital to contribute.
- Discussions reflect on power dynamics and conversations with participants interrogate who has access to resources and thus, how conversations are shaped, what/who is ignored and/or who is listened to.
- Introduce an Equality Divesity and Inclusivity impact assessment to understand how community (and learning) activities may constrain and deepen inequality as well as identify opportunities for the freedoms to flourish.

What a socio-cultural (situated learning) perspective can offer

Originally conceived as situated learning by Lave and Wenger (1991), the process of meaning making was reworked by Wenger et al (2002) as 'knowing in practice' (p.141) and 'experience in knowing' (p.142). With a focus on cognition, Wenger helps us to understand how professional and learning conversations are rooted through the social interactions that take place within the context of our CoP. In this perspective, ways of knowing are not made or performed alone, but are viewed as a social practice and developed through collaboration. This perspective aligns comfortably with Habermas's domain two and often migrating into domain three to achieve personal transformation.

If naturally occurring conversations during the planning phase looks as below, we might suggest looking to the emancipatory pedagogues to consider the broader social context that shape individual aspirations.

- Fostering a culture of continuous development and growth through workshops.
- Sharing knowledge, practice, and artefacts to support mastery
- Support, often mentoring and group encouragement, to experiment to overcome challenges and achieve shared learning goals.

When naturally occurring planning conversations consider the following, then we might encourage the leader to return to Wenger to scaffold the processes of learning.

- Conversations are a call to nurture and support critical and socially conscious spaces that seeks, respects and values all insights as expertise from experience.
- Planning how to foster an environment which opens communications and empowers individuals to open up
- Conversations ask how educators can empower and liberate individuals to make changes within and to their community.
- Promote an intersectional approach to question dominant beliefs and challenging power dynamics.

What can emancipatory pedagogues Freire (1996) and hooks (2003) offer?

Freire (1996) and hooks (2003) would each demand we leave aside Habermas's framework. For emancipatory pedagogues, collective praxis is developed through critical reflection on the embodied entanglements of material, professional and personal and professional practices. Emancipatory educationists seek to dismantle and transform existing structures through dialogue, collaboration, and a critical reflection that encourages individuals to question dominant narratives and confront social injustices.

Conclusions

We are at the start of our journey and intend to explore the dimensions of togetherness by offering a Community (of Practice) as a vehicle from which to share experiences of undergoing change. In an era where the call for a CoP to become a vehicle for critical thinking is so visible, it is paramount that as academic developers, we embrace opportunities for collaboration, networking, critical thinking and of course learning. Being centrally positioned does contain risks that may prevent engagement, but our

positioning does offer us unique connections between practice and strategy. It is in this discourse terrain, that we are seeking to generate alternative ways of viewing disruption and challenge.

This is the context in which we attempt to create a CoP to form a collective praxis, from which individuals operating at the grass roots, can work together to improve the student experience and to potentially inform the ways in which policy and cultural change is enacted.

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CHAPTER THIRTEEN

Academic Impostor Syndrome in students and academic staff: Navigating the pathway to confidence and control

ACADEMIC IMPOSTOR SYNDROME IN STUDENTS AND ACADEMIC STAFF: NAVIGATING THE PATHWAY TO CONFIDENCE AND CONTROL

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Editorial Comment:

This comprehensive exploration of general and academic imposter syndrome offers a critical contribution to understanding its prevalence and impact within higher education. By contextualising the study through both empirical data and theoretical frameworks, the authors effectively bridge the gap between general imposter perceptions and the academic environment. Notably, this chapter emphasises the importance of

belonging, adaptive social comparisons, and institutional responsibility in mitigating imposter perceptions. The authors offer practical, research-backed strategies such as fostering peer mentorship, promoting growth mindsets, and improving institutional support to combat the negative effects of imposter syndrome.

ABSTRACT

Impostor syndrome has received growing attention in recent years because of its universality and maladaptive association with wellbeing and performance outcomes in professional and academic settings. Researchers have grappled with measurement issues in the quest for a gold standard. Our initial pursuit was to develop a measure that captured students' approaches to study in the context of impostor perceptions. From 10 issues emerging from the literature some examples are fear of evaluation, fear of being discovered, impression management, feelings of not belonging and unfavourable comparisons with others. We confirmed that the 10 issues were commonly reported in students from 2 UK universities ($N = 332$), and in presenting our findings to international audiences, academic colleagues also reported impostor intrusions that impaired their wellbeing and debilitated their confidence. We therefore reflected on and propose strategies to counter each domain identified and to empower student and academics' navigation to confident control.

Keywords: Impostor syndrome; Impostor phenomenon; Negative self-talk; Internal dialogue; Impostor measurement.

INTRODUCTION

Contextualisation of study

This study is based on our recent presentation at the International Federation of National Teaching Fellows Symposathon (Dec., 2024) and on our recent publication (Todd & Mcilroy, 2025) related to data collection at two UK universities in West Wales and in the Northwest of England. The novel aspect of the study was to garner well established concepts within general impostor syndrome (also referred to as impostor phenomenon) and adapt them to the academic context, as this facilitates greater predictive validity (Bandura, 1997). This provided us with the needed content validity, and we augmented this through focus groups with students to ensure the measure we created was fit-for-purpose for its end users. In addition, through presentations at conferences, seminars and symposia many academic teachers or Faculty members provided feedback showing that impostor syndrome is prevalent among Faculty members. This resonates with the literature that impostor syndrome is evident in professional and academic settings (Bothelli & Roulette, 2019). Three academic colleagues from three institutions in the USA joined the team to develop the research cross-culturally and through the intersectionality highlighted below.

General and Academic Impostor Syndrome

General impostor syndrome is described as an inaccurate self-assessment whereby individuals do not experience an internal sense of success, despite high achievements, leading to chronic feelings of self-doubt and inadequacy (La Donna et al., 2018). The chronic feelings of self-doubt point to the

enduring nature of impostor syndrome which is associated with depressive symptoms (Cheung & Cheng, 2024). Characteristics of the symptoms of impostor syndrome include affectivity (feeling), cognition (self-doubt), and behavioural aspects (depressive symptoms). Although impostor syndrome does not appear in the Diagnostic and Statistical Manual of Mental Disorders, (DSM 5-TR) as a psychiatric disorder, it may trigger a sense of unease (Sverdlik et al., 2020), with sufficient disturbance to impair mental health and psychological wellbeing (Le, 2019; Mullangi & Jagsi, 2019).

Impostor syndrome is borne out of environments and social interactions that lead people to question their own ability and worth (Feenstra et al., 2020), so in the educational context, impostor syndrome is prevalent in students, whose ability is subjected to ongoing assessment, and academic staff, who are potentially subjected to repeated rejection in the culture of "publish or perish". Higher levels of impostor syndrome are detrimental to mental health (La Donna et al., 2018) and are correlated with burnout in both students (Diaconescu et al., 2024) and academic staff (Jaremka et al., 2020).

Capturing and adapting breadth of content from impostor syndrome literature

In developing measurement around impostor perceptions, we adapted the general approach to the academic context to create a new education-specific measure (see Todd & Mcilroy, 2025) to specifically assess academic impostor syndrome (AIS). A review of the four established measures of general impostor syndrome (Clance Impostor Phenomenon Scale, Clance, 1985; Harvey Impostor Scale, Harvey, 1981; Perceived Fraudulence Scale, Kolligian & Sternberg, 1991; and Leary Impostor Scale, Leary et al., 2000) identified 10 primary domains. These are fraudulent ideation, less capable than peers, fear of being discovered, self-criticism, achievement pressure, impression formation, difficulty internalising success, self-monitoring, self-sabotaging and fear of evaluation. Mak et al. (2019) concluded that no gold standard of measurement is currently available. Hence, we have embraced the challenge of constructing 10 items (i.e. statements for respondents to endorse on a 7-point scale ranging from Strongly Disagree to Strongly Agree) related to the perceptions of students (and currently in construction for academic staff). According to the Times Higher Education periodical in

the UK (TES, 2018), open discussion of the issues around impostor syndrome may bring relief and changed perceptions. For students, impostor intrusions have been implicated in perceptions of fraudulence (Breeze, 2018), enrolment, retention, progression, integration, and identity (Chrousos & Mentis, 2020; Hamood, 2020), as well as debilitating confidence and undermining wellbeing (Collins et al., 2020).

Group differences in imposter syndrome

Content validity from established measures and contemporary literature provided a catalyst for developing the new measure. However, understanding the dynamic functionality of the phenomenon at the individual level requires exploring Intersectionality. For example, non-traditional students are prone to impostor perceptions with the belief that they do not belong (Muradoglu et al., 2021). Conversely, high achievers may also be vulnerable (Holden et al., 2021) and attribute their achievements to external factors (Bravata et al., 2020). Moreover, Price et al.'s (2024) meta-analysis has confirmed that women are more inclined to impostor beliefs than men, but the differences are minimal.

Some group and individual difference comparisons that warrant additional consideration include first-generation versus continuing-generation students and on-ground compared to online students. Both first-generation and online students might hold social comparisons that devalue their legitimacy and question their belonging. Little research has been conducted to date on impostor syndrome within online student communities, and given that, in the United States as an example, non-traditional, under prepared and underrepresented students enrol online at higher rates than other students (Dynarski, 2018; Jaggars, 2011), and this may be a context in which impostor syndrome is most prevalent. Belongingness may be lower and impostor syndrome higher in students attending online. Given that these factors impact enrolment and retention, intentional methods to mitigate social comparison and negative biases could offer significant benefits.

Ménard and Chittle (2023) have suggested that the relationship between imposter syndrome and demographic backgrounds or identities may depend on other factors, such as self-esteem and sense of belonging. Supporting this possibility, previous research has shown that imposter syndrome is associated with self-esteem, academic self-concept, fear of failure, fear of

success, stereotype threat, and test anxiety (e.g., Cokley et al., 2015; 2018; Jöstl et al., 2012; Kumar & Jagacinski, 2006; Lige et al., 2016; Neureiter & Traut-Mattausch, 2016; Peteet et al., 2015; Schubert & Bowker, 2017). Some of the above findings may be counterintuitive at a cursory glance but this breadth of understanding is vital for informing intervention strategies.

Strategies for supporting students

Given previous research regarding the potential impact of impostor syndrome on enrolment, retention, and achievement (Sonnak & Towell, 2001), what are some recommended strategies for supporting students? Chrousos and Mentis (2020) emphasized the importance of increasing visibility of the problem, especially through open discussions about imposter syndrome at the institutional level which can assist students in naming their emotions and can help to normalize the experience. In addition, they suggest that institutions provide access to mental health coaching or other forms of mental health support as students grapple with the psychological consequences of imposter syndrome. Similarly, in response to their finding that stress and imposter syndrome had a stronger relationship for first-generation students relative to others, Holden et al. (2021) suggest proactive efforts to promote wellbeing and resilience for all students.

Researchers have also highlighted the role of communication. von der Embse et al. (2015) found that appealing to efficacy rather than fear when providing feedback to students can help to improve test scores over time. Fear appeals are focused on negative consequences associated with failing, while efficacy appeals are intended to reinforce potential and capability. Feedback to students may be a trigger to induce impostor perceptions, but optimal feedback will be nurturing and supportive (Todd & Mcilroy, 2014), with challenges presented in this climate of learning. However, academic staff may also inadvertently engender fear, anxiety, and diffidence by inappropriate comments (von der Embse et al., 2015). For this reason, it is recommended that academic staff focus on growth mindset (see Dweck, 2017) when providing instructions and feedback for students. By utilizing a growth mindset, academic staff can emphasize the ways in which abilities and intelligence can be developed through effort, effective strategies, and persistence, rather than presenting abilities as fixed traits.

It is also highly recommended that faculty create opportunities for group peer mentoring. Collins et al. (2020) highlighted the value of a group peer mentoring approach in which teams of students with more training and experience collaboratively mentor groups of students with less experience, creating a pipeline in which less experienced students eventually progress to become mentors themselves. Working in teams and groups can provide opportunities for co-mentoring and can help to create a culture of mentorship. Collaborative learning in mixed-ability groups as well as student-led, project-based learning, can foster belongingness, identity, value and interest, ability, self-efficacy, and confidence (e.g., Hernandez et al., 2013; National Research Council et al., 2012; Paushter, 2017; Spence et al., 2022; Wei & Woodin, 2011) – all of which can help to combat imposter syndrome. Working within the framework of these adaptive psychological concepts and constructs will signal the way forward.

It is a given that academic teachers support students in the delivery of solid educational substance (Kelly-Laubscher & van der Merwe, 2014; McWilliams & Allan, 2014). This should be endorsed and implemented without question by all Faculty members. Moreover, there should be reasonable consensus around the core content that gives validity to a study programme, equipping students to progress to professional practice. However, although all may agree to delivering the appropriate content of learning not all might fully engage in inducing the climate of learning that nurtures student wellbeing and reduces impostor intrusions. Or at least some may inadvertently not attend to such issues or feel that this is not within their competence repertoire. Academics should not be expected to become professional therapists or counsellors. Nevertheless, a simple caring and attentive approach can transform collaboration (Broom et al., 2024; Wingate, 2019) and nurture a good sense of academic community.

Loneliness and isolation may be extremely detrimental to student achievement and wellbeing, and impostor syndrome means students are more likely to remain as invisible as possible. There must therefore be strong social and communication solutions to impostor syndrome through the adaptive interactions and mechanisms contained within an academic community. No stone should be left unturned in equipping our students to combat the onslaught of this problem. However, true community means that faculty are also supported to maximise their capacity to support their students. Collaboration among faculty might serve their own battles with

impostor syndrome as well (see next section). It is worth noting that all these factors are complicated when considering online and remote educational methods where both students and faculty are potentially isolated. However, the problems around impostor syndrome for students may not be effectively addressed fully without attention to countering the problem in faculty.

Imposter syndrome among faculty

Perceptions of academics may be affected when shown the achievements of colleagues or when their work does not appear to be valued or rewarded to the same extent as other colleagues' efforts. Social Comparison Theory indicates that self-esteem and wellbeing may be impaired through maladaptive comparisons with others (Gerber et al., 2018). Other gateways that may trigger and sustain impostor perceptions might include appraisal meetings, pursuing promotion, module or course evaluation, peer or exchange observation, self-consciousness, accent, race, gender, age, experience etc. A related issue that warrants further attention is the effect of student evaluations of faculty that may serve either to validate or demotivate individual faculty members.

Impostor syndrome among university faculty is a challenging phenomenon. Many academics experience feelings of inadequacy despite clear evidence of their competence. There are many factors that can contribute to faculty experiencing imposter syndrome and these vary from person to person. Bothello & Roulet, (2019) found that there are a range of factors that can impact faculty imposter syndrome. These can include: (1) the need to meet high expectations, (2) the publish or perish culture and (3) job insecurity for temporary contract faculty. In their meta-analysis Harris & Orth (2020) found that self-esteem plays a significant role in imposter syndrome and noted that self-esteem and social relationships are deeply interconnected and can mutually influence each other over time. They found that individuals with higher self-esteem were more likely to engage in positive and supportive relationships and this can serve as a protective factor against the negative effects of impostor syndrome.

In addition to self-esteem there are other considerations that can help address imposter syndrome and improve overall well-being in faculty. The first is the role of the institution (Muradoglu et al., 2021) and the second is the role of the individual. Institutional considerations can include working to

foster inclusive environments that ensure that recognition and validation are an integral part of institutional culture. Moreover, institutions can recognize the strain of job insecurity for temporary contract faculty and take steps to ameliorate financial strain and low pay by creating ways to support the contract faculty financially. For example, institutions can offer stipends and reimbursements for contract faculty who attend professional development opportunities. For individuals, Harris and Orth (2020) found that seeking support from trusted colleagues or mentors can help faculty because there is a reciprocal relationship between social relationships and self-esteem building over time. This bidirectional connection implies that personal efforts, like actively seeking support, alongside institutional backing, can play a crucial role in addressing impostor syndrome. By addressing both institutional systemic challenges as well as fostering self-esteem, we can create a healthier, more supportive environment for academics to thrive.

Building the academic community

In our measure of academic imposter syndrome (see Todd & Mcilroy, 2025) the issue of comparing with others recurs either directly or indirectly, and a big issue in this is simply connecting with other colleagues (or for students with other students). According to Harris and Orth (2020) self-esteem is boosted by friendships and social connections. Although everyone should navigate their way through recurrent impostor intrusions, a strong community will nourish the climate to combat this.

Human connection and interaction are likely to influence self-esteem and self-efficacy, including friendships at university (Morelli et al., 2023). Moreover, staff-student rapport warranted the development of a psychometric tool to evaluate its structure, content and outcomes (Broom et al., 2024). The friendliness of the teacher emerges as a factor that may impact on student engagement. Broom et al. (2024) also refer to the academic staff as responsible for creating an engaging and constructive atmosphere through approachability and a caring disposition. So, in addition to the content, context and configuration of learning, the climate of learning adds a vital ingredient to nurturing the student experience. Moreover, public or private “put downs” to students should be studiously avoided (von der Embse et al., 2015). All this is vital in rebutting students’ predisposition toward academic impostor syndrome (Todd & Mcilroy, 2025).

Belonging - toward inclusion and adaptive comparisons in an academic community

In our conceptualisation of academic impostor syndrome, belonging is postulated as a potent antidote. Belonging is at the kernel of academic community, and in the 10-items we have developed for students (and now for academics) the word "belong" is at the heart. This does not imply top-down institutional ownership but rather integration within the academic community. To counter impostor perceptions, a strong sense of belonging is a powerful weapon (Allen, 2021). True belonging is not a static state but consists of affectivity, thinking processes and behavioural engagement. Students and staff may be more likely to feel connection with the community when they spontaneously invest time and energy in valued academic tasks.

A second point relates to comparing ourselves with others especially when individuals gravitate toward unfavourable comparisons. At this point we can call on Social Comparison Theory (see Gerber et al., 2018) which highlights the various comparative dimensions to engage with. We may see others as further on than us, falling behind us, or on a similar footing, and our comparisons are likely to be adaptive or maladaptive to our wellbeing and motivation. Attention is needed to avoid making unfavourable and unrealistic comparisons with others.

The turning point toward an adaptive evaluation may begin when we focus on the personal progress we have made, and how much we may have already surpassed our previous expectations. Every individual has their personal pathway and unique set of circumstances and there is real value in celebrating what we have and where we are. Others may have more support, more resources, and more opportunities than us (for example for promotion).

Future directions

One next step for our research team is to adapt the academic impostor syndrome scale developed by Todd and Mcilroy (2025) for STEM-focused courses, including statistics and research methods courses. Statistical trends show that women and minorities are underrepresented in career paths that include data analysis, computer programming, and research (US Bureau of

Labor Statistics, 2020; Kaggle Machine Learning and Data Science Survey, 2020). Tao and Gloria (2019) have found evidence for an association between gender representation in STEM fields and levels of imposter syndrome among female graduate students. We plan to build on previous research by investigating the role of STEM-specific academic imposter syndrome and associated correlates among students from diverse backgrounds. In addition, we plan to explore the role of academic impostor syndrome among faculty at different stages of their career, and to examine the effectiveness of specific interventions designed to mitigate imposter syndrome within higher education.

Conclusions

In conclusion, general and academic impostor syndrome perceptions may have negative impact on one's wellbeing and self-esteem, but they may also be used as motivators for progress and for keeping us grounded and grateful to the many others who have contributed to our successes. The measure we have constructed allows individuals to rate themselves in the 10 salient domains. Everyone can evaluate their score on each of the 10-items and the scale overall. We have created a tool that has content validity and an operational definition that allows everyone to confront the issues. The aim is to generate discussion and to provide everyone with the empowerment of knowing that they are not alone. The more we learn about factors that contribute to impostor syndrome and academic impostor syndrome, the more we can create intentional interventions to sway it toward being motivating. The realisation of the commonality of the problem has been reassuring to many students and academics and has enabled many to validate themselves and each other.

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CHAPTER FOURTEEN

Australian study tour leaders: lived experiences, approaches to curriculum, support and training needs

AUSTRALIAN STUDY TOUR LEADERS: LIVED EXPERIENCES, APPROACHES TO CURRICULUM, SUPPORT AND TRAINING NEEDS

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Editorial Comment:

This chapter presents ongoing research at an Australian university aimed at understanding the lived experiences of study tour leaders and the factors influencing the implementation of study tour programs. Using autoethnography as a research method, it offers three insightful vignettes from study tours in China, Malaysia, and Mongolia.

ABSTRACT

Study tour pedagogy and leadership are under-researched internationally and in Australia. Both authors are experienced study tour leaders and qualified teachers. The lack of formal research into study tour pedagogy and leadership in Australia led the researchers to commence their research with an analysis of their previous experience, using autoethnographic methods. This chapter presents selected autoethnographic stories and emergent themes. The findings of the autoethnographic analysis identified that study tour leadership was more complex than classroom teaching, and presented different types of pedagogic, organisational, and student support challenges not found in other university teaching. This required a broader set of pedagogical, pastoral care, and conflict resolution skills and the capacity to respond innovatively and constructively to unexpected events. This autoethnography precedes planned research to document the lived experiences and perspectives of other Australian academics who have led outbound mobility study tours.

Keywords: Academic development, Pedagogy, New Colombo Plan, Autoethnography; Study tour leadership.

INTRODUCTION

Both authors are experienced study tour leaders. When Rosa, wanted to commence her PhD, Trudi became the Principal Supervisor and the idea of researching the topic of pedagogy of Australian study tours began to take shape. A preliminary review of literature found limited international research on the pedagogical practices of study tours leaders. Several studies were located that examined students' experiences (Keese and O'Brien, 2011) or students' learning (Jiusto and DiBiasio, 2006) but these did not discuss the practices of study tour leaders and how they fostered students' learning. Analysis of the international literature on study tours indicated considerable international variation in the form and purposes of academic study tours in higher education. For this reason, a decision was made to de-limit the research project to an examination of Australian study tours funded under the New Colombo Plan (NCP).

Definitions

Formal learning: structured intentional and purposive curriculum with expectations of the explicit pre-determined outcomes, for example Tyler's (1949) approach to curriculum.

Informal learning: planned and unplanned learning opportunities, where learning outcomes are not pre-determined and may vary between people. Requires awareness by the study tour leader to recognise unplanned opportunities, and skills in using dialogical conversations (Jeffs and Smith, 2005) to support students' critical reflective skills, and to identify learning opportunities in everyday life. As suggested by Coombs and Ahmed (1974),

informal learning is lifelong, even when the learner lacks awareness of unanticipated learning. Informal learning focuses upon self-development and exploration of worldviews where assumptions, beliefs and values are challenged. Such learning may not be apparent until after the experience (Kolb et al., 2014). According to Rutherford (2017), informal learning lacks structure and does not comply with power or hierarchical roles, and different learning may be achieved by people sharing the same experience.

Research aims and questions

The research aims were developed following a preliminary literature search and the autoethnographic analysis of the authors' lived experience. The aims were to better understand the lived experiences of study tour leaders and factors that support or impede implementation of study tour programmes. An intended outcome is to develop recommendations about how universities can maximise student learning on study tours through improved staff support, training, and pedagogy. The three research questions are:

1. What are the lived experiences and pedagogic practices of study tour leaders leading NCP tours?
2. What are the implications of the experiences of study tour leaders for theorising the pedagogies and practices of NCP study tour leaders?
3. What are the implications of the experiences of study tour leaders for theorising the pedagogies and practices of NCP study tour leaders?

It is anticipated that this research will lead to a typology of NCP study tours, and model(s) of pedagogic processes used by study tours leader to balances multiple competing expectations, and to support students' formal and informal learning. The research will have implications for institutional policies and support arrangements, including how support needs of study tour leaders planning future tours are met. A 'Learning Framework' for professional development for study tour leaders is a possible outcome.

Literature on Australian study tour leaders' perspectives

Two Australian research studies by Lafferty (2022) and Tran and Rahimi (2018) were located that touched upon study tour leaders' experiences of study tours. The most significant findings from these studies were that study tour leaders were challenged by their professional isolation in the host country, by constantly being available to students, by the management of third-party providers and often felt overwhelmed. These findings accorded with the authors' experiences, but both authors considered that the published findings only partially captured study tour leaders' the lived experiences. In the absence of a well-developed literature, an auto-ethnographical process was used to identify and sensitise the primary researcher to the pedagogical and practical considerations that study tour leaders faced when planning and implementing study tour programmes.

Autoethnography as a research method

Autoethnography is a qualitative research methodology in which the researcher explores their personal experiences as data, being both the subject of the study and the investigator, (Muncey, 2010; Rutherford, 2017). According to Reed-Danahay et al. (1997), the researcher analyses their experiences in their socio-cultural context, which sensitizes the researcher to the other perspectives and other ways of seeing events.

FINDINGS

The findings present three vignettes, two of which are accounts drawn from the experiences of the first author, the third vignette is based upon the shared experiences of both authors. Some details (including dates) have been omitted to maintain anonymity of other parties. The first vignette describes aspects of Rosa's experiences of a study tour to China with a group of undergraduate education students. The focus of this vignette is upon the practical difficulties encountered when the study tour leader discovers they have been placed in a situation that is very different from what they expected, where there are limited formal opportunities for student learning, and where there is no communication with the outside world. The second vignette

describes aspects of the first author's experiences of a study tour to Malaysia. This vignette focuses on positive and negative aspects of informal inter-cultural experiences, and the logistic and pedagogical challenges this raised. The third vignette describes aspects of both authors' experiences of a study tour to Mongolia. The focus of this vignette is upon the interplay between formal and informal learning opportunities, between the planned experiences, and the unplanned incidental experiences.

A study tour experience in China

China was the destination for the undergraduate student teachers who had completed at least 50% of their degree. The school and accommodation were on a campus which housed 3,000 Chinese students aged from 13 years to 18 years. The Chinese students lived on campus during the week and were collected by their families for the weekend. The campus was self-contained and set amongst trees and greenery. It had covered areas, a café, refectory, medical facilities, library, science laboratories, computer facilities, teaching rooms, arts and crafts studios, and a sport stadium with running track and a grandstand. The teaching staff lived on campus in shared two-bedroom accommodation in high rise buildings. The purpose of the tour was for the students was to complete a teaching practice unit in China, which would be accredited to their degree. The arrangements for the in-country experience were made by an Australian working at the school who did not communicate with the study tour leader before her arrival in China. The role of the Australian was that of a Third-Party Provider (TPP) who was a school employee and was one of two English speakers on site. The other was a Chinese national who was the direct line to the principal. To communicate with the principal, I needed to speak with the TPP, who informed the Chinese National, who informed the principal. There were no direct conversations. The communication process was extremely difficult, and became more complex after the TPP informed the students that she represented the Australian University and as such she was in charge.

The school campus was in a compound bounded by high concrete walls with barbed wire and armed guards at the entry and exit gates. The message to us was that as, foreigners, we were not allowed out, and that the principal would be jailed if we were involved in any incidents. Our passports were taken by the police for safekeeping and only returned shortly before our

departure. There was no Wi-Fi or connectivity for mobile phones, so I had no means to communicate with my university or the Australian Embassy. The students were placed in groups of three, dispersed amongst fifteen high-rise accommodation blocks, and I was elsewhere. I could not get a list of the buildings nor find out where the students were housed. I managed to get a classroom where I held a daily meeting at 9.00 am. We encountered each other at mealtimes where we ate with the Chinese students. Food was fried chicken, rice, yoghurt, porridge and bok choi for every meal. The mealtimes were 7.00am, 11.30am and 4.00pm. The principal refused to allow the Australian students to do any classroom teaching as he claimed that the Australians would make learning too much fun. The classes had up to 40 students who sat in their allocated seats with a desk and an overhead frame stacked with papers and notes. The teacher read aloud from a textbook and the students made notes. There was no interaction. After weekly tests, students' seating was re-ordered and those with the highest score were moved to the front. I was told later that to be a teacher at this level has very low status and was a consequence of test failure. I negotiated for students to be classroom observers, and this contributed to our daily discussion. I discovered that all school students had a compulsory independent outdoor session between the end of the school day between 3pm and the 4pm evening meal. The Australian students and I participated in these sessions and assisted with umpiring, coaching, and engaged in conversations. These relationships flowed onto mealtimes in the refectory. Every third night, we were expected to attend a banquet with the principal and his key staff. We had a private room, and we were waited on like very important guests. We were plied with liquor for drinking games and cigars and cigarettes. Through the interpreter I explained diplomatically that we would prefer not to participate because of religious and health reasons. Despite my statement, the offerings of liquor and cigarettes were constant.

The experiences were confusing. As soon as we arrived the principal offered to employ the students immediately as English Teachers whether they were qualified or not, despite not permitting the students to do classroom teaching during their visit. I was concerned about the removal of passports and the threats about the principal's welfare. My perception of the Australian students' learning was that they developed an understanding of relational informal learning though engaging with school students during the outdoor sessions. From observations of practice, they gained insight into rote learning

and the use of the public incentive model to attain high results. Freedom to communicate and to be mobile were denied to the Australian students, but they accepted the principal's rule as being a usual cultural practice, and whilst finding it challenging, endeavoured to make the best of the situation for everyone.

A study tour experience in Malaysia

The first author's university was in a consortium with three universities from eastern Australia. The students were from the Faculty of Education and upon graduation would be either primary or secondary teachers. The purpose of the Malaysian study tour was for all the students to complete a two-week Teaching Placement, as an accredited unit within their degree. A Third-Party Provider (TPP) was appointed by the universities to source accommodation, match students to schools, arrange cultural awareness events and schedule non-compulsory weekend events. None of the study tour leaders had interacted with the TPPs until they met in Kuala Lumpur, Malaysia. The accommodation for students and study tour leaders were located on different sites, 30-minutes apart by train. This made it difficult to support students with lesson planning, sourcing resources and providing pastoral care. The student accommodation was in a 15-storey complex which also housed families and single aged people. There was a communal swimming pool. The suburb was in a red-light district and the nearby 24-hour fast-food outlets was the contact point. The students were allocated five per room with 2 double beds and floor mattresses. I knew that in some Asian countries that co-sleeping was common, but for Australian students aged 20-55 years, sleeping with strangers, was confronting. The toilet, shower and wash basin were in the corner with only a curtain for privacy. The pool was popular with the students as they struggled with the humid climate. However, their enjoyment of the pool till 10.00pm every evening caused discomfort to the other residents. The aged residents shooed them away with their walking sticks, whilst families told female students to cover their bodies and to not talk to or sit near the male students. We were banned from the lifts because the load signage of seven (Malaysian) people did not equate to the weight of seven Australians, which caused the lift to become stuck between floors. This made the Accommodation Manager angry with students, who thought

that they would die from lack of oxygen as the emergency button when activated did not yield a quick response.

Schools operated on three shifts with the first commencing at 6.00 am and the third shift finishing at 10.00 pm. The students went to the schools on public transport and travelled a minimum of 60 minutes each way. The briefing to the host teachers and schools had been undertaken by the TPP and was inadequate. Unaddressed issues included: supervising teachers being non-English speaking, requirements that students wore traditional Malaysian dress, expecting the student to teach all day if the teacher did not attend, and only permitting pen and paper tasks with no discussion.

I felt very disconnected from my students because of the separate accommodation and the school shifts meant I was not well placed to support then professionally or personally. I offered students the option of moving to a suite in my hotel, (65% took up the offer). I scheduled two non-compulsory daily briefings at the hotel coffee shop where I debriefed with individuals and groups over coffee and cake. The Teaching Practice did not align with the official outcomes expected for this academic unit, but my perception was that the Australian students gained understandings of another education system, of living and working in a Muslim community, and an awareness of their own biases and beliefs.

A study tour experience in Mongolia

Both authors jointly co-led two study tours to Mongolia. Both tours were for humanities and community studies students. The purposes were to increase knowledge and awareness of Mongolian culture and language. There were twelve students on the first tour and seventeen on the second tour. Before the first study tour, three-way discussions occurred between representatives of a Mongolian university, representatives of government and community service organisations and the two Australian study tour leaders. Accommodation for both study tours was centrally located, for the first study tour in student Halls of Residence, and for the second study tour in a small Mongolian-run hotel. The change occurred because of accommodation availability. It was agreed that the curriculum should include elements of planned formal learning, planned informal learning and opportunities for unplanned incidental learning. Formal learning was delivered at the Mongolian University of Science and Technology in the mornings. Informal planned visits and

activities with Mongolian 'buddies' occurred from late morning to late afternoon, or evening.

Formal learning included lectures on Mongolian history, prehistory, culture, dress, food, music, industry, social welfare, daily life and language. Informal learning included visits to museums, temples, cultural exhibitions, musical performances, visits to government departments, to the Australian embassy, to parliament, and walking tours around the city, including to the 'Ger district' where new arrivals to the city were housed in traditional 'gers' (yurts -large circular tents). Some longer excursions were included where students stayed for two nights in gers and had opportunities to visit rural parts of Mongolia. Both study tours included train travel on the trans-Mongolian railway, on the first tour from Beijing across the Gobi Desert, on the second through Mongolia to the Russian border. The first study tour included attending the Naadam festival. Both study tours included visits to social projects, the first tour visited an aged care facility, a former orphanage that now ran youth projects, and a summer camp, whilst in the second tour visited a social enterprise project operated by the Mongolian Down's Association.

Opportunities for unstructured informal learning were supported by including a daily morning group debrief co-facilitated with the students, and by eating meals together. Unplanned events provided unexpected learning opportunities, such as the extended closure of banks, many shops, and entertainment venues during an election period, unplanned travel delays, the loss of all hot water for most of the second study tour, because of annual maintenance of the communal neighbourhood boiler, the widespread use of informal taxis and on the first study tour, sickness of one of the leaders and several participants. Natural group dynamics and interpersonal conflicts provided other incidental learning opportunities. On the first study tour students had only one day of un-programmed time.

Reflecting on these experiences, things we learnt from the first tour informed changes to the design of the second tour. The main changes were a reduction in the complexity and intensity of the program for the second study tour. This enabled students to have more free time. Arriving earlier in the month meant missing Naadam and omitting the Chinese leg of the journey. Greater collaborative planning and a better understanding of the possibilities enabled us to reduce the amount of bus travel and change the selection of community visits. Informal feedback from students indicated that the study

tour was life changing in positive ways for many students, especially those who had not previously travelled overseas, or who had not previously engaged with local people in middle-income countries. For the study tour leaders, both study tours were interesting, but exhausting. Both authors drew upon experiences in our lives prior lives to help us support students' informal and incidental learning and to positively manage culture shock, homesickness, and intra-group conflict that occurs when people live for extended periods in close quarters.

Discussion and Conclusion

In all three case studies, there were examples of extreme differences in dominant cultural assumptions between Australia and host country about what constituted good pedagogical practice. This made pre-planning difficult because the parties began from different tacit assumptions. The unpredictability of practical arrangements (accommodation, experiences, travel) meant that study tour leaders had to be able to change strategy rapidly to achieve pedagogical goals, when the arrangements differed from what was expected. Additionally, study tour leaders sometimes found their authority undermined by the actions of TPP or others, either accidentally or deliberately.

All study tours offered students a rich mixture of opportunities and experiences that blended formal and informal learning. These opportunities would not have been available to them as tourists. For the full benefits of these opportunities to be realised, required the study tour leaders to engage in dialogical conversations with students about what they were experiencing. For some students, experiences were confronting and left them in need of emotional support and pastoral care from study tour leaders who provided support by being available to students informally before, during and after scheduled activities.

The demands on study tour leaders meant, as leaders, we experienced profound exhaustion after our return. The skills required by study tour leaders are not those gained in normal academic work. Rosa gained these skills working with people in remote Australian Aboriginal and regional communities, and Trudi, as a youth and community worker in the UK.

In conclusion, after comparing the literature with our lived experiences of study tours, the authors judged that there were important gaps in the research literature on Australian study tours, especially the literature on the pedagogy and practices of study tour leaders. This autoethnography identified that study tour leadership was more complex than classroom teaching, and presented different types of pedagogic, organisational, and student support challenges not found in other university teaching. This meant that study tour leadership required more diverse skills, including skills to support students' formal and informal learning, to provide individual personal support, to resolve intragroup conflict resolution, to respond constructively to unexpected logistical events and to manage competing and incompatible expectations of stakeholders.

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CHAPTER FIFTEEN

The School of Education Little Book Of Hope: A Collection of Resilience, Grit

and Digging Deep Tales of Life

THE SCHOOL OF EDUCATION LITTLE BOOK OF HOPE: A COLLECTION OF RESILIENCE, GRIT

AND DIGGING DEEP TALES OF LIFE

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Editorial Comment:

This chapter adds to the discourse on student wellbeing in higher education by providing an insightful exploration of the challenges faced by university students in the current UK socio-economic climate, with a particular focus on the innovative use of peer-to-peer storytelling as a means of support. It documents the challenges students face and offers an innovative solution that empowers students to support each other in addition to structural solutions and/or curriculum considerations.

ABSTRACT

This chapter details a project designed to facilitate peer to peer support students by self-identifying their academic challenges and enabling them to share these coping strategies. Conducted with student interns, this project provided a platform for students to voice their experiences and share insights. Additionally, it illuminated for academics their students' experiences in their own words.

The project's product was a thematically compiled book titled *The Little Book of Hope*. This book is used during induction to support new and returning students and is shared with academic staff to highlight student experiences. The collection of stories revealed areas in which students find academic challenges and illustrated the connected nature of these challenges, e.g., work commitments reducing students' time for studying. Students could mitigate some challenges themselves, but others require structural solutions and/or curriculum considerations.

Keywords: Student experiences, Curriculum enhancement, Resilience, Higher Education, Student voices

INTRODUCTION

Recently, the wellbeing of students has become an increasingly prominent concern (Campbell et al., 2022; Eisenberg et al., 2009; Macaskill, 2013; Royal College of Psychiatrists, 2011, 2013). The COVID-19 pandemic further intensified these issues by disrupting essential social interactions, which are vital for mental health (Campbell et al., 2022). Measures such as lockdowns and social distancing have led to heightened isolation and fewer opportunities for face-to-face communication, negatively impacting the wellbeing of both students and educators (ONS, 2021). Additionally, the cost-of-living crisis has further impacted students, with many now having to work part-time and study reducing time for socialisation and academic work. With many students struggling mentally, waiting times for university support have increased (Campbell, 2019) while at the same time universities face some difficult budgetary decisions due to the financial challenges (Habib and Hastings, 2025) about which and at what level services are provided.

Many universities already employ peer-to-peer mentoring (Gehreke, Schilling, and Kauffeld, 2023) which has emerged, in recent years, as an effective strategy for enhancing student success and wellbeing. This approach involves more experienced students providing guidance, support, and knowledge to less experienced peers, fostering a supportive and collaborative learning environment (Hayman et al., 2022) this can make students feel more integrated and supported within the university environment (Yomtov et al., 2017). By offering academic support it can foster a sense of community and reducing feelings of isolation (Byrom, 2018). Peer mentors help mentees navigate the challenges of university life, leading to better academic outcomes and higher retention rates (Le, Sok, and Heng, 2024). By collating students' individual stories of resilience into a book to share with other students this harnesses some of the peer-to-peer mentoring benefits

while at the same time utilising storytelling as a tool for enhancing student wellbeing. Through storytelling, students can learn about various coping mechanisms and mental health strategies in a relatable and engaging manner. Reading about others' struggles and triumphs can inspire students to reflect on their own lives and consider making changes. Stories can contextualise wellbeing strategies, making them more memorable and easier to apply in real life and by sharing personal narratives, students gain insights into effective wellbeing practices but also may feel less isolated in their experiences, fostering a supportive community. This support is particularly crucial during the transition to starting university, a period often marked by increased academic demands and social adjustments. As with peer mentoring, one of the key advantages, for universities, of peer storytelling is its cost-effectiveness. Peer storytelling utilises the existing student body, making it a more accessible and sustainable option for universities with limited resources (Collier, 2017). This approach not only maximizes the use of available resources but also empowers students to take an active role in supporting their peers. For mentors, the experience of guiding and supporting their peers can be highly rewarding and developmental. It is documented that peer mentors often develop valuable leadership, communication, and interpersonal skills, which can enhance their own academic and professional prospects (Wilton et al., 2021) and cultural capital for their chosen professions (Hayman et al., 2022) and we propose that some of these benefits could also be experienced by those who contribute their stories.

Finally, while peer-to-peer mentoring develops and coaches the individual on a bespoke basis while developing the mentor, the support that a student receives is solely based on the one mentor they are allocated. It does not facilitate the sharing of wider perspectives or collective experiences to be shared widely. Therefore, peer-to-peer collective storytelling, through the artefact of a compiled book, does not replace peer-to-peer mentoring but is perhaps a complimentary additional strand to supporting students through providing wider perspectives.

This paper discusses a project that integrated peer-to-peer support and storytelling by collecting narratives from students in a School of Education about their academic challenges and how they overcame them. These stories were compiled into a book titled *The Little Book of Hope: A Collection of Resilience, Grit, and Digging Deep Tales of Life*.

Methodology

Research Aim

This study explored the academic challenges encountered by students in the School of Education at Liverpool John Moores University (LJMU) and to highlighted the strategies they used to overcome these obstacles.

Research Questions

1. What types of experiences do students identify as challenging?
2. What strategies do students report using to navigate these challenges?
3. What collective recommendations can be made for curriculum developers based on these findings?

Research Design

A qualitative, social constructivist case study was adopted for this study to delve into the experiences and challenges faced by students while acknowledging that knowledge is constructed through social interactions and shared experiences (Vygotsky, 1978). This framework was used to interpret the data collected from the participants, focusing on how their narratives contributed to their understanding and coping strategies. The case study method was suitable because it allowed for an in-depth examination of a specific context within its real-life setting (Yin, 2014), in this case HE students in a School of Education.

Data collection Tools

Data were collected using a structured questionnaire, which was designed to capture detailed information about the students' experiences and coping strategies. Questionnaires were a valuable tool because they allowed for the systematic collection of data from many participants (Cohen, Manion, and Morrison, 2018) enabling the project to be open to all students in the School of Education. The qualitative questionnaire was designed to capture detailed

information about the students' experiences and coping strategies and included five open-ended questions.

- Tell me about a time you found challenging.
- Why was it challenging?
- How did you overcome your challenges?
- If you could do anything differently, what would it be?
- If you had a friend in the same situation, what would you advise them to do?

These questions provided participants with the opportunity to express their thoughts and experiences in their own words, while (Bryman, 2016) providing them with the opportunity to articulate their personal narratives and reflections (Cohen, Manion, and Morrison, 2018).

Participants

Participants were recruited through various channels, including email invitations, announcements during lectures, and posters displayed around the campus. This multi-faceted recruitment strategy aimed to reach a broad audience and encourage participation from a wide range of students (Negrin et al., 2022). A total of 28 participants from the School of Education opted into the project. These were from across levels 4, 5, 6, 7 and 8 and from both wider education programmes (Early Childhood Studies, Education and Primary Studies) and Initial Teacher Education programmes (BA(hons) Primary, Primary and Secondary PGCE QTS) as well as the MA Education Practice and PhD programmes.

Ethical Considerations

Ethical considerations were of paramount and as such informed consent was obtained from all participants, ensuring they were fully aware of the study's purpose, procedures, and their right to withdraw at any time without providing a reason. Participants were also regularly reminded of their right to leave the project. Anonymity and confidentiality were maintained throughout the research process to protect participants' identities and

personal information. The project was opt-in, meaning that participation was entirely voluntary. Students who chose to participate were provided with an information sheet detailing the study's purpose, procedures, and ethical considerations. They were also given a consent form to sign, indicating their informed consent to participate in the study (Cohen, Manion, and Morrison, 2018). These ethical practices adhered to the guidelines set by the British Educational Research Association (BERA, 2018).

Data Analysis

The data collected from the questionnaires were analysed using thematic analysis (Braun and Clarke, 2006). Firstly, we familiarised ourselves with the data by immersing ourselves through repeatedly reading the responses, noting initial impressions. This generated the initial codes which were then used to systematically code the data, assigning labels to segments of text that were relevant to our research questions. We collated these codes into potential themes, grouping similar codes together to identify overarching patterns and then reviewed these (Braun and Clarke, 2006).

Findings and Discussion

3.1 Academic Challenges

The students who responded to the questionnaire faced difficulties balancing their academic responsibilities with personal life, especially when financial stability necessitated employment. To mitigate burnout, some students integrated social interactions with work, though this strategy could sometimes be overwhelming (Byrom, 2018). Effective time management and daily task planning emerged as crucial recommendations from these students to their peers, aiming to prevent pressure and work accumulation (Wolters and Brady, 2021). Commuting and adapting to new environments were additional stressors because they ‘used up valuable time’; however, some students managed these challenges by using travel time productively and preparing the night before (Nicklin, Meachon, and McNall, 2019) although the travel cost implications could not be mitigated.

A lack of familiarity with digital platforms and writing in English posed significant challenges for some non-native speakers, similarly, students who

spoke English as a first language but had been away from education found returning to academic writing after a long break intimidating however attending training sessions and workshops helped. Communicating these concerns with university staff and using the support services, such as the library, provided significant help and improved confidence in academic writing (Yomtov et al., 2017) but again, overcoming these issues did take time. Group work and reliance on others for meeting deadlines were significant sources of stress and anxiety, as finding reliable team members who actively contributed was not always feasible (Yomtov et al., 2017). The volume of information to be learned in a short time was another concern, but preparing in advance and summarizing lectures into key points helped manage the workload and reduce stress (Pointon-Haas et al., 2023). Adapting to uncontrollable changes, such as mentor illness or curriculum modifications, posed further challenges. Seeking support from colleagues and university services, and leveraging their knowledge and perspectives, proved beneficial in navigating these difficulties (Byrom, 2018; Pointon-Haas et al., 2023; Yomtov et al., 2017).

3.2 Mental Health

Managing university workloads, anxiety, and feelings of inadequacy were common challenges. To cope, taking breaks, making to-do lists, engaging in enjoyable activities, and focusing on the end goal were helpful strategies (Waterhouse and Samra, 2024). Although these steps provided some relief, for some, the feelings of anxiety and inadequacy persisted (Islam and Rabbi, 2024). For others, it was navigating social expectations at university, which was challenging, especially for neurodiverse students who found prolonged interaction overwhelming. The perceived pressure to make new friends and spend time with them could be mentally exhausting, a challenge that may have been exacerbated post-COVID (Waterhouse and Samra, 2024). Accepting personal boundaries and recognising that not every social situation was suitable led to identifying true friends who understood the need for alone time, resulting in a happier and less stressful university experience (Islam and Rabbi, 2024). Absorbing large amounts of information from lengthy lectures could also be difficult for some students due to a short concentration span and limited breaks. Taking short walks to refresh helped somewhat, but there was a concern about missing valuable content. Seeking support from the

Disabled Students' Allowance (DSA) was a step towards addressing this issue. Overall, the strategies included accepting personal boundaries, seeking appropriate support, taking breaks, planning tasks, and focusing on enjoyable activities and long-term goals. These approaches helped manage the various challenges faced at university.

3.3 Living Away from Home

One of the greatest challenges was socialising and dealing with the transition of moving away from home and this is important for students because those who do not transition well may struggle with challenges throughout their first year (Kantanis, 2000). Kantanis (2000) suggests that academic staff should consider how their taught sessions allow for students to network as part of their curriculum learning, and this perhaps even more relevant during the cost-of-living crisis which sees time and money for socialising reduced. The stress of being away from family for months added to the difficulty (Alharbi and Smith, 2019). Reaching out to the student wellbeing service and getting support from a tutor helped manage this transition. Additionally, trips home provided some relief, reducing stress and increasing contentment.

3.4 Time Management

Managing student workload especially if they were on a professional course with both assignments and placements was a significant challenge, with high expectations during placements making it challenging. Prioritising tasks and finding supportive staff members were key strategies, although university support services were not always easily accessible due to limited opening hours (Nicklin, Meachon, and McNall, 2019). Balancing workload and social life while finding time for oneself was another major challenge so using tools like Headspace and setting boundaries by saying no to social activities helped. The intensity of the PGDE (professional Initial Teacher Education) course (120 level 7 credits), with continuous assignments and lesson plans, left some students feeling there was very little time for rest and recovery, leading to exhaustion and feelings of isolation. Extensions provided some relief, but the overall course structure was demanding. Maintaining a positive and flexible mindset, focusing on small daily positives, and prioritising mental health were beneficial strategies. Engaging

with peers and staff, both in and out of teaching contexts, helped create a sense of belonging and support (Kantanis, 2000). Support from the university varied, with some staff being more approachable and helpful than others. It was important to find key staff members who were empathetic and understanding. Communicating with the university when feeling overwhelmed made a significant difference, lightening the mental load. Keeping in touch with peers and participating in social activities outside of teaching also helped alleviate feelings of isolation (Campbell et al., 2022).

3.5 Work-Life Balance

Many students wrote about work-life balance but being a mature student presented additional challenges such as making friends, balancing childcare, navigating new digital platforms, and managing university work. Commuting added to the difficulty of finding time for work, especially without initial childcare support. Student support services and a supportive tutor were crucial in managing these challenges (Jindal-Snape, 2010). Scheduling time with friends and family and setting aside an "off day" for self-care, helped maintain a healthy work-life balance. It was suggested that older students might benefit from additional support tailored to their unique circumstances.

Discussion

The Little Book of Hope facilitated students to share their stories of overcoming challenges with their peers and their lecturers. The book has functioned as a catalyst in sessions with students to start conversations about what they are finding challenging and how staff and students can work together to plan to overcome these difficulties. Students have welcomed reading about what worked for others, and feedback is positive. However, care should be exercised not to suggest that if students simply read these stories and implement the suggested strategies then their challenges will simply melt away. This is not the case. The UK Higher Education sector is significantly influenced by the broader geopolitical and economic landscape, including the ongoing war in Ukraine, post-Brexit relations with the EU, and the cost-of-living crisis (Marginson et al., 2024). These macro-level factors exacerbate financial constraints on universities, many of which are in

financial difficulties, leading to increased waiting times for support services and limited accessibility to resources (Marginson et al., 2024). Consequently, students may face heightened mental health challenges as they struggle to balance part-time work with their studies, manage academic workloads, and cope with less social interactions (Ali et al., 2024). On a micro-level, these individual students are experiencing specific challenges that reflect these broader economic and geopolitical environments. Students, particularly those from disadvantaged backgrounds, struggle with the rising costs of living and the need to work part-time, which can impact their academic performance and mental health (Ali et al., 2024).

Conclusion

Part of navigating university life is responding to and overcoming the challenges that a new environment can bring such as academic study, time management and work-life balance. However, the rising cost of living has placed significant financial strain on students in the UK, impacting their ability to cover essential expenses and forcing many to increase their working hours. This financial pressure has reduced their available time for studying and socialising, which perhaps recent university cohorts may have needed as they were disrupted earlier in their adolescence by the Covid-19 pandemic. Although universities offer students some financial support, it is often insufficient to meet the growing needs of students, particularly those from lower socio-economic backgrounds and when universities offer other support such as for academic or mental health challenges finding the time to access these services can be challenging. Therefore, it is important to recognise that while peer support in the form of sharing stories can be helpful in providing other students with some ideas and strategies for overcoming difficulties in their university lives, some of these issues are more structural in nature, such as the financial pressures currently operating on students.

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CHAPTER SIXTEEN

IDEA Lab: A Mechanism for Transformation, Engagement, and Community Through Interdisciplinary Innovation and Leadership

IDEA LAB: A MECHANISM FOR TRANSFORMATION, ENGAGEMENT, AND COMMUNITY THROUGH INTERDISCIPLINARY INNOVATION AND LEADERSHIP

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Editorial Comment:

The IDEA Lab at Tufts exemplifies the application of innovation throughout the entire fabric of student endeavour, from learning, to application, to management, and deliverables. We are in good hands when the next generation embodies a positive vision for the future.

ABSTRACT

Traditional education struggles to prepare students for an increasingly complex and uncertain world. Siloed disciplines, rigid pedagogies, and passive learning structures often fail to cultivate the adaptability, creativity, and collaborative skills essential for addressing real-world challenges. The IDEA Lab at Tufts University is a bold response to this gap, pioneering an experiential, interdisciplinary, and student-driven model of learning.

Founded on principles of co-learning, leadership, and social impact, IDEA Lab empowers students to take ownership of ambitious, real-world projects while working across disciplines. Through a distributed leadership model, iterative research methodologies, and an inclusive innovation ecosystem, students gain hands-on experience tackling problems ranging from AI-driven recycling to robotic rehabilitation and assistive technology. The model fosters collaborative problem-solving, ethical design, and human-centred research, equipping students with the mindset and skills needed to navigate and shape the future.

With the recent launch of IDEA Lab @ Fletcher, the model is proving its scalability beyond engineering and design into international policy, humanitarian innovation, and global conflict mitigation. This expansion underscores IDEA Lab's potential to transform education at scale, creating a decentralised, open-source network of interdisciplinary innovation hubs.

This chapter explores the philosophy, structure, and impact of IDEA Lab, highlighting how its methods can be replicated to reimagine higher education. By breaking silos, fostering leadership, and embedding social responsibility at the core of innovation, IDEA Lab is more than a program—it is a blueprint for the future of experiential, interdisciplinary learning in the 21st century.

Keywords: Innovation, Experiential learning, Interdisciplinary collaboration, Student leadership, Social impact

INTRODUCTION

Traditional teaching models, while effective in imparting disciplinary knowledge, often isolate students within rigid academic silos. This approach limits their exposure to the interdisciplinary thinking necessary to tackle complex, real-world challenges, such as climate change, global health crises, and the ethical implications of emerging technologies. To address these limitations, higher education institutions must adopt innovative, collaborative, and inclusive pedagogical frameworks that prepare students to thrive in a rapidly evolving world. The IDEA Lab at Tufts University (https://sites.tufts.edu/idea/) exemplifies such a transformative model, fostering interdisciplinary innovation, collaboration, leadership, and social impact.

Founded in 2018, the IDEA Lab—short for Innovation, Design, Engineering, and Action—was conceived as a response to the growing need for dynamic, student-driven ecosystems that transcend traditional academic boundaries. The lab brings together students from a wide array of disciplines including engineering, psychology, computer science, anthropology, and the arts, to work on 'moonshot' projects aimed at solving pressing societal challenges. With over 80 active members and six major projects, the IDEA Lab has become a vibrant community of collaboration and co-learning.

The IDEA Lab's success is rooted in its unique combination of aspirational projects, experiential learning, student leadership, and interdisciplinary collaboration. By providing opportunities for students to engage in hands-on research, take ownership of projects, and interact with diverse peers and mentors, the lab not only equips members with technical and problem-solving skills but also fosters personal growth, resilience, and a sense of purpose. This aligns with emerging educational paradigms, such as John Dewey's experiential learning theory (Miettinen, 2000), which

emphasizes learning through doing and reflection, and Etienne Wenger's concept of communities of practice (Wenger, 1998), which highlights the value of shared knowledge and collaboration in shaping individual and collective expertise.

Moreover, the IDEA Lab addresses critical equity issues in education and professional development. By designing projects that prioritize social and environmental justice—such as creating ergonomic dental tools for underrepresented users or developing assistive technologies for people with low vision—the lab demonstrates its commitment to inclusivity and impact. These projects embody the principles of design justice, as articulated by Sasha Costanza-Chock (2020), which call for participatory, equitable, and sustainable design processes that centre the needs of marginalised communities.

As this chapter will explore, the IDEA Lab represents a replicable and scalable model for transforming teaching excellence in higher education. By breaking down silos, fostering leadership, and prioritizing social impact, the lab offers a blueprint for preparing students to navigate and address the challenges of tomorrow. In the sections that follow, we will present the lab's operational model, its core pillars, and the tangible outcomes it has achieved, and highlight its potential to inspire broader adoption across institutions worldwide.

Operational Model

The success of the IDEA Lab lies in its thoughtfully designed operational model, which balances structure and flexibility to foster creativity, accountability, and sustained student engagement. This model incorporates leadership development, interdisciplinary collaboration, and adaptive processes, all underpinned by a cost-effective and scalable framework that prioritises inclusivity and accessibility.

- **Leadership Structure**

At the heart of the IDEA Lab is a distributed leadership model that empowers students to take ownership of projects while maintaining strong

mentorship support. The lab is overseen by a faculty advisor and two student co-directors, who are responsible for guiding the lab's overall vision, managing operations, and facilitating external partnerships. Each major project is led by a student project leader and a project coordinator. These roles are carefully differentiated to encourage complementary skill development: while the project leader focuses on long-term vision and strategy, the coordinator manages day-to-day operations, including timelines, deliverables, and team logistics.

This hierarchical yet collaborative structure not only promotes leadership growth but also ensures clear communication and accountability at all levels. Research on distributed leadership, such as that by Spillane et al. (2004), highlights how shared leadership models enhance organisational resilience and adaptability—values that are core to the IDEA Lab's mission.

- **Processes and Frameworks**

The IDEA Lab employs an iterative approach to project development, blending autonomy with structured guidance. Teams independently plan meetings, set milestones, and execute tasks while aligning with lab-wide events such as mid-semester presentations, workshops, and end-of-semester reflections. Feedback loops are central to this process: students provide input through regular team discussions and anonymous forms, enabling the lab directors and faculty advisor to make data-driven improvements each semester. This adaptability mirrors agile project management frameworks, which prioritise responsiveness and continuous iteration.

- **Collaboration Across Disciplines**

Interdisciplinary collaboration is a cornerstone of the IDEA Lab's operational model. Each team is composed of students from diverse academic backgrounds, ensuring that projects benefit from multiple perspectives and expertise. This diversity of thought is critical for tackling complex challenges, as demonstrated by research from Page (2007), which shows that heterogeneous teams outperform homogeneous ones when solving intricate problems. For example, the IDEA Lab "Reflex project", which focuses on robotic rehabilitation for stroke survivors, draws on expertise

from mechanical engineering, human factors psychology, occupational therapy, and computer science, illustrating how interdisciplinarity drives innovation.

- **Scalability and Cost-Effectiveness**

A key strength of the IDEA Lab is its low-cost, high-impact design. The lab operates without salaries or academic credit, relying instead on intrinsic motivation and the shared passion of its members. Minimal costs—such as those for prototyping materials, coffee, and snacks—are offset by significant returns in student learning and societal impact. By prioritising resource efficiency, the lab creates a replicable model for other institutions seeking to enhance interdisciplinary learning without incurring substantial financial burdens.

The IDEA Lab's operational model is not static but dynamic, evolving to meet the needs of its growing community. Starting with a single project and a handful of students, the lab has expanded to support over 80 members across six major initiatives. This growth trajectory demonstrates the scalability of the model, which the lab is working to codify into an open-source toolkit for broader dissemination.

Core Pillars of IDEA Lab

The IDEA Lab's transformative impact is grounded in four core pillars: interdisciplinarity, leadership development, community and belonging, and social and environmental impact. These foundational elements work in synergy to create a dynamic ecosystem where students thrive academically, professionally, and personally. By prioritizing these pillars, the IDEA Lab not only equips students with technical and leadership skills but also instils a commitment to equity, collaboration, and real-world problem-solving.

Pillar 1. Interdisciplinarity: Breaking Silos, Building Bridges

Modern challenges—ranging from climate adaptation to assistive technologies—require diverse perspectives and expertise. Recognising this, the IDEA Lab integrates students from fields as varied as human factors engineering, computer science, psychology, anthropology, biomedical engineering, and the arts. This interdisciplinary approach encourages students to move beyond their academic silos and engage in cross-disciplinary dialogue and collaboration.

- **Key Benefits:**
  Students gain exposure to diverse methodologies, problem-solving techniques, and cultural perspectives. For example, the Plastibot project combines hyperspectral imaging, machine learning, and environmental science to tackle plastic sorting inefficiencies in recycling systems. Such interdisciplinary teamwork mirrors findings by Page (2007), who demonstrated that cognitively diverse teams are more effective at solving complex problems than homogenous ones.

- **Skill Development:**
  Students develop critical communication and translation skills, learning to articulate ideas across disciplines. These skills are vital in professional settings where collaboration among specialists is the norm.

Pillar 2. Leadership Development: Empowering Future Innovators

The IDEA Lab fosters leadership at all levels by offering students opportunities to take ownership of their projects and navigate real-world challenges. Leadership roles, such as project leaders and coordinators, provide structured yet flexible pathways for skill development.

- **Progression of Responsibility:**
  Students begin as team contributors and progress to leadership roles, managing teams of up to 15 members. This tiered system not only builds confidence but also equips students with project management,

conflict resolution, and decision-making skills. Spillane et al.'s (2004) work on distributed leadership emphasises how such models foster agency and innovation, key qualities for future leaders.

- **Mentorship Ecosystem:**
  The IDEA Lab cultivates a culture of mentorship, with experienced students guiding newcomers through workshops, onboarding sessions, and informal mentoring. This peer-led approach enhances learning and strengthens the lab's collaborative culture.

Pillar 3. Community and Belonging: A Culture of Collaboration

At its core, the IDEA Lab is a community-driven initiative that fosters a sense of belonging among its members. This emphasis on community addresses common challenges in higher education, such as isolation and lack of social integration.

- **Building Connections:**
  Regular team-building events, such as scavenger hunts, workshops, and interdisciplinary dinners, create bonds across project teams. These interactions break down stereotypes and encourage students to view peers from different disciplines as collaborators and friends.

- **Interdisciplinary Networks:**
  Working with students from diverse backgrounds expands social and professional networks. Psychology and engineering students, for instance, collaborate on projects and attend social gatherings, fostering cross-disciplinary friendships that extend beyond the lab.

- **Emotional Resilience:**

Members report reduced feelings of isolation and increased engagement, aligning with Wenger's (1998) theory of communities of practice, which highlights the role of shared goals and interactions in fostering a sense of purpose and belonging.

Pillar 4. Social and Environmental Impact: Designing for Justice

The IDEA Lab's projects are guided by a commitment to equity, inclusion, and sustainability. This focus ensures that students' work has tangible benefits for underserved communities and the environment.

- **Equity in Design:**
  Projects like the Dentistry initiative address the gender biases in medical device design, creating ergonomic tools for female dentists to reduce musculoskeletal disorders. Such efforts align with Sasha Costanza-Chock's principles of design justice, which emphasise participatory, equitable processes.

- **Sustainability Initiatives:**
  Projects like Plastibot tackle critical environmental challenges, such as reducing plastic waste through innovative sorting technologies. These initiatives exemplify the IDEA Lab's commitment to addressing global issues through local action.

- **Real-World Applications:**
  By engaging with stakeholders, such as community members and industry professionals, students ensure their work remains impactful and relevant. This hands-on approach bridges the gap between academic research and societal needs.

By centring these four pillars, the IDEA Lab has created a scalable, replicable model that prepares students to thrive in complex, interconnected environments. These pillars not only shape the lab's internal culture but also position it as a leader in educational innovation and social impact.

Methodology and Outcomes

The IDEA Lab's success stems from its robust and adaptive methodology, which combines structured frameworks with the flexibility needed for creative problem-solving. This approach not only drives impactful project outcomes but also fosters significant personal and professional growth among its members. By grounding its methodology in interdisciplinary collaboration, iterative design, and inclusive practices, the lab serves as a model for experiential education.

Methodology: An Adaptive and Inclusive Framework

1. Research and Design Process

The IDEA Lab employs an iterative, user-centred approach to project development. Each initiative begins with comprehensive research, including task analyses, literature reviews, stakeholder interviews, and patent analyses. These methods ensure that projects are grounded in real-world needs and informed by existing knowledge.

- **Example:** The Dentistry project analysed existing tools and interviewed dentists to identify ergonomic challenges faced by women. This research informed the design of attachable grips to reduce musculoskeletal strain.

The iterative design process involves multiple phases:

- **Prototyping:** Teams create low- and mid-fidelity prototypes, using tools like CAD modelling and 3D printing to test feasibility and

ergonomics. Of course, for non-physical projects, the prototyping will be adjusted appropriately. For example, low-fidelity websites might be created, or initial versions of a game, or a first-draft version of an educational intervention.

- **Feedback Loops:** Stakeholders, such as users and domain experts, provide ongoing input to refine designs.

- **Evaluation:** Teams assess prototypes against metrics such as usability, comfort, and task efficiency, ensuring alignment with project goals.

2. Leadership and Autonomy

The lab empowers students to take ownership of their work through a distributed leadership model. Teams independently manage project timelines, milestones, and deliverables while aligning with broader lab activities. Regular mid-semester presentations and end-of-semester reflections provide opportunities for peer feedback and knowledge sharing.

- **Continuous Improvement:** Anonymous feedback forms and open discussions allow the lab's leadership to implement changes that enhance efficiency and inclusivity. The feedback requested might be in regard to specific events, processes, future directions, etc.

Outcomes: Transformative Impact on Students and Society

1. Student Outcomes

The IDEA Lab prioritises holistic development, equipping students with technical expertise, leadership skills, and emotional resilience.

- **Leadership Growth:** Students progress through roles of increasing responsibility, from contributors to project leaders and co-directors. This progression builds confidence and prepares them for professional challenges. Alumni frequently credit the lab for their success in securing placements at other more specialised research groups at Tufts or at leading organisations like Google or graduate programs.

- **Skill Development:** Members gain experience in project management, interdisciplinary communication, and user-centred design. These skills are critical for navigating today's complex professional landscape.

- **Community Engagement:** The lab's inclusive culture fosters a sense of belonging, reducing feelings of isolation often reported in higher education. Students benefit from diverse networks, enriching their academic and personal lives.

2. Project Outcomes

The lab's initiatives tackle complex societal and environmental challenges, delivering tangible real-world impact.

- **Innovative Solutions:** Projects such as Plastibot leverage hyperspectral imaging and machine learning to address recycling inefficiencies, while Reflex uses robotic technologies to aid stroke survivors.

- **Social Justice:** The lab's focus on equity is evident in projects like Dentistry, which addresses gender disparities in medical device design.

- **Environmental Sustainability:** The IDEA Lab prioritises sustainability, developing solutions that mitigate environmental harm, such as reducing plastic waste through advanced sorting technologies.

3. Institutional and Global Impacts

The IDEA Lab's model is designed to be scalable and replicable, with minimal costs and high impact. Its achievements demonstrate the potential for broader adoption in higher education.

- **Scalability:** The lab's open-source toolkit, currently in development, will enable other institutions to replicate its methodology.

- **Global Reach:** The recent launch of a second IDEA Lab at Tufts (IDEA Lab @ Fletcher) highlights its potential for expansion and innovation across disciplines and contexts. The second lab launched with four new moonshot projects and within 3 weeks attracted over 50 students into this new ecosystem of innovation.

By combining rigorous methodologies with a focus on personal and societal impact, the IDEA Lab exemplifies the transformative potential of interdisciplinary, student-led innovation. Its outcomes not only validate its approach but also inspire a vision for the future of experiential learning.

Vision for the Future

The IDEA Lab has already demonstrated its power to transform teaching excellence, foster interdisciplinary collaboration, and generate real-world impact. However, this is just the beginning. The Lab's future lies in its ability to scale, adapt, and extend its reach, both within Tufts University and beyond. With the successful launch of the **IDEA Lab @ Fletcher**, the IDEA Lab

model is now proving itself as a flexible, scalable framework that can thrive in diverse academic and applied settings. This expansion serves as a major milestone and a proof of concept for future growth.

1. Scaling the IDEA Lab Model

A. Institutional Expansion: The Birth of IDEA Lab @ Fletcher

As of Spring 2025, the IDEA Lab has successfully expanded to **The Fletcher School of Law and Diplomacy**, Tufts' renowned graduate school focused on international affairs. With a mission to apply the Lab's interdisciplinary, student-driven innovation model to pressing global challenges, the **IDEA Lab @ Fletcher** has already launched with:

- **Over 50 students** from diverse disciplines.
- **Four major projects**, each addressing real-world geopolitical, humanitarian, and environmental issues.
- **A leadership structure**, including project leads, coordinators, and two student co-directors to maintain autonomy and continuity.

This new IDEA Lab brings together **engineers, policy analysts, data scientists, humanitarian experts, and UX designers** to tackle critical global challenges. The projects include:

- **The Migrant Compass** – A mobile platform providing real-time guidance to migrants, integrating crowdsourced data, official resources, and AI analytics.

- **The Digital Oasis** – A secure, cloud-based platform that allows displaced individuals to store essential documents and personal records, safeguarding identity and dignity in times of crisis.

- **Instability Insights** – A dynamic geopolitical dashboard aggregating real-time data to track and predict civil unrest, economic instability, and emerging conflicts.

- **Shared Waters Data Portal** – A transboundary water governance tool integrating hydrological, environmental, and policy data to improve water resource management and diplomacy .

The rapid success of **IDEA Lab @ Fletcher** underscores the **scalability of the model** and provides a roadmap for replicating it at other institutions.

B. The Open-Source Toolkit: A Playbook for Future IDEA Labs

To accelerate further expansion, the IDEA Lab is developing an **open-source toolkit** that will allow other universities, research centres, and even non-academic organisations to implement similar models. This toolkit will include:

- **Operational blueprints** (e.g., leadership roles, feedback loops, recruitment strategies).

- **Guidelines for interdisciplinary collaboration** (best practices for integrating diverse academic disciplines and skill sets).

- **Low-cost implementation strategies**, ensuring financial feasibility without reliance on significant external funding.

- **Case studies and impact reports**, demonstrating the effectiveness of the IDEA Lab approach.

The goal is to make it **seamless for other institutions to adopt** the model, creating **a global network of IDEA Labs** advancing interdisciplinary innovation.

2. Expanding Partnerships and Collaborations

The IDEA Lab's next phase of growth includes deeper engagement with external stakeholders, including **industry leaders, NGOs, and policymakers**. These partnerships will:

- **Provide real-world data and problem sets**, ensuring projects remain impactful and actionable.

- **Offer mentorship and internship opportunities**, helping students bridge the gap between academic research and professional careers.

- **Facilitate project funding and sponsorship**, supporting prototyping, fieldwork, and pilot testing of key initiatives.

The Fletcher School's global focus also positions the **IDEA Lab model as a hub for international collaboration**, leveraging networks of policymakers, humanitarian organisations, and research institutions.

3. Enhancing Technological Integration

Future developments in the IDEA Lab will incorporate emerging **technologies such as AI, blockchain, and extended reality (XR)** to drive

innovation across diverse domains. Some anticipated advancements include:

- **AI-Powered Insights** – Enhancing projects like *Instability Insights* with predictive analytics for political and economic forecasting.

- **Blockchain for Economic Equity** – Implementing decentralised verification mechanisms for global supply chain transparency.

- **Extended Reality (XR) for Humanitarian Training** – Using VR/AR simulations to train responders in crisis management, environmental resilience, and refugee logistics .

These technological expansions will **not only enhance the Lab's research capabilities but also provide students with hands-on experience** in some of the most cutting-edge tools shaping the future.

4. The Long-Term Vision: A Global Network of IDEA Labs

The IDEA Lab's long-term vision is to **expand beyond Tufts University**, establishing a **decentralised network of IDEA Labs** worldwide—each tailored to address pressing, region-specific challenges. These labs would:

- **Tackle localised issues** such as climate adaptation in coastal cities, healthcare innovation in low-resource settings, and conflict resolution in politically unstable regions.

- **Foster academic-industry partnerships**, ensuring that student-driven research translates into actionable solutions in policy, business, and technology.

- **Train the next generation of leaders**, equipping students with the ability to work across disciplines, cultures, and emerging technologies to drive meaningful change.

With **scalable methodologies, strategic collaborations, and cutting-edge innovations**, IDEA Lab is positioned to **become a global catalyst for interdisciplinary learning and real-world impact**.

As the model continues to evolve, one thing remains clear: **IDEA Lab is not just about education—it is about redefining how knowledge, innovation, and collaboration shape the world.**

Conclusion

The IDEA Lab stands as a powerful testament to what is possible when education moves beyond traditional disciplinary silos and embraces a model of collaborative, student-driven innovation. By fostering an environment where students take ownership of real-world challenges, develop leadership skills, and work across multiple disciplines, the lab has become a transformative force in experiential learning.

At its core, the IDEA Lab is not just about solving problems—it is about changing how we approach them. It cultivates agility, creativity, and resilience, equipping students with the mindset and skills to navigate the complexities of an unpredictable world. Through its unique distributed leadership structure, interdisciplinary collaboration, and social impact focus, the lab has demonstrated how education can be reimagined to prepare students not just for existing careers, but for challenges that have yet to emerge.

With the recent launch of IDEA Lab @ Fletcher, the model has already begun to scale into new domains, proving that this framework can thrive beyond its original setting. This expansion marks the beginning of what could become a global movement—one that redefines how institutions bridge theory and practice, foster equity in innovation, and prepare students for a world in constant flux.

The Lab's future lies in broadening its reach, refining its methodologies, and leveraging emerging technologies to push the boundaries of what interdisciplinary education can achieve. Whether through open-source

toolkits, international partnerships, or technological integration, the IDEA Lab is positioned to reshape the future of education itself.

Ultimately, the success of IDEA Lab is not measured by its projects alone, but by the students it empowers, the communities it impacts, and the vision it inspires. It is proof that when education is centred around curiosity, collaboration, and action, it becomes a catalyst for change—not just within universities, but in the world at large.

The next chapter is unwritten. But one thing is certain: **IDEA Lab is not just a place—it is a mindset, a movement, and a model for the future of learning, innovation, and impact.**

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CHAPTER SEVENTEEN

Fostering and Sustaining a Vibrant International Academic Community

FOSTERING AND SUSTAINING A VIBRANT INTERNATIONAL ACADEMIC COMMUNITY

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Editorial Comment:

This chapter presents an overview of the IFNTF: the people, the structure, and the community. It also pays particular tribute to Heather Kavan, who served on the Executive Committee as the Vice President representing New Zealand.

ABSTRACT

The International Federation of National Teaching Fellows (IFNTF) is an established independent organisation officially launched at the House of Lords, UK parliament, London, in September 2016. Its aim is to unite National award-winning Higher Education teachers from across the globe.

In this keynote I will share insights into how this academic community of practice was set up, is fostered and sustained to promote the importance of excellence in teaching in higher education and share evidence-based pedagogy, scholarship and research.

How the Higher Education sector is encouraged to actively participate to maximise reach and accessibly and build our collective knowledge and experience through this international vibrant academic community is also shared.

Keywords: Community of Practice, National Teaching Fellows, International academic community, International Federation of National Teaching Fellows

INTRODUCTION

The International Federation of National Teaching Fellows (IFNTF) is a global community dedicated to bringing together leading experts in teaching and learning who have been recognised by their respective country for excellence in learning and teaching by the prestigious National Teaching Fellowship award.

The IFNTFs primary purpose is to facilitate knowledge sharing, foster professional development, and create networking opportunities among higher education professionals worldwide. The IFNTF serves as a platform for collaboration and engagement, enabling members to exchange ideas and advance and promote excellence in teaching and learning at an international level.

The key objectives of the IFNTF include:

- Facilitating international collaboration among post-secondary educators on projects and initiatives.
- Advocating for excellence in teaching within higher education.
- Promoting evidence-based pedagogy and research.
- Engaging with outstanding students through the International Student Fellows program.
- Establishing networks with teaching and learning organisations and societies.
- Advising on the development of National Teaching Fellowship schemes.
- Organising an annual international symposium that brings together educators from around the world.

These objectives are achieved by nurturing and sustaining a global Community of Practice (CoP)—a well-established framework for knowledge sharing, professional growth, and collaborative learning. Originally conceptualised by Lave and Wenger (1991), CoPs are defined as groups of individuals who share a common interest or profession and engage in collective learning through shared activities. Wenger (1998) further expanded this model by identifying three fundamental elements of a CoP: **Domain, Community, and Practice**. In other work Wenger, McDermott & Snyder, (2002) posit ways to cultivate COPs.

IFNTF as a Community of Practice

Domain: The IFNTF's domain is a shared commitment to advancing excellence in teaching and learning in higher education. This collective interest unites members and distinguishes the federation from other professional groups. The focus is on enhancing teaching practices, fostering scholarship, and promoting leadership in education on a global scale.

Community: The IFNTF fosters a dynamic and supportive environment where members engage through discussions, workshops, and international summits. By sharing best practices, evidence-based pedagogy, and innovative teaching strategies, members cultivate professional relationships and encourage active participation across borders. The federation facilitates networking opportunities, strengthening connections among educators from diverse backgrounds and institutions worldwide.

Practice: The IFNTF curates and develops a shared repertoire of resources, tools, and experiences that contribute to professional expertise and the pursuit of excellence in teaching and learning. Members collaborate on research, mentoring programs, and pedagogical innovations, contributing to a growing body of knowledge. The federation provides access to valuable resources such as case studies, teaching materials, and frameworks for effective educational practices. These resources enable members to refine their skills, implement, disseminate and further lead innovative strategies within their own institutions.

The IFNTF is also proud to collaborate with students from around the world, actively involving them in various aspects of the organisation. Students have played a key role in shaping and contributing to IFNTF activities—for instance, an arts student designed the IFNTF logo, a computer science student manages website development and maintenance, and a doctoral student serves as the newsletter editor. Additionally, students engage as co-authors and presenters at the annual international summits. Through these experiences, students, alongside academic colleagues, gain valuable professional development and actively participate as visible members of the IFNTF community, enhancing their portfolios and creating opportunities to connect with potential employers.

Through its strong foundation as a **Community of Practice**, the IFNTF continues to serve as a catalyst for meaningful collaboration and sustained professional growth, shaping the future of higher education on an international scale.

Fostering and Sustaining the Community- The IFNTF Executive

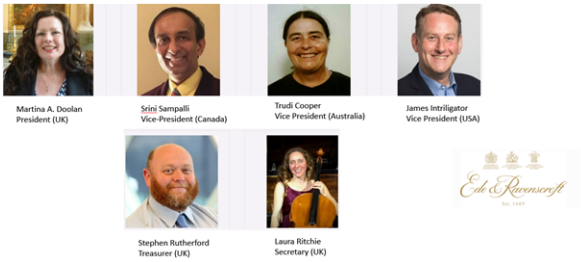

Figure 1: the IFNTF Executive https://www.ifntf.org/page-committee

The IFNTF is guided by an executive committee composed of dedicated academic leaders who volunteer their time to advance excellence in higher education (Figure 1). The committee includes the President, who is the author of this paper, as well as Vice Presidents representing Canada, Australia, and the United States, alongside a UK-based Treasurer and Secretary. These ambassadors and regional representatives promote the IFNTF and share and support local engagement efforts related to teaching and learning.

As a Community of Practice, the executive team works collaboratively, making strategic decisions to enhance teaching and learning across higher education. Through collective leadership, the committee brings together

diverse backgrounds, skills, and expertise, ensuring that decisions are informed by a shared commitment to innovation and educational excellence.

At the core of the IFNTF's mission are the principles of equality, diversity, and inclusivity, which guide our actions and decision-making processes. We actively champion the scholarship of learning and teaching, striving to elevate its profile within the sector while advocating for better recognition and rewards for educators worldwide.

Our executive committee represents members and associates from multiple countries who have been recognised for their outstanding contributions to teaching and learning through prestigious national awards, including the UK's National Teaching Fellowship Scheme, Canada's 3M National Teaching Fellowship, Australia's Awards for University Teaching Excellence Awards. By working together, we foster a global network committed to strengthening educational practices and supporting the professional growth of educators across borders.

Maximising Reach and Accessibility

Maximising reach and accessibility for the IFNTF Community of Practice involves leveraging diverse strategies to engage the broad international audience, foster inclusivity especially given the different time zones across respective countries to enhance global participation.

The following provide effective approaches:

Digital Engagement and Online Presence:

The IFNTF has an established interactive website – as this is the face of the IFNTF it is paramount to ensure the IFNTF website is user-friendly, regularly updated, and includes resources such as research publications, case studies, event materials, recordings and the newsletter.

Social Media Outreach –the IFNTF specifically uses Twitter (now named X), to share updates, promote discussions, and encourage member engagement.

Virtual Webinars and Summits – Live and recorded regular seminars are available on YouTube and an annual "symposathon" is hosted online to accommodate members across different time zones and allow for flexible access to those who cannot attend live events (figure 2).

Crowdsourced Resources – We encourage members to contribute teaching materials, research, and case studies for a collective online knowledge repository.

Engagement is supplemented through email. Such communication enables effective engagement with the IFNTF community and stakeholders. It allows for the exchange of information, ideas, and feedback that assists in developing interventions that are responsive and culturally attuned to the IFNTF community's needs.

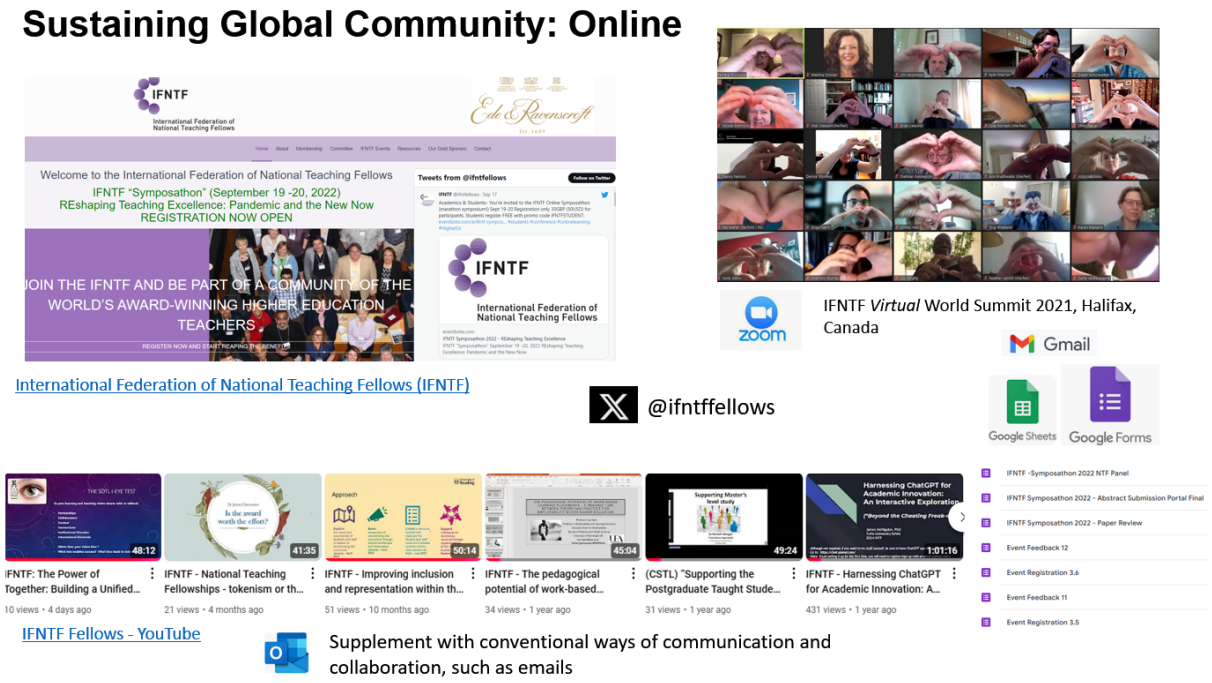

Figure 2: Sustaining Global Online COP

Inclusive Membership and Participation:

Full membership of the IFNTF community is available to individuals who have been recognised as National Teaching Fellows (NTFs) in their respective countries. Associate membership is open to international higher education professionals who have received a significant regional teaching award in their home country.

Student Involvement – There are opportunities for students to contribute directly to projects, co-author and present research, and participate in IFNTF initiatives as outlined above. Further engagement in the IFNTF community of practice is through the International Student Fellows program.

Collaborative Partnerships

The IFNTF community actively collaborates with teaching and learning organisations, educational institutions, and professional bodies to expand its reach and impact. One such example, illustrated in Figure 3, highlights the IFNTF President's engagement with the Society for Teaching and Learning in Higher Education (STLHE) annual conference in Canada. Additionally, the President attended the 2024 3M National Teaching Fellowship Awards Celebration, honouring both educators and students for their outstanding contributions to educational leadership and excellence in higher education teaching.

Figure 3: Sustaining Community- Growing International Networks

Reward and Recognition

The IFNTF serves as a driving force for change, fostering discussions where educators share experiences, challenges, and barriers to career progression. Through collaboration with Higher Education Institutions, we advocate for the recognition and reward of exceptional teachers and scholars. Our community provides guidance on progression criteria, ensuring they are fair and effective, while advising institutions on processes that enhance recognition opportunities for educators. To further this mission, the IFNTF has developed a 'recommender system' that pairs individuals seeking promotion with experienced mentors who offer valuable guidance and support throughout their career advancement journey.

Furthermore, the IFNTF facilitates connections between experienced teaching fellows, early-career educators, and students to support knowledge exchange and professional growth.

Promotion and Visibility

The seminar series strengthens and connects the international community by promoting professional development and encouraging active engagement in discussions (Figure 3).

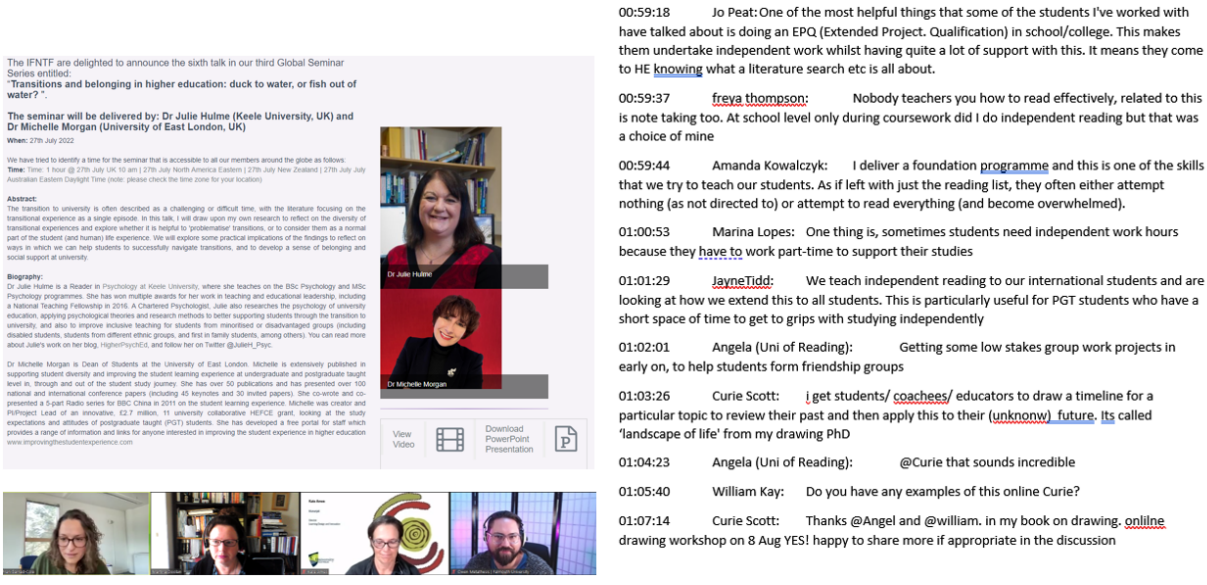

Figure 4: Served by the community, active participation in COP

The insights and outcomes from these seminars contribute to an expanding repertoire, a core element of Community of Practice theory (Wenger, 1998). This growing body of knowledge serves as a valuable learning resource that can be revisited over time, continuously evolving and expanding (Doolan, 2007). By fostering ongoing engagement and knowledge sharing, this approach strengthens and sustains the visibility of the IFNTF as a dynamic and thriving global Community of Practice (Doolan, 2023).

Global Seminar Book Series

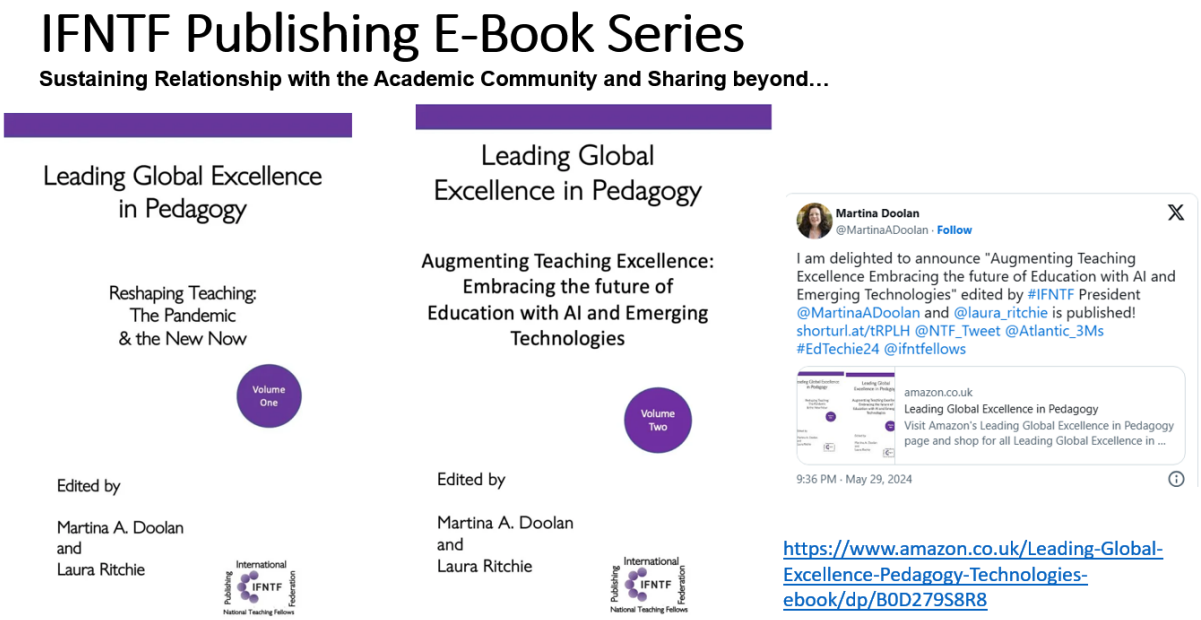

Figure 5: Establishing and Sustaining IFNTF E-Book Series

The IFNTF community remains engaged and visible through initiatives like our e-book series, which promotes and serves our members. In 2025, we are proud to publish the third volume of Leading Global Excellence in Pedagogy, featuring keynotes and presentations from our annual "Symposathon." This event showcases evidence-based pedagogical research and scholarship conducted by experts worldwide.

The “Symposathon” concept merges “symposium” and “marathon,” reflecting its unique format—held across three time zones (UK, Canada, New Zealand, and Australia) to maximise global participation. By bringing together national teaching fellows, co-authors, colleagues, and students, this event fosters a thriving community dedicated to advancing the scholarship of learning and teaching. It provides a platform for sharing research, exchanging ideas, and demonstrating diverse methodologies across disciplines. The e-book series ensures that these contributions remain accessible, preserving and disseminating valuable insights to educators worldwide.

Newsletter and Contributions -The IFNTF regularly publishes a newsletter that highlights member achievements, research, and past and upcoming events as shown in Figure 6.

Figure 6: The Newsletter - Serving the Community

The newsletter serves to strengthen the community by showcasing learning, teaching, and research, ensuring that the innovative work of educators, researchers, and institutions is widely recognised. The newsletter fosters

engagement by connecting educators, researchers, and students, facilitating the exchange of insights, experiences, and best practices while strengthening professional networks. Additionally, it serves as a platform for disseminating evidence-based research, new teaching methodologies, and successful case studies, making valuable knowledge accessible to a broader audience. Available to both members and the wider academic community via the IFNTF website, the newsletter promotes collaboration by featuring ongoing projects, emerging research, and interdisciplinary approaches. Ultimately, it encourages continuous improvement, inspiring educators to reflect on and refine their teaching practices, enhancing both teaching quality and student learning outcomes.

Conclusion

This chapter has explored the establishment and sustainability of a global Community of Practice that unites National Teaching Fellows and award-winning educators in higher education. The IFNTF thrives as a dynamic network, sustained by its dedicated members, including an executive committee that voluntarily contributes time and expertise. These scholars, working across diverse institutions worldwide, are passionate about advancing the scholarship of learning and teaching, enhancing student experiences, and driving educational innovation and change to strengthen higher education quality and learning outcomes.

Students play a vital role, collaborating with the IFNTF organisation and its members on various initiatives that enhance teaching, learning, and practice. Their involvement not only enriches the community but also develops their employability skills.

The IFNTF Community of Practice is built and sustained through the generosity of its members, who actively engage in seminar series, contribute to e-books and newsletters, mentor colleagues, and advocate for the recognition of educators globally expanding its reach, accessibility, and collective knowledge, fostering a truly global academic community.

From my experience, the foundation of building and sustaining a thriving Community of Practice lies in people in partnership—individuals who actively and consistently invest time and effort to nurture and grow the community. A Community of Practice requires dedication, commitment, and a shared purpose. The IFNTF has flourished thanks to countless colleagues

who selflessly contribute by sharing evidence-based pedagogy and research, attending and participating in events, delivering talks, running workshops, and providing invaluable feedback. Their willingness to engage, collaborate, and learn from one another drives the ongoing advancement of teaching, learning, and assessment in higher education.

Equally important is ensuring that our community embodies the values of equality, diversity, and inclusivity while remaining accessible to all. To support this, the IFNTF hosts monthly Zoom seminars, publishes a quarterly newsletter, organises an annual symposium, and maintains an online platform with resources, discussion forums, and recordings of past events.

I encourage colleagues—regardless of discipline or role—to step beyond institutional silos and engage with like-minded educators. By joining a scholarly community like the IFNTF, we collectively strengthen higher education, fostering meaningful change both inside and outside the classroom and beyond our higher education institution.

Recognising and rewarding excellence in teaching, as well as advancing the scholarship of learning and teaching, is essential to elevating the status of education. As a community, let us continue sharing best practices, advocating for institutional change, and breaking down barriers to career progression.

In community, we are stronger. In community we elevate teaching and learning. In community we shape the future of higher education.

Acknowledgements

This chapter is dedicated to the memory of Dr Heather Kavan, Massey University, New Zealand, a former Vice President of the IFNTF who so diligently served New Zealand as a member on the executive committee.

14th June 1957 – 21st December 2024

Dr Heather Kavan passed away suddenly on the 21st of December 2024. See https://www.stuff.co.nz/nz-news/360532471/senior-lecturer-and-quote-year-founder-dr-heather-kavan-dies-day-results

Heather worked at Massey University for 22 years and gained national recognition for her excellence in learning and teaching across New Zealand and the wider international higher education community. Heather served as the Vice President of the IFNTF diligently representing National Teaching Fellows and the wider New Zealand HE community on the Executive

Committee. Heather attended meetings full of 'the joys of Spring' first thing in the morning and late at night, beaming with insights and always with a smile.

Heather was passionate about teaching and learning encouraging and supporting colleagues in applying for teaching awards, highlighting their successes, challenges and contributions. This was evident in her work as editor of the IFNTF Newsletter which she produced on a quarterly basis. Heather was a critical thinker with excellent language proficiency, a wonderful writer and storyteller who worked closely with colleagues supporting them with content development.

Heather brought together award-winning teachers from across New Zealand, promoting the IFNTF and supporting its growth for the advancement of excellence in learning and teaching in higher education internationally. Heather was a prolific speaker for the IFNTF and encouraged colleagues to deliver keynotes and made significant contributions to the annual symposium.

Heather was highly intelligent, full of integrity, with an amazing sense of humour and a quiet wit. Heather was modest, a very gentle yet strong woman with an unwavering commitment to teaching and learning in Higher Education.

I am very privileged to have known Heather and so very proud to have worked alongside her in my role as President of the IFNTF. Heather is a big loss to the International Federation of National Teaching Fellows and the wider Higher Education community. Heather will be greatly missed. Our thoughts are with her family, friends' colleagues and students at this very sad time.

May she Rest in Peace.

Professor Martina A. Doolan, President of IFNTF.

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https://www.ifntf.org/

Leading Global Excellence in Pedagogy

Transforming Teaching Excellence:
Future Proofing Education for All

This volume of Leading Global Excellence in Pedagogy brings together a diverse collection of thought-provoking papers that spotlight transformative and innovative teaching practices.

Authored by nationally recognised educators from universities across the UK, Canada, the USA, and Australia, the book showcases powerful methodologies that are shaping the future of teaching and learning in higher education.

Contributors explore forward-thinking strategies including digital transformation, lifelong learning, upskilling, micro-credentialing, competency-based education, inclusive teaching, and support for mental health and well-being offering rich insights into pedagogical innovations across disciplines and learning contexts whilst providing practical approaches to designing impactful educational experiences.

This book is an essential resource for academics, teachers, researchers, and students seeking to adopt evidence-informed practices and lead meaningful educational change. It highlights the importance of thoughtful planning, equity, and adaptability in sustaining high-quality teaching in today's evolving academic landscape.
Both editors are National Teaching Fellows.

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