Pedagogy for Higher Education Large Classes

(PHELC)

Proceedings of the
Fifth PHELC Symposium
9 June 2023

Facilitated by Anna Logan and Ann Marie Farrell,
Dublin City University

Editors:
Anna Logan and Ann Marie Farrell

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Proceedings of the Fifth PHELC Symposium, Online Event, 9th June 2023

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Introduction

Welcome to the proceedings of the fifth Pedagogy for Higher Education Large Classes (PHELC) Symposium which this year was a fully online event. Once again we were delighted to receive funding for PHELC from Dublin City University under the Strategic Alignment of Teaching and Learning Enhancement (SATLE) Funding in Higher Education administered by Ireland's National Forum for the Enhancement of Teaching and Learning in partnership with the Higher Education Authority. We are very grateful to Professor Monica Ward, Dean of Teaching and Learning at Dublin City University for this support and to our wonderful DCU colleagues Karen Buckley, Rob Lowney, Suzanne Stone, and Conor Sullivan who once again supported us before, during and after the event. We would also like to thank Gitzy Fragiotta who this year has provided invaluable administrative support for PHELC.

Drawing on her extensive experience with large classes in higher education and bringing the positive outlook on the potential and power of teaching and learning at scale which has been a thread running through previous PHELC symposia, our wonderful keynote speaker Associate Professor Elaine Huber of the University of Sydney Business School opened the symposium with her presentation titled '*Scaling New Horizons: Empowering Educators and Reimagining the Student Experience in Higher Education Large Classes*'. Elaine offered many insights from The Connected Learning at Scale (CLaS) project and, highlighting the importance of sharing best practices in large class pedagogy, set the scene for presenters subsequently sharing their insights in the range of short papers and pre-recorded Lightning Talks and discussions and Q and A.

Interest in PHELC continues to grow with a significant increase in the number and range of submissions received. To date funding support has enabled us to offer registration for PHELC free of charge, removing possible barriers for Irish and international attendees and this year we were delighted to welcome participants from 14 countries across five continents. Readers of this set of proceedings will note that the published papers draw from a range of experiences across disciplines in higher education reflecting the interdisciplinary approach that underpins the PHELC special interest group. While many of the papers relate to the broad themes of teaching, learning and assessment, this year we note an emerging focus on curriculum design and delivery with large student cohorts. Spot prizes are a feature of PHELC symposia so once again well done to our 'wheel of fortune' winners.

Reverting to an online format from the hybrid approach adopted in 2022 facilitated a more streamlined event which was conducive to creating an equitable, vibrant and open space for debate and discussion among the presenters and attendees from across the globe, and in which all voices could be heard equally. Therefore, we have decided that next year PHELC will also be an online event, provisionally scheduled for Friday 7th June 2024. So, save the date, keep an eye on our website phelc.ie and follow @PHELCprofessors on Twitter. We hope you enjoy reading these proceedings and look forward to seeing you at PHELC24.

Anna Logan and Ann Marie Farrell (Editors)

	**Pedagogy for Higher Education Large Classes (PHELC)** **Fifth Annual Symposium - Online — 9 June 2023** **Facilitated by Dr Anna Logan and Ann Marie Farrell, Dublin City University** **Twitter: @PHELCprofessors #PHELC23 @AnnMFarrell @logananna11**
10.45-11.00 (Irish/British Standard Time) 11.45-12.00 (Central European Time) 17.45-18.00 (Hong Kong Time) 05.45-06.00 (Eastern Daylight Time) 19.45-20.00 (Australian Eastern Std Time)	**Log on / Registration** *We recommend that you log on to the zoom link at this time in case there are any difficulties.*
11.00-11.30 (Irish/British Standard Time) 12.00-12.30 (Central European Time) 18.00-18.30 (Hong Kong Time) 06.00-06.30 (Eastern Daylight Time) 20.00-20.30 (Australian Eastern Std Time)	**Welcome: Introduction to symposium and participants** **Dr. Anna Logan (@logananna11) & Ann Marie Farrell (@AnnMFarrell), Dublin City University**
11.30–13.00 (Irish/British Standard Time) 12.30-14.00 (Central European Time) 18.30-20.00 (Hong Kong Time) 06.30-08.00 (Eastern Daylight Time) 20.30-22.00 (Australian Eastern Std Time)	**Elaine Huber (@enm181), University of Sydney** ***KEYNOTE:*** *Scaling New Horizons: Empowering Educators and Reimagining the Student Experience in Higher Education Large Classes* **Lightning talks:** **Yalemisew Abgaz (@Yalemisew) & Ciaran Dunne, Dublin City University** *Designing Microcurricula-as-a-Service: The Case of Large Class, Cross programme, and Online Asynchronous Module* **Uzma Ahmad, University of Sheffield** *Does Online Engagement Improve Students' Performance in Large Classroom: Empirical Evidence of Microeconomics module at University of Sheffield International College during the COVID19 pandemic* **Hyowon Lee and Naile Hacioglu, Dublin City University** *An Experience of Applying Active Learning to Large Classes* **Short papers:** **Roisin Lyons (@RoLyonz), University of Limerick, Orlagh Reynolds & Catherine Faherty, Dublin City University** *Student Reflections on the Hackathon Experience* **Kofi Nseibo, Kristin Van Tonder, Chantal Samuels, Cheryl Hodgkinson-Williams (@CherylHW), Judith McKenzie, University of Cape Town** *Enhancing student engagement in large classes by integrating principles of Universal Design for Learning in a Disability Studies in Education short course at the University of Cape Town* **Q&A Session (keynote, lightning talk and short paper presenters)**
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*PHELC23 is sponsored by the **DCU SATLE** fund (Strategic Alignment of Teaching and Learning Enhancement), provided by The **National Forum for the Enhancement of Teaching and Learning in Higher Education** (the national body responsible for leading and advising on the enhancement of teaching and learning in Irish higher education) and the **Higher Education Authority** of Ireland (HEA).*

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New horizons in higher education: Empowering educators and reimagining the student experience in large classes

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Abstract
This paper explores the significance of large class teaching in the context of escalating university enrolments and the growing diversity of student populations. It emphasizes the pressing need to transform large classes into active and collaborative learning environments and away from didactive delivery of information. While educational technology plays a role in this transformation, it should be noted that it is not the sole solution. The paper highlights the challenges faced by educators in maintaining quality teaching in large classes and proposes networked teaching as a viable approach to address these challenges. It also explores the personal and professional benefits of large class teaching, along with strategies for constant improvement. The Connected Learning at Scale (CLaS) project is introduced as a comprehensive case study, discussing its co-design challenges, impact demonstration, and the importance of sharing best practices. It concludes by urging educators to involve additional stakeholders in the design process to enhance the student experience and foster deeper learning.

Keywords: *Higher education; large classes; networked teaching; student engagement; co-design*

1. Introduction

The current landscape of higher education is characterized by a consistent rise in university enrolments and an increasingly diverse student body. As a consequence, large class teaching has become a prominent concern (Gannaway et al., 2017; Kagan & Diamond, 2019; Ryan et al., 2021; UNESCO, 2017). Large classes are an enduring reality and need to be delivered in vibrant, active and collaborative learning spaces. While experiential learning has been recognized as a powerful pedagogical approach (Black et al., 2021; Kolb & Kolb, 2009; Lynch & Pappas, 2017; Miller & Maellaro, 2016), its implementation at scale remains a complex challenge (Mantai & Huber, 2021). Amongst these is the challenge of managing a team of tutors or teaching assistants and ensuring consistency across these multiple teams for the student experience and indeed maintaining student engagement (Clancy et al., 2021). Moreover, while educational technology can support large class teaching (Bryant, 2018; Yang et al., 2018), it should be acknowledged that it is not the panacea for all the issues faced (Kane, 2019; Ryan et al., 2021).

This paper explores the importance of adopting networked teaching practices which involve viewing teaching as a networked activity rather than relying solely on the direct relationship between educators and students (Mantai & Huber, 2021). By embracing networked teaching, educators can effectively coordinate and manage the various elements within the teaching and learning process, such as learning management systems, learning technologies, tutors, fellow teachers, students as teachers and peer reviewers, learning designers, and educational developers. Understanding the networked nature of teaching can alleviate the burden on educators and unlock new possibilities for enhancing the student experience.

2. Networked Teaching

Traditionally, teaching has been a siloed activity with the educator having complete control and responsibility for the learning, teaching and assessment activities, including the design, delivery, marking and improvements. The quality of teaching and resulting learning experiences has been associated with the direct relationship between educators and students (Broadbent, 2018; Gannaway et al., 2017). However, as class sizes grow, this perspective often leads to faculty anxiety and a sense of loss of control (Hubbard & Tallents, 2020). Educators can struggle to maintain the illusion of control, resulting in frustration and burnout (Mantai & Huber, 2021). It is crucial therefore to recognize that teaching is a networked activity, where the educator acts as a coordinator and manager of various elements within the teaching and learning process. This includes learning management systems, learning technologies, tutors, fellow teachers, students as teachers and reviewers, learning designers, and educational developers.

Indeed, there are a range of roles involved in a networked teaching approach, each with its own responsibilities. As well as a large teaching team that may consist of lecturers and teaching assistants/tutors, the educator may be joined by others in the design process - educational developers, learning designers and educational technologists. Input through pedagogical advice, latest research on teaching methods, new tools and platforms to achieve learning outcomes and professional development support as well as liaison with ICT units. Then there may be industry partners who can bring in authentic contexts and perspectives to the classroom, library personnel who can support academic literacy skills, media officers and producers who can advise and support the creation of interactive and quality learning media objects, research assistants who can support the development of an evaluation plan to see how any new interventions are playing out in practice and finally the students. They can be instrumental in peer reviews, peer assisted learning support, developing resources and co-designing. Understanding this networked nature of teaching can alleviate the burden on educators and open up new possibilities for enhancing the student experience. That said, this is a transformational move away from a siloed approach and not one many experienced educators may be comfortable with.

3. Benefits of Large Class Teaching

Although perceived barriers to facilitating large classes can dominate, large class teaching can offer both personal and professional benefits for educators. By engaging in transformative teaching practices, educators can experience continuous growth and development, leading to personal satisfaction and a sense of professional achievement (Mantai & Huber, 2021). Participants in their study cited benefits including the ability to harness a greater energy in a large classroom, better participation, diversity of thought and ideas, as well as benefits to society through increased student access to, and development of, knowledge, leading to greater meaning to their roles as educators. Additionally, large class teaching provides a unique opportunity to transform the student experience as they too benefit from the diversity and participation opportunities (Bryant, 2022b). Recognizing the benefits associated with large class teaching, it is important to support educators in their journey of innovation and improvement. Whilst funding is helpful in terms of 'buying time', more often than not it is usually not available, so we also recommend looking for alternative ways of working with colleagues and other interested stakeholders in the design and development journey.

4. Co-Design approaches

In education, co-design is a facilitated, team-based approach which brings actors together to design a solution to an overarching educational need or problem (Roschelle et al., 2006).

Co-design in a broader context involves active and collaborative participation from a diverse set of stakeholders (Manzini, 2015). It can also be defined as "a practice where people collaborate or connect their knowledge, skills, and resources in order to carry out a design task" (Zamenopoulos & Alexiou, 2018, p. 10). What Co-design is not, and is often confused as, is student surveys and feedback, inviting guest speakers or industry experts to present, or peer observation of teaching. All of these are valid activities that contribute to quality learning and teaching, but they are not co-design. Co-design as a term has risen in prominence lately and is often found masquerading under other 'titles' such as lived-experience, participatory approaches, students as partners, and user-experience design. But what is consistent across any definition is the underpinning philosophy that learners are included as collaborators or partners in the process of designing their learning journey.

5. Connected Learning at Scale (CLaS)

The Connected Learning at Scale (CLaS) project serves as a valuable case study in the context of large class teaching. The project was initiated to transform the student experience in specific units with high student enrolments (Bryant, 2022a). The aim was to co-design interventions using a range of strategies we label as deep, medium, and light approaches (Wilson et al., 2021; Zeivots et al., 2023). Each approach involves to some extent or another implementing innovations across three simple principles:

(1) Information engagement – where students both individually and collectively engage with discipline knowledge as opposed to having it broadcast at them in a lecture.

(2) Connected participation and active learning - where face-to-face teaching time, student learning activities and technology are leveraged to build connections and networks to address, debate and solve critical global and local challenges through innovative pedagogical approaches.

(3) Relevant and authentic assessment and feed-forward – where learning is applied and tested through authentic assessment modes supported by opportunities to receive and share feedback from both academics and their peers.

As would be expected in a project of this size and complexity, we encountered numerous challenges ranging from gaining buy-in from faculty, to navigating differing teaching styles; not to mention the need to 'change' whilst in the middle of another large scale change - the rapid move to remote teaching due to the COVID-19 pandemic. This highlights the need in these larger projects to allow enough time for building trust and capacity through and in the co-design process. The CLaS project also emphasizes the importance of thinking differently about the ways educators work and cultivating a mindset that is receptive to innovative approaches and collaborative endeavours. Integrating opportunities for academic professional development into the project through the co-design process, can ensure another outcome of the project, capacity building in learning design and sustainable futures (Voogt et al., 2015).

6. Sharing Practice and Demonstrating Impact

To create a meaningful and lasting impact, it is essential to share best practices and showcase successful interventions. Gribble and Beckman (2022) espouse a 4Cs approach to disseminating innovations in a university setting: classroom, corridors, campus and community. In the CLaS project this has been achieved through various means, such as organizing showcase sessions both within the Business School and the University of Sydney as well as at local and international conferences, where educators can present their innovative teaching methods and strategies. Additionally, building a website or blog, dedicated to sharing experiences, insights, and resources can serve as a valuable platform for disseminating knowledge (http://cdrg.blog). Embracing the concept of patterns that can be reproduced in different contexts further contributes to the scalability and sustainability of innovative teaching practices (see https://clasdesignpatterns.com).

Celebrating participation and recognizing the contributions of stakeholders play a pivotal role in creating a culture of continuous improvement. Moreover, it is crucial to move beyond the initial engagement and consulting stages, where educators are "doing for" stakeholders, and transition towards a more balanced and collaborative approach of "doing with" stakeholders (Dollinger et al., 2022). By involving stakeholders throughout the design and implementation process, their expertise and perspectives are valued, leading to more inclusive and effective educational practices (Vallis et al., 2022).

7. Conclusion

In conclusion, the paper underscores the importance of addressing the challenges posed by large class teaching in higher education. It advocates for networked teaching practices, which acknowledge the complex and interconnected nature of teaching, and emphasizes the personal and professional benefits that educators can derive from large class teaching. The paper highlights the Connected Learning at Scale (CLaS) project as a case study, showcasing the significance of co-design, sharing best practices, and demonstrating impact. Moreover, it urges educators to involve additional stakeholders in the design process to create a more authentic and enriching learning experience for students. While involving others in the design process may require additional time and effort, the rewards in terms of improved student experience and deeper learning outcomes justify the investment. By embracing innovation, collaboration, and the networked nature of teaching, educators can empower themselves and reimagine the student experience in large classes, paving the way for a transformative and inclusive higher education landscape.

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Designing Microcurricula-as-a-service: The case of large class, cross programme, and online asynchronous module

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Abstract
Repurposing higher-education curriculum to tailor to the needs of learners is becoming common in response to recent societal and technological changes. Designing existing and new modules into microcurriculum is taking place with the objective of delivering very specific knowledge and skill set based on the requirements of learners. This paper outlines the design of Microcurricula-as-a-Service (MaaS) based on "As-a-Service" principle borrowed from the software engineering domain. The paper presents the design of a Data Literacy and Analytics (DLA) module at Dublin City University under the DCU Futures programme as a case study. DLA is an online and asynchronous module designed for ten DCU Futures programmes, embedded into 34 standard modules, and delivered to eight hundred first- and second-year students in the 2022/23 academic year. The module consists of 14 carefully selected data literacy and analytics microcurricula worth 0.5 to 1 ECTS. This paper further demonstrates that MaaS can furnish microcurricula focused on specific topics, that are self-contained, composable, flexible, scalable, and economical. MaaS can be composed into large credits catering for the requirements of individual programmes, or embedded into other modules maintaining high quality at a lower cost.

Keywords: *Microcurricula-as-a-service; microcurriculum design; data literacy; data analytics*

1. Introduction

Curriculum design has always been at the heart of the higher education sector (Clayton & Clopton, 2019). Universities revisit their curriculum to reflect their mission and stay up to date to meet the changing requirements of learners, employers, industry partners, and other stakeholders. In recent years, curriculum design demonstrated a significant shift from the traditional classroom-based delivery of education to a more targeted, flexible, self-paced, and large class delivery using online, synchronous or asynchronous modes. The pandemic further contributed towards the wide adaptation of such curriculum in third-level education (Bashir et al., 2021, Turnbull et al., 2021, Farell et al., 2021).

Another recent global development deals with the prevalence of data in a data-driven culture and its application demanding educators to focus on producing data-literate workforce equipped with competency skills that are required to navigate through the ocean of data (Vuorikari et al., 2022). There is a growing demand for data literacy and analytics skills both from employers and learners alike in all disciplines that consume data. To meet this demand, universities are focusing on equipping learners with data literacy and analytics skills by designing modules to respond to the growing demand. Data literacy equips learners with the knowledge, tools and techniques they require to successfully utilise the benefits of data and its analytics. Data literacy and analytics in the 21st century become a common denominator among multiple disciplines that deal with data and its analytics. Data literacy and analytics is often delivered across multiple programmes with a very large number of learners subscribing for one or more aspects of the subject.

DCU has long recognised this requirement and established DCU Futures[1] to empower students to be future-capable and to traverse through the unscripted world defined by unprecedented technological and social change. DCU Futures is an HCI-funded project which aims at re-imagining undergraduate education focusing on transversal skills including data literacy, digital literacy, language skills, creative thinking, health literacy, and others that are identified as transversal skill sets. Data literacy and analytics is one of the skill sets incorporated into the programme and identified as a core skill set to be delivered to ten participating DCU Futures programmes.

2. Description of the Teaching/Learning Context

This paper presents an approach for designing microcurricula using a MaaS design approach. The microcurricula are developed for Data Literacy and Analytics (DLA) under the DCU Futures initiative for all participating programmes. The DLA module, which is designed by applying the MaaS approach and is being delivered to 805 students in an online and asynchronous setting is presented as a case study.

2.1. MaaS

MaaS is an approach borrowed from a software engineering domain known as Software-as-a-Service (SaaS) (Schütz et al., 2013) and microservices design (Newman, 2015). SaaS focuses on providing specific software as a service by a software provider taking care of the design, implementation, and management of a small unit of software (microservice) that does a single task. In SaaS, two or more microservices can be composed into a big software service. Each microservice is responsible for a single task and can be embedded into other services.

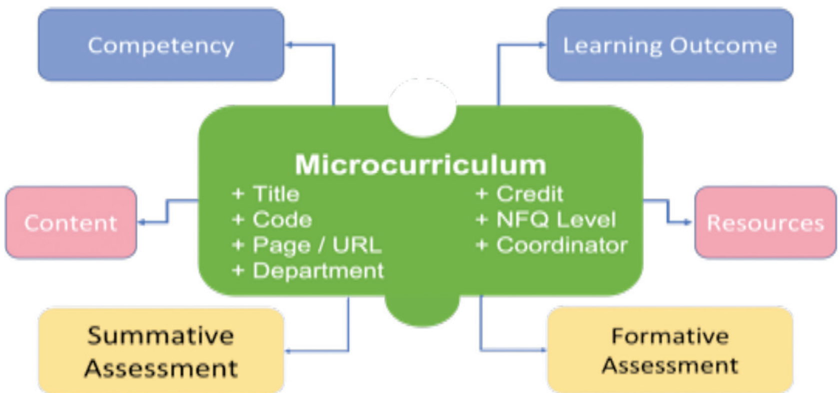

Figure 1. Microcurriculum-as-a-Service skeleton and components.

1 https://www.dcu.ie/ovpaa/dcu-futures

Analogous to SaaS, MaaS focuses on designing a microcurriculum that delivers a single cohesive and self-contained topic with a single competency, learning outcome, activities, assessment, and microcredits in European Credit Transfer and Accumulation System (ECTS) (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2017). A module designed as MaaS can be embedded into other modules or can be composed into larger credits (2.5, 5, 7.5 or 10 ECTS) depending on the requirements of the programmes. Figure 1, presents the skeleton of a MaaS along with its major components. The module coordinator (provider) is responsible for the development and management of the MaaS and making it available for clients (in this case, other module coordinators) to reuse the MaaS in their modules. A microcurriculum contains a single competency and learning outcome with coherent content and resources specifically tailored to achieve the learning outcome along with one or more formative and summative assessments.

2.2. Case Study: Data Literacy and Analytics Module

DCU's data literacy and analytics expert working group, which is composed of academics and operational staff across the university, defined data literacy as the capability to process, critique, analyse, visualise, and interpret data in an unbiased, responsible, actionable, and ethical manner. Following a consultation of the industry partners and academic stakeholders, the data literacy and analytics working group identified 14 core topics (later treated as microcurricula) that are deemed to be critical skills for DCU students (see Figure 2). The working group contributed towards the definition of the competency levels and learning outcomes for the identified curricula. Each microcurriculum (identified hereafter as DLAT) has an estimated ECTS workload, where one ECTS credit corresponds to 25 hours of work (DCU Marks and Standards, Version 2021.1, Section 2.1.1). This workload includes online lecture hours, practical/lab hours, any tutorials and independent study hours. The corresponding ECTS of each microcurriculum along the topics covered is depicted in Figure 2.

Four of the 14 microcurricula (Introduction to Data Literacy, Introduction to Big Data Analytics, Data Protection and Ethics, Database Modelling) focus on theoretical and fundamental concepts that are mandatory while the other three nine microcurricula focus on data analytics and visualisation tools delivered using three routes: Spreadsheet, Python, and R. For example, Introduction to Spreadsheet, Intermediate Spreadsheet, and Data Visualisation using Spreadsheet are included under the Spreadsheet route. These three routes allow DCU Futures programmes to select one or more tools to teach students based on their disciplinary requirements. It further allows students to specialise in two or more data analytics tools of their choice. The last microcurriculum (Introduction to Statistics) is also available to students as an introductory statistics topic. Each microcurriculum has been embedded into 34 standard DCU modules during the 22/23 academic year. For example, CS218 embeds DLAT1 and 2, whereas CS207 embeds DLAT 3, 5, 6 and 7.

A 5 ECTS stand-alone module (CA179) is composed of the four mandatory microcurricula and three additional microcurricula using the Spreadsheet route. While two DCU Futures programmes chose the 5 ECTS stand-alone module, eight programmes decided to embed these microcurricula into their core modules. One programme chose to go along with the R route while another programme selected the Python route.

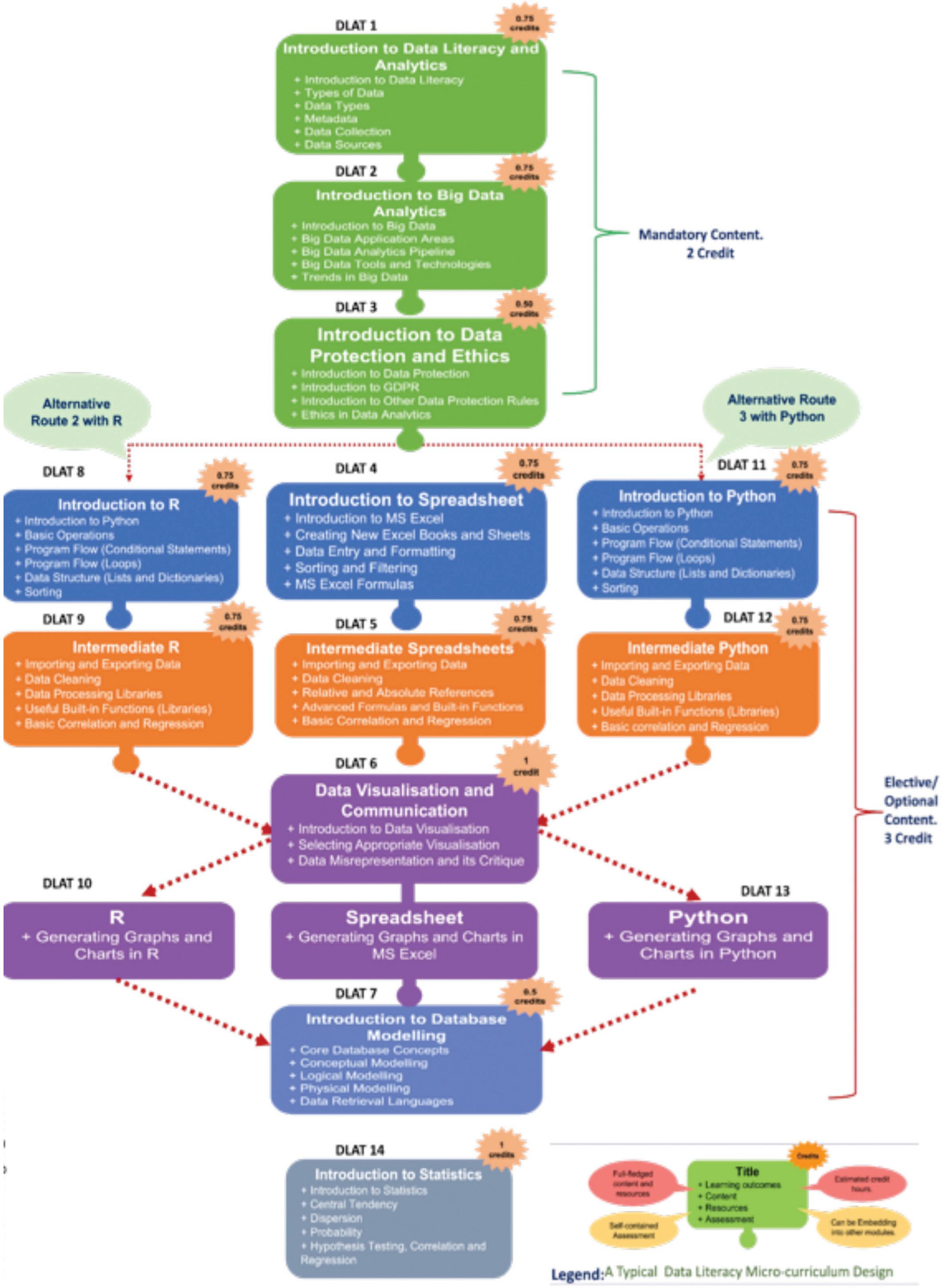

Figure 2. Data Literacy and Analytics for 21st Century Microcurricula-as-a-Service.

The content in each microcurriculum is designed based on inputs from several experts in the area of data literacy and analytics, industry experts, and other stakeholders. The content is produced at a higher standard and implemented in Loop (DCU's virtual learning environment) mostly using H5P books, expert interviews (fireside chats) and high-quality reference materials. The content is developed following the ABC learning design principle and incorporates the acquisition of knowledge, collaboration, discussion, investigation, practice, and collaboration (Hasenknopf et al., 2019, Young & Perović, 2020). The design incorporates most of these tasks explicitly in the module. However, it gives lesser emphasis to collaboration which is a challenge in an online asynchronous environment (Smyth et al., 2021) and requires additional efforts to achieve it (Fabriz et al., 2021). Each microcurriculum has its own online asynchronous summative assessment which is made available as soon as a student completes all the subtopics and the peer-learning activities. The assessment questions are derived from a large set of question banks using a stratified random sampling method where each stratum represents the subtopics of the microcurriculum.

3. Literature Review

Designing a curriculum targeting a large cohort of heterogeneous learners requires meticulous planning and execution (Laurillard, 2010). The design should take into consideration major issues including the aim, topics, learning outcomes, learning time, assessment, staffing and the number of students. The 21st-century curriculum further looks into approaches that deliver composable, flexible, and scalable curricula reflecting the requirements of users and considering state-of-the-art educational technologies.

Microcurriculum design has become a common curriculum design option related to the development and delivery of specific content within a topic targeting niche learner groups to attain specific knowledge and skills ((Li, 2018; Robertson, 2021). The approach relies on current educational technologies and online environments to reach a large number of learners in both synchronous and asynchronous modes (Jin, 2020; Farell et al., 2021).

Recently concepts borrowed from other disciplines provide alternative ways of designing microcurricula. One of the approaches considers microcurricula as a service analogous to Software-as-a-Service (SaaS) paradigm. Although the As-a-Service approach is being used across many disciplines, it is not a widely used concept in curriculum design. Different scholars are proposing the use of Microcurricula as a service in higher education settings (Ashraf & Alanezi, 2020).

4. Empirical Methodology/Data

The DLA module targeted more than 805 DCU Futures students in the 2022/23 academic year from ten programmes under four of the five faculties in DCU. The delivery of the module was in a fully asynchronous and online mode. The module was delivered to two DCU Futures programmes as a 5-credit stand-alone module: BSc in Bioprocessing (BP) and BA in Climate and Environmental Science (BCES). Both programmes opted for the spreadsheet route. BCES students took an additional Introduction to Statistics topic to introduce them to the core concepts of statistics for data analytics. Thirty-four modules (first, second, and year-long semesters) embedded the microcurricula as part of their modules. All programmes embedded the core microcurricula, while the majority of the programmes subscribed to the spreadsheet route, one programme subscribed to the Python route and another programme subscribed to the R route. Module coordinators who embedded these topics are responsible for the smooth integration of the topics in their overall module content and ensuring the students complete the topics they embed in their modules. For the two programmes that took the stand-alone module, the DLA module coordinator provided face-to-face synchronous tutorials to ensure their engagement with the content.

Table 1 shows the number of learners and module coordinators per microcurriculum with the last column showing the total number of unique users. Since 34 modules embedded one or more microcurricula, the respective module coordinators are added as non-editing teachers. This role allows them to review and follow up the progress and results of their respective students.

Table 1. The distribution of students and module coordinators in each microcurricula

Role	DLAT1	DLAT2	DLAT3	DLAT4	DLAT5	DLAT6	DLAT7	DLAT8	DLAT9	DLAT10	DLAT11	DLAT12	DLAT13	DLAT14	Total (Unique)
# Students	646	644	710	723	730	567	707	16	16	16	25	25	25	79	**805**
# Teacher & non-editing Teachers	28	30	39	33	31	34	29	2	2	2	10	10	10	10	**59**
Total (Unique)	**674**	**674**	**749**	**756**	**761**	**601**	**736**	**18**	**18**	**18**	**35**	**35**	**35**	**35**	**864**

Preliminary statistics collected from the interaction of the students at the end of the first semester indicated a higher level of engagement and participation from the students. Self-assessment questions posed at the beginning of each module show that there is a strong need for data literacy and analytics knowledge. Parallel questions asked at the end of each microcurriculum further indicate that the students' knowledge and skill set have improved due to the delivery of these topics. A more systematic analysis of the data is underway, however, the full result of the study will only be available at the end of the academic year 2022/23.

Module coordinators also indicated that the MaaS approach is flexible enabling them to make the microcurricula available to students on their own schedule at any time in the academic year independent of the class size. It further saves the time and effort of the module coordinators in preparing and delivering the module and conducting a summative assessment of the module. Following the success of the first semester, seven module coordinators who are not part of the DCU Futures programme have also embedded the microcurricula in their second and third-year modules.

5. Analysis of/Reflection on/Implications for Practice

DLA demonstrates the potential of designing microcurricula based on the MaaS principles in that it is highly scalable, flexible, composable, and independent. Among the many benefits of MaaS, the following features are worth mentioning.

Scalability: the scalability of the module comes in two dimensions. First, since each microcurriculum is organised as separate module instances, it is possible to add or remove new topics based on the requirements of the programmes without affecting other microcurricula. Second, since the resources to the microcurricula are delivered in an asynchronous and online environment, it is demonstrated that the module is scalable in terms of accommodating a large number of enrolled students.

Self-contained and independent: this aspect emanates from the structure of each microcurriculum. The microcurriculum is structured to cover a single cohesive topic which is decoupled from other topics. A microcurriculum also has independent activities, resources, assessments with pass/fail marks, and most importantly estimated ECTS. Thus, each of the 14 microcurricula can be viewed as an independent self-contained microcurriculum which can be delivered to students independently.

Composable: The microcurricula are related to each other and the knowledge of one microcurriculum could be a basis for another. In circumstances where there is a need to build these independent topics into a stand-alone full-fledged module, it is possible to compose the microcurricula into 2.5, 5.0, 7.5 or 10 ECTS modules. Although we propose practical precedence of the topics, the microcurricula can be taken in any order that suits the learner starting from the basics to progressing to the advanced topics.

Embedded: These microcurricula are organised in such a way that the topics (even the subtopics) are suitable to be embedded in other modules. For example, a 2.5 credit Introduction to Spreadsheet which is composed of the three topics (Introduction to Excel, Intermediate Excel, and Data Visualisation with Excel) is embedded into a "Visualisation & Validation of Laboratory Data" module claiming the 2.5 credits. In another instance, Introduction to Big Data Analytics is embedded into a "Chemistry Lab & Spectroscopic Workshop" module claiming 0.75 credits. When the microcurricula are embedded, it allows the module coordinators to reuse all the resources without reinventing the wheel which significantly reduces the time required to prepare the same content across several faculties and departments.

Economical: data is ubiquitous and so is the demand for data literacy and analytics. Universities with several thousands of students and a significant number of programmes require to include data literacy and analytics microcurricula in their programmes. Doing this individually will result in duplication of effort and waste of resources. MaaS addresses this issue by designing high-quality microcurricula centrally and reusing them across several modules and different programmes. This approach can be extended to other modules that are delivered across multiple programmes.

Although these are some of the benefits, our implementation of DLA using MaaS also comes with its own disadvantages. First, there is no single size fits all solution that works for all programmes. To reduce this problem, we ran several workshops and consultation meetings with programme chairs to select the topics and the learning outcomes. We provided multiple options to deliver the required topics for programmes. The options included several levels of customisation of the content to satisfy the requirements of different programmes by inviting subject matter experts from different backgrounds and incorporating discipline-specific content to make the module relevant to the students. The customisation challenge is also reflected in the preparation and delivery of the content on Loop (our learning platform).

Second, the summative assessment required dealing with academic integrity. With many students taking the online asynchronous assessment, there was an ongoing risk that students could share answers among their circles. To avoid this, we prepared large question banks and randomised the questions to ensure students got different sets of questions. Even If the solution did not completely remove the challenge, it has significantly reduced the risk. Third, the formative assessment required a considerable time to provide individual feedback to the students. The scale of participation in the peer-learning activities and discussion forums posed a significant challenge to the module coordinator to give individual feedback and required additional scalable solutions.

Above all the challenges, early-stage data and informal feedback from the students indicate that the MaaS design is working well with promising results. Future work in the area will look into the standardisation and dissemination of the MaaS approach using semantic models (Abgaz et al., 2018, Phal et al., 2010,) to make it available for the wider academic community.

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Does online engagement improve students' performance in a large classroom: Empirical evidence from a microeconomics module at University of Sheffield International College during the COVID19 pandemic

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Abstract
This paper investigates the association between students' online engagement and their performance in a HE (level 6) compulsory Microeconomics module. The data for this study comes from a unique purpose-built student online survey with a large cohort of 282 students in University of Sheffield International College (USIC) in England. The dataset was also matched with college administrative data to access students' performance records. Students' performance was measured from their end-of-term summative assessment score in the module. Multiple Regression analysis was used to identify the relationship between students' engagement and performance. The findings show a positive and significant relationship between online engagement (performance in formative assessments and use of discussion boards) and performance (end-of -term score). This study also provides useful insights by informing as to what works best for students in large classrooms regarding their engagement.

Keywords: *Student engagement; performance; online learning; HE; pandemic; large classes*

1. Introduction

To contextualise the current study within the wider HE context, higher levels of student engagement is relevant and can be seen as measures of success for students, teachers, programmes and higher education institutions themselves. Higher engagement levels are important for quality student experiences. Therefore, education researchers and stakeholders are keen to know about student engagement in higher education for various reasons including competition (Vuori, 2014). The current study is particularly concerned with looking at students' perspectives by asking a range of questions about activities related to multiple dimensions of engagement. There is a deliberate focus on self-reported measures in order to gain students' subjective experience which their course has prioritised, thereby identifying specific areas where the relevant institution can make further progress and enhance if appropriate and possible.

This paper investigates the association between students' online engagement and their performance in a HE (level 6) compulsory module of Economics: Microeconomics. The data comes from a unique purpose-built student online survey (282 students) collected from University of Sheffield International College (USIC) in England. The dataset is also matched with administrative data of the college to access students' performance records. Students' performance is measured from their end-of-term summative assessment score in that module. Multiple Regression analysis is used to identify the relationship between students' engagement and performance. This paper proceeds as follows: section 2 reviews previous literature before and after the pandemic, section 3 and 4 describe the data and methodology, section 5 presents the results and section 6 concludes.

2. Description of the Teaching/Learning Context

The data comes from a purpose-built, semi-structured online student questionnaire conducted using online google survey forms during virtual sessions. The online student survey was sent to all (311) pre masters, level 6 students studying a course in their term 2 (started from Jan 2021) in Microeconomics course at University of Sheffield International College (USIC) UK. Out of 311 students, 282 responded to the survey, having a 90% response rate. The international pre masters programme consists of three terms**:** **term 1: Sep term** which started from Sept 2020, there is no Economics in term 1. **Term 2**: **Jan term** 2021: students study a compulsory module: Microeconomics in this term. **Term 3: April** term that starts from April 2021 and students take another Economics module: Macroeconomics. Usually, each term lasts for 8-9 teaching weeks followed by the end of term exam period. This course was the largest module among all other modules and programmes. This large cohort is arranged (300 plus students) as having a combined lecture together (2hrs) in a lecture theatre and two teaching sessions (seminar 1(1.5 hrs) and 2 (1.5 hr)) delivered as small teaching groups (around 20 students class size each, so in total 15 groups.)

The module is mandatory for both pathways: Economics and Business. The delivery of the module is achieved using a blended learning approach involving VLE- based distance learning, traditional face to face teaching and a combination of both. Table 1 below provides the description of termly learning hours for this module.

Table 1. Breakdown of termly Guided Learning Hours

Teaching and Learning activities	Indicative guided learning hours per term
Asynchronous Learning: Guided VLE activities, independent study, assessment preparation	42
Synchronous Learning: Live classes, small group workshops, support	18

All students studying this course are international students. It is very important to study the students' progress/performance in this course in the pre-masters programme as this maps the students' transition from University of Sheffield International College (USIC) to the University of Sheffield and this aids the student's preparation for their master's degree at university. The overall aim of the module is to introduce students with no prior background in economics to the subject-specific language and study skills. The module provides students with some basic and intermediate concepts and theories in economics. Hence, this will enable them to acquire the appropriate knowledge to progress with confidence onto their chosen master's degree programme at the University of Sheffield.

Students were asked (through student questionnaires) to provide their student id numbers which helped the author to match students' self-reported engagement perceptions responses and demographic variables from the mid-term questionnaire to the University of Sheffield International (USIC) administrative central management data that contain their attendance, term scores and other information etc. The student questionnaire is attached in Appendix 1, containing detailed information about the range of questions asked to students. Therefore, it is quite a comprehensive and rich dataset to assess the underlying research question. The reliability of data comes from the fact that students were not asked about their scores, instead student id collected from respondents were used to get their score and other records so reducing the chance of reporting error and manipulation.

Like face-to-face discussion, discussion boards are reflective in nature, a powerful tool in an online environment, VLE and allow students to think critically about the seminar topic throughout the week and support the points well, also moving the discussion on by responding to other students' contributions. Given the context of international students, it is also a good tool to gauge students' opinions especially for new students particularly the quiet ones. However, reviewing students' responses in large cohorts poses a challenge for educators. This has been dealt well by allowing students to use discussion boards in seminar sessions where a teacher can manage around 20 students' views.

Formative assessments (assessment for learning) progress tests that involved multiple types of questions, short questions and answers, calculation, MCQs were used. All these were linked with their summative assessments, SA (unseen exam). The biggest challenges were that these are very time consuming to mark and required data tracking particularly with a large cohort such as this where the teacher has to offer one to one feedback. Feedback, should be timely (Haunt and Pellegrino, 2002) and smart as formative assessments may not be meaningful if the teacher cannot identify, analyse, and respond to the problems of individual students. The intuition behind using FA as a measure of student engagement is that progress tests are useful to obtain feedback as to what the students have learned. For students, these tests are an opportunity to show what they have learned and the extent and depth of their knowledge. Also, a teacher's ability to develop FA and feedback should be strong, consistent, and nurtured. Given the nature of international and large cohorts and differences across time zones both discussion board and FA were built in with sufficient time allowing students to respond at their own time.

The table 2 below gives the definition and description of variables and how they are constructed in present study.

Table 2. Description of Variable and Summary Statistics of Variables used in the study

Definition of variables used in present study	
Dependent variable	
End-of-term student performance measured as marks obtained in summative assessment of Economics course.	
Independent variables	
Gender a binary variable: 1= Male, 2= Female	
Indicators of engagement	
Engagement 1: Percentage of attendance in live teaching sessions (including lectures and seminars) during the term.	
Engagement 2: Average score in four formative assessments (online progress class tests) during the term.	
Engagement 3: Student use of online academic discussion board in response to teacher posted questions during the term.	
Engagement 4: Student motivation measured as their self-reported perceptions/beliefs of their engagement during online classes measured as a composite index consisting of an average of three sets of items (Q1 excitement, Q2 involvement, Q3 participation). These questions were asked to students in an online mid-term survey and their responses were recorded on 5 points Likert scale.	
Sample Size	172 students

2.1. Data Ethics and Confidentiality

This project was approved by The School of Education's ethics review procedure at the University of Sheffield. Students were informed that taking part in the project would include completing a student questionnaire and that responses would be matched with their term scores and other records using their student id. Students were provided with a detailed project information sheet outlining the title and descriptions of the project, why they were chosen as a participant, as well as information about confidentiality, data control, the legal basis for processing data and a consent form. Also, they were told that submitting the questionnaire would be taken as them providing informed consent.

Students were given a certain date to withdraw from study after the data collection and were assured that they did not have to give any reasons for why they no longer wanted to take part and that there would be no adverse consequences if they choose to withdraw. Few students submitted their responses at the end of the week as most students completed the survey during lecture time.

3. Literature Review

Student engagement is defined as an active participation in the education process along with feeling and sense making that require a positive frame of mind (Harper and Quaye, 2009) and is considered an indicator of institutional quality (Kuh, 2001). An excellent undergraduate education is most likely to happen at the colleges and universities which are successful at enhancing student engagement through maximising good practices (Pascarella, 2001).

Looking at literature, it is evident that it is vital to analyse student engagement from a student's perspective. Harper, (2007; 2011) describes that the most important and efficient method to enhance student engagement is to call for those students who are educationally less engaged and ask their opinions and experiences. Therefore, it is highly recommended for education institutions to maintain a system in place and establish ways to consult students and hear their voice and then explore their views as learners and document the nature and quality of their experiences (ACPA & NASPA, 2004). One of the main factors in student engagement is gauged through student attendance, though, this is a poorly defined measure as it only takes a narrow view of student participation. Therefore, this study did not consider traditional engagement measures such as mere participation in class and attendance and instead looked at engagement as a comprehensive measure in different ways as seen through the students' lens (further details are given in data and methodology section).

Drawing on Bloom (1956), Fredricks, Blumenfeld, & Paris, 2004, identified three dimensions of student engagement, which are emotional, behavioural, and cognitive. A review of the literature shows that these dimensions are associated with different concepts. Behavioural engagement is defined as attendance, participation in learning and activities and interaction with others. Emotional engagement is considered as a sense of belonging, attitudes, interests, and values during the learning process. Cognitive engagement is defined in terms of motivation, persistence and deep processing of information during the learning journey.

Most other studies have found a positive association between student attendance and their performance in studies (Durden & Ellis, 1995; Gatherer & Manning, 1998; Grabe & Christopherson, 2008; Massingham & Herrington, 2006; Stewart, Stott, & Nuttall, 2011; Thatcher, Fridjhon, & Cockcroft, 2007). As a response to the pandemic and the move to online learning, student engagement became even more challenging, and was considered a sector-wide concern for universities (Nickerson and Shea, 2020). However, there is almost non-existent research, exploring the link between student engagement and their performance during the COVID-19. Some researchers looked at the different strategies to foster student engagement (descriptive studies) as a result of pandemic challenge (Zhang et al., 2021; Brown, 2021; Lungu and Lungu, 2021, Koob et al., 2021). To the best of our knowledge, this is the first empirical study looking at an empirical relationship of student online engagement and end-of-term exam performance in an economics module (Level 6) in an international education setting in England, during COVID-19.

4. Analysis

4.1. Model: Education Production Function (EPF)

This study used the Education Production Function (EPF) to describe the quantitative relationship between education inputs and output adopted from Harris (2010). The EPF is derived from production theory in Economics and is defined as a process where a combination of all education inputs (student, school, teacher etc) produce a certain level of output such as students' test score/academic achievement. This methodology is commonly used in estimating the effect of any education input on education output. A contemporaneous specification, which assumes observed performance of students are determined by only current inputs.

The equation for above EPF is written as:

$$Y_{it}^{\text{Student performance}} = \beta 0 + \beta 1\ X_{it}^{\text{Student gender}} + \beta 2\ \text{Student Engagement1}\ X_{it}^{\text{Attendance Live}} + \beta 3\ \text{Student Engagement2}\ X_{it}^{\text{Avg formattive score}} + \beta 4\ \text{Student Engagement3}\ X_{it}^{\text{Discussion board}} + \beta 5\ \text{Student Engagement4}\ X_{it}^{\text{Student motivation}} + \varepsilon_i$$

Where:

i = 1.... n denotes the student.

$\mathbf{Y}_i^{\textbf{Student Performance}}$ – Student performance measured as end-of-term exam score in Microeconomics, term 2.

$\mathbf{X}_i^{\textbf{Student}}$ – Students demographic variables: Gender measured in term2.

Student Engagement $\mathbf{X}_{\mathbf{it:}}$ Student Engagement is measured as their self-perceived and self-reported behaviour in term 2 related to excitement, involvement, and participation (these questions are measured on five point Likert scales) in classroom in term 2, along with other engagement indicators, such as, attendance in live teaching sessions, average formative assessment score, use of online discussion board.

$\boldsymbol{\varepsilon}_i$ – Error term assumed distributed as normal.

βo, β1, β1, β2, β3, β4, β5 are parameters and are estimated through using Multiple Regression technique in **STATA** (Software for Statistics and Data Science). Figure 1 below explains different dimensions of student engagement used in this study.

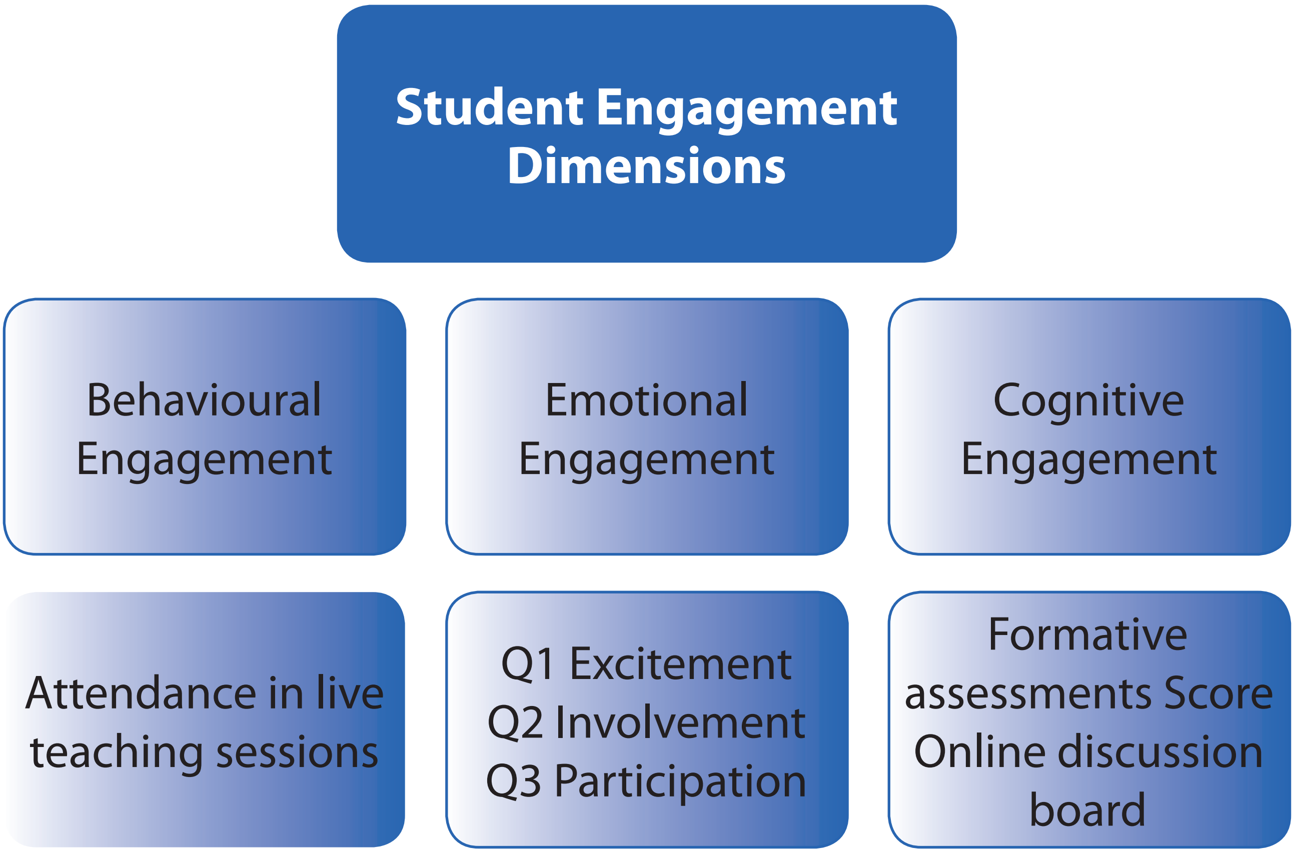

Figure 1: Student Engagement Dimensions

The current study presents an analysis of the association between a range of student engagements during an online course and end-of-term performance measured as marks obtained in end-of-term summative assessment in an economics module.

1. Percentage of attendance in classes (including lecture and seminars).
2. Engagement with formative assessment measured as average marks obtained in four online class progress tests.
3. Use of an online academic discussion board during the term.
4. Students' own perceptions/beliefs of their engagement during online classes measured as a composite index consist of an average of three sets of items (Q1 excitement, Q2 involvement, Q3 participation). These questions were asked to students in an online survey and their responses were recorded on a 5 point Likert scale.

The students' engagement was measured as their perceptions related to excitement and participation in online classes asked in mid-term students' questionnaires. For further details, see Figure 2, below showing responses to the questions re student engagement.

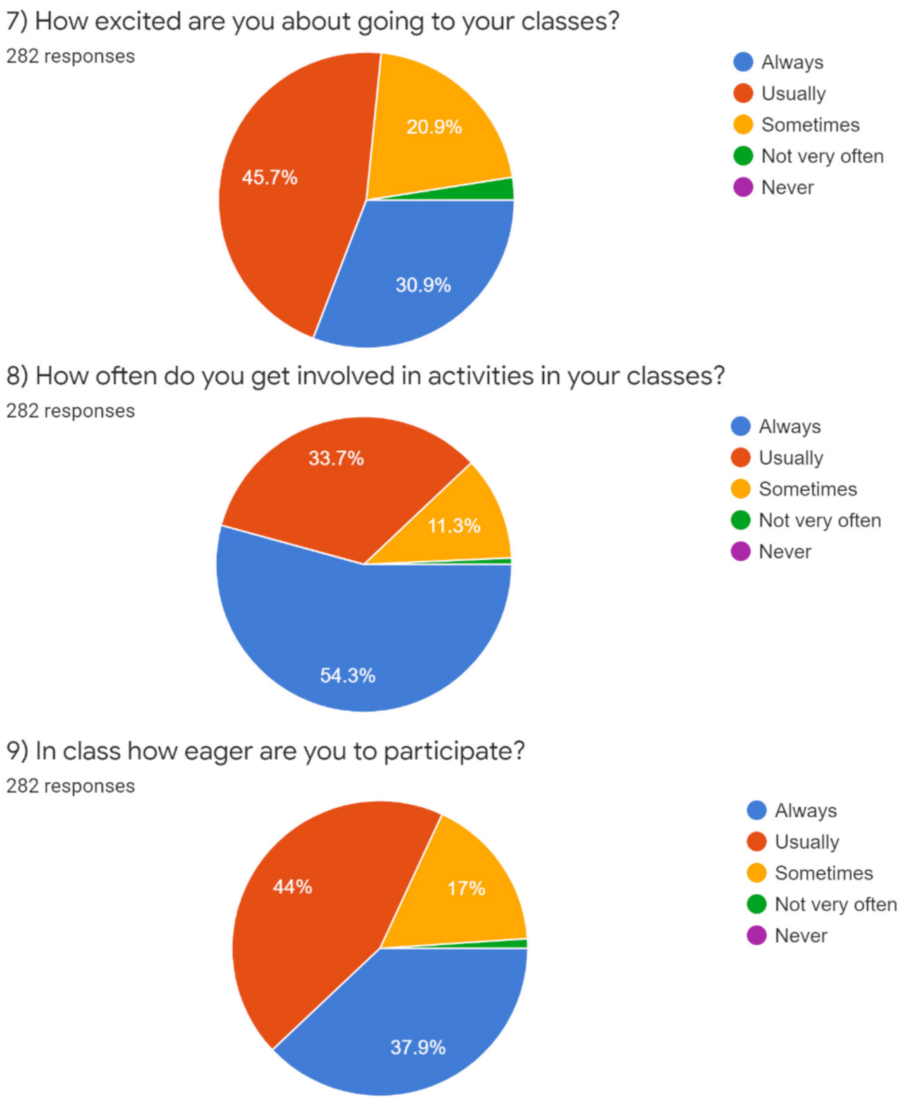

Figure 2: Student responses to questions re engagement

5. Results and Discussion

Table 3 (Appendix 2) presents the operational definition of variables and a descriptive summary of the estimated effect of a range of student engagement variables (independent variables) on student performance in the economics exam (dependent variable). A multiple regression model (Table 4 in Appendix 2) was used to estimate the relationship between student engagement and performance. In order to find the coefficient estimates of variables, STATA was used to run the model.

Before estimation of the model, the data were cleaned for missing information. Student id information was missing for 100 students, reducing our sample for 282 to 172, because of that the author was unable to match those questionnaires to administrative data of test scores. Due to a few other missing information on self-reported variables (student motivation level, the final estimated sample size arrived at 172 observations (students). It is crucial to estimate the model using consistent observations of all variables, so that our results are not affected by any sample change and the estimated coefficients are robust.

The variables such as gender, attendance in live teaching sessions and student motivation appeared as insignificant whereas formative assessment score and use of online discussion board turned out as highly significant (significant 1% level of significance). This means that neither of those variables (gender, attendance in live teaching sessions and student motivation) have any statistical relationship with student performance in end-of-term exams in this model. Therefore, it is irrelevant to discuss the effect of coefficients of these variables on outcome variable.

However, there are a few things worth mentioning about statistically insignificant variables. Firstly, attendance during live teaching sessions has an external restriction imposed on it. Students are mandated to attend classes if they will have visa issues, the distribution of the attendance variable is skewed towards maintaining the requirement. Therefore, all students will have at least the minimum attendance. Those that have high marks and low marks will have high attendance (The mean attendance is 96% in our sample which is quite high and confirming the compliance of visa policy). This reduces the predictive power of attendance. So, the external restriction on attendance is confounding the results. Our insignificant results of attendance variable are contrary to studies in the past (Grabe & Christopherson, 2008; Massingham & Herrington, 2006; Stewart, Stott, & Nuttall, 2011).

Secondly, the negative coefficient on student motivation (although statistically insignificant) seems counter intuitive, as one could expect a positive association between student motivation and end-of- term performance. This could be due to the fact that these students are highly motivated (self-reported), but they may not know how to use appropriate learning strategies, hence ending up spending more time during classes. This suggests that they are doing hard work, but it does not translate into results. Classroom evidence shows that students do not always know how to use online resources effectively and efficiently. Another reason of negative coefficient for the student motivation variable could be measurement error as a result of self-reported bias, which is ubiquitous in survey data where cognitive processes, social desirability, and survey conditions can alter interviewee's responses (Bound, Brown, & Mathiowetz, 2001).

Turning to statistically significant coefficients, the coefficient on formative assessment score represents the mean increase of total marks obtained in the economics module for every additional one mark in the formative score, keeping all other factors constant. This implies that if the formative assessment score increases by 1, the average total marks in the economics subject increases by 0.42. Similarly, the coefficient on use of online discussion boards has a positive value means that a student increase in use of weekly discussion boards will increase student marks in the economics by 0.52, keeping all other factors constant. Our results corroborate previous findings (Appleton et al., 2008; Fredricks and McColskey, 2012).

6. Conclusions and Policy Implications

The current study was conducted to fill a gap in existing literature on student engagement and performance using a unique student survey data matched with administrative data. It was unique in its nature of measuring an association between student engagement and their education outcome in England in the Sheffield International College setting. Multiple regression analysis was conducted to investigate the relationship between student engagement and their end of term performance. The findings show a positive and significant relationship between online engagement (performance in formative assessments and use of discussion board) and performance (end-of -term score). To sum up, this study also provides useful insights by informing as to what works best for students regarding their engagement.

These results have several implications. With the efficient and effective use of online discussion boards, student engagement can be enhanced and that increases the student education outcomes. This has obvious implications for HE, contributing to local, institution and sector-wide debate on student engagement and performance. This policy is easy to follow as almost all universities are using VLE for learning and teaching and using online discussion boards has no extra cost for education providers. Another implication is that educators can use formative assessments as a tool effectively to increase student engagement, leading to a positive effect on student performance. However, these call for further insights that a careful and thorough design of formative assessments is needed. It is also important while designing the formative assessment, to make sure that planning goes into developing a clear link between formative and summative assessments so that the results from formative assessment can be translated to summative assessments. The findings of the paper show a positive and significant relationship between online engagement (performance in formative assessments and use of discussion board) and performance (end-of-term score). This study also provides useful insights by informing as to what works best for students regarding their engagement.

6.1. Limitations of the Study

Despite the above study presenting an evidence-informed approach of student engagement and performance, nonetheless, there are few caveats.

1. Analysis of the study is based on cross-section data (that is, data collected at one point of time)- data analysed precluded any definitive claims of causality.
2. This study does not use a modified value-added education production function, this important because it takes into account the effect of student past performance. This is very important to control the prior ability of students in the previous term as it captures the effect of previous

knowledge and understanding gained through prior studies/work experience, it is also an indicator of prior achievements that students bring into the classroom.

3. It is possible that high performing students are those who have higher motivation, which is impossible to capture completely.

Future research with longitudinal methods could be used to address the issue of causality. Further, we would be cautious before generalising the findings to other parts of the UK, or indeed to other countries.

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Appendix 1

STUDENT QUESTIONNAIRE

1) Teaching group ______________________________

2) What is your major area of study? Business ❑ Economics ❑

3) Gender: I prefer to define myself Male ❑ Female ❑ I prefer not to say ❑

4) What are the BEST ASPECTS of how your college engages students in learning?
(You can pick more than one options but not all)

Lecture ❑

Seminars ❑

Progress tests ❑

Online discussion board ❑

In class activities ❑

Mole video/materials ❑

Or any other ________________

5) From above Question 4, Why you think they are the best (provide reason/justification)

____

6) What could be done to IMPROVE how your college engages students?

____

____

7) How excited are you about going to your classes?

Always Usually

❑ ❑ ❑ ❑ ❑

8) How often do you get so focused on activities in your classes that you lose track of time?

Always Usually

❑ ❑ ❑ ❑ ❑

9) In your classes, how eager are you to participate?

Always Usually

❑ ❑ ❑ ❑ ❑

10) Which aspects of class have you found most engaging?

____

11) Which aspects of class have you found least engaging?

12) If you were teaching class, what is the one thing you would do to make it more engaging for all students?

13) How do you know when you are feeling engaged in class?

14) What projects/assignments/activities do you find most engaging in this class?

15) What does this teacher do to make this class engaging?

16) Any other comments

Appendix 2

Table 3. Operational definition of variables and descriptive summary

Definition of Variables used in present study	Variables	Observations	Mean	Standard deviation	Min	Max
Dependent variable 1						
End-of-term student performance measured as marks obtained in summative assessment of Economics course	Student performance	172	67.42	14.22	0	91
Independent variables						
Gender dummy variable 1= Male 2= Female	Gender	172	1.47	0.50	1	2
Indicators of engagement						
Engagement 1: Attendance in live teaching sessions (including lectures and seminars)	Attendance in live teaching sessions	172	96.40	13.76	0	100
Engagement 2: Score in formative assessment (online class test)	Formative assessment score	172	73.92	15.62	10	99
Engagement 3: Student use of online discussion board during the term	Use of Online discussion board	172	6.19	4.19	0	11
Engagement 4: Student self-perceptions	Student motivation	172	2.49	1.07	1	4
Sample Size	N		172			

Table 4. Regression Analysis: Determinants of Performance
Dependent variable is student score (Total marks obtained in Economics module)

Variables	Coefficients	Robust Standard Errors in parenthesis	t value	p-value
Gender	0.41	(1.82)	0.23	0.82
Attendance in live teaching sessions	0.03	(0.052)	0.61	0.54
Formative assessment score	0.42***	(0.099)	4.29	0.000
Use of Online discussion board	0.52***	(0.220)	2.35	0.020
Student motivation	-1.01	0.830	-1.22	0.224
Constant	31.607			
N	172			
R^2	0.27			
F-value	6.63			
Prob >F	0.000			

Notes: *** p<0.01, ** p<0.05, * p<0.1. (.) report robust standard errors

An experience of applying active learning to large classes

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Abstract
We share our experience of applying some of the active learning techniques typically used in small classes, to a large class across 2 semesters (174 and 165 students respectively) in a traditional lecture hall setting. While some of the techniques require institution-level support thus limited in what an individual lecturer can instrument in large classes, there are ones that can be readily applied and still be effective without considerable cost in running them. In particular, increased use of questions and answers throughout the lectures for sustained engagement and weekly reflection journal keeping by students as an additional, individualised feedback channel worked well despite the size of the classes. Pedagogical techniques well-advocated in the active learning community that are also cost-effective in large classes in enhancing engagement and learning will be a useful venue for further investigation especially if they do not require major restructuring of the institute's pedagogy infrastructure.

Keywords: *Active learning; large class; use of questions; reflection journal; learning log*

1. Introduction

A typical form factor in an active learning class is to chop up the lecture session into a number of "activities" and small groups of students participate in these activities while the lecturer visits each group to guide the activities. Such in-class activities greatly help students engage and be involved during class. One crucial assumption of this form factor is that the class has a small number of students.

In Singapore University of Technology and Design (SUTD), a nationally-funded university with active learning as its primary pedagogical stance, the class sizes are kept small (maximum 45-50 students) and newly-recruited lecturers are trained and practice various active learning tools and techniques for almost all of its curriculums from theoretical subjects such as mathematics, to practical and application-oriented subjects such as computer programming and natural language processing. This paper shares one of the co-author's experiences in training and practicing the active learning in SUTD and especially how, upon joining later a different institute (Dublin City University (DCU), Ireland) with more traditional pedagogical setup, his attempts worked out at implementing various active learning techniques to much larger class sizes (around 150-180).

2. Description of Context: Training in Active Learning

Established in 2009 as a national university in Singapore, SUTD was from the start having a focus on producing the graduates who are pro-active, articulate in expressing their thoughts, willing to try new without the fear of failure, and being hands-on with design thinking[1]. Their primary pedagogy to implement this was an active learning mandated for the entire duration of undergraduate programmes. Newly-recruited lecturers received a series of training in active learning, including seminar series where experienced professors in active learning demonstrated various practicalities of running such courses, a semester-long active learning workshop run by Teaching+Learning Lab at MIT, and visits to exemplary active-learning institutes such as Olin College (Massachusetts, USA). In addition, by being involved in actual creation and delivery of heavily active learning courses within SUTD with close consultation with experienced professors in active learning, the new lecturers got intensive hands-on experience. One of the co-authors was among the first batch of lecturers who went through it (see his experiences during this period teaching calculus (Tsai et al., 2013), programming (Yoong et al., 2015) and interaction design (Lee, 2015) all heavily active learning courses created and ran for a number of years).

While the physical campus infrastructure was designed to maximally support the pedagogy (small classrooms with rollable desks/chairs allowing easy reforming of small groups during class, 7 ceiling-mounted projectors on all sides of all classrooms allowing mini collaborative activities, etc.), and its timetable and lecturer assignment was designed to support multiple within-class activities in each session where 2-3 lecturers co-teach within classroom[2].

Joining a different university (DCU) afterwards with a more conventional pedagogy and traditional classroom settings, the author tried to apply active learning as trained and practiced from SUTD. Major challenges faced in this process include:

- *Large class size* – mandatory courses are attended by all students in the department, resulting in 100 – 200 students in a class;
- *Short class hours* – typical course has two separate 1-hour sessions per week (5 ECTS equivalent), leaving little room for running activities during a session;
- *Lecture hall configuration* – to accommodate a large number of students, sessions are in large lecture halls with forward-facing desks and chairs fixed on the floor, making it difficult for group engagement or moving around.

Table 1 summarises some major tools/techniques practiced in SUTD (middle column) and which of these were tried in DCU by the author (3rd column).

1 Design thinking is often characterised by an iterative refinement approach in formulating the ideas and actions, quickly moving onto tentative solution space even when there is no sufficient information or clues in the problem space but gaining new knowledge through these iterations. This contrasts with scientific/engineering approach where full understanding of problem space precedes any further steps into finding the solution.

2 This means there are many lecturers involved in running one such course. There is usually a weekly coordination meeting among all lectures involved in, to ensure that all classrooms will cover the same materials and activities.

Table 1. Active learning methods and tools used and applying them to a large class (√: applied).

	Active learning tools practiced in SUTD	Tools applied to large classes in DCU
Infrastructure	Re-configurable classroom	
	Small class size	
	Long class hours	
Session structure	Pre-class reading	√
	Chopping up lecture hour(s)	√
	Incorporating activities during session	√
Feedback channel	Studio session (small group discussion)	
	Q&A throughout class	**√**
	Weekly journal	**√**
	In-class poll for nimble adjustment	√

As can be seen, it was not possible to apply infrastructural elements; neither was studio sessions in which the lecturer visits each group and discusses their progress in class while other groups continue their project work, due to the large class size.

3. Literature Review

The significance of student engagement in higher education classes for effective learning has been well recognised, shown in many pedagogy studies both face-to-face (e.g., Kahu (2013), Kahn (2014), Quaye et al. (2019)) and online (e.g. Meyer (2014) and Paulsen and McCormick (2020)) as well as national-level surveys focusing on student engagement (e.g. annual Irish Survey on Student Engagement by Higher Education Authority (HEA, (2023)). Active learning community suggests various methods to increase student engagement during the class hours, its pedagogical tools and techniques applied and experimented in higher education (e.g. see a review Bernstein (2018)) and detailed analyses of active learning studies becoming more available today (e.g. see Nguyen et al. (2021)). Pedagogical concerns and strategies for higher education large classes include, among many others, principles for teaching in large online class that involve active learning techniques (Hornsby, 2020), use of online self-test tools for formative assessment in large classes (Ward, 2022), and use of card-based quiz in a large class as an alternative to clicker devices often used in active learning (Chanialidis, 2019). Effectiveness of active learning tools in large classrooms has also been studied (e.g. see Barak et al. (2006), Walker et al. (2008), Smith and Cardaciotto (2011), Carloye (2017)). Efforts in finding suitable pedagogical tools in large classrooms also show a number of active learning strategies, including asking more questions, maintaining Q&A forums and providing short feedback mechanisms (McDonagh and Radaković, 2022). Identifying those active learning tools and techniques that scale in larger classrooms without requiring extensive infrastructural or institutional support will be a useful angle which we address in this paper.

4. Methodology/Data: Applying Active Learning in the New Context

The classes reporting here are a 12-week mandatory user-interface design course for 3rd year undergraduate computing students in DCU in autumn 2021 (174 students) and then repeated in autumn 2022 (165 students). Among the active-learning methods applied, in this paper we focus on two feedback mechanisms (*Q&A throughout the class* and *weekly journal*) as these were most scalable explained below.

4.1. Q&A throughout Class: Low-cost Engagement in Large Class

Turning the class delivery from a lengthy, monologue lecture to an engaging conversational session between lecturer and students via suitable questions and answers throughout the lecture has been a technique used in active learning to enhance engagement during class. There have been studies of positive effects of this technique in terms of engaging the students (e.g. see Byers, (2001)) and now majority of active learning guidelines include the use of interactive questions and answers during the lecture (e.g. those by King's College London[3] and Arizona State University[4]).

Throughout the sessions, the lecturer (author) asked questions and let students answer, and used their answers to continue the explanation. Majority of these Q&As were in the form of oral questions by the lecturer casually asked in the middle of concept explanations during the lecture, e.g. "… so why do you think this is the case?" or "… but could there be any simpler solution, do you think?" The lecturer paused to let some of the students (orally) answer. The lecturer then augmented or paraphrased the students' answers in order to further lead to explanations or follow-up questions. Where the nature of questions was more stand-alone and would benefit consensus from larger numbers of answers (e.g. students' level of background knowledge, the pace of lecture, etc.) a clicker tool Vevox was used, though less frequently.
By increasing the number of questions during the lecture in this way, the perceived level of engagement considerably improved, evidenced from the attention level in the class itself, as well as feedback from students (names are modified):

> "The lecture was very informative and very interactive" (Louise, week 1 journal, 2021)
>
> "I loved how engaging the class was" (Mark, week 2 journal, 2021)
>
> "I'm glad that we were encouraged to question…" (Dawn, week 5 journal, 2021)
>
> "A very engaging lecture, I learned a lot" (Alina, week 6 journal, 2021)
>
> "Greater understanding of the course, due to the interactive lecture…" (Cian, week 7 journal, 2021)
>
> "…delivered in such an interesting and engaging way" (Grainne, week 9 journal, 2021)
>
> "It is amazing how the lecturer is readily available to answer any questions, and also make the class as interactive as possible by asking questions or opinions" (Oliver, week 3, journal 2022)
>
> "Great engagement in the class" (Alice, week 5, journal 2022)
>
> "…the lectures this week were very engaging!" (Muhammad, week 5, journal 2022)
>
> "Very engaging and interesting lectures this week" (Tim, week 6, journal 2022)

3 7 Ways to Engage Students in Lectures. Staff Quick Guides, King's Learning Institute, King's College London. https://www.kcl.ac.uk/study-legacy/learningteaching/learning-and-teaching-support/quickguides/kcl-qg/dl/7ways-engage-students-lectures.pdf

4 Active Learning Instructional Strategy: Pose a Question. Learning and Teaching Hub, Arizona State University. https://lth.engineering.asu.edu/2021/09/pose-a-question/

4.2. Weekly Journal: a Cost-effective Extra Feedback Channel

Students keeping weekly journal (sometimes called "reflection journal" or "learning logs"[1]) has often been practiced in SUTD as part of active learning in maximising their learning by encouraging a reflection after activities (e.g. see McCrindle (1995) and Moon (1999)), as well as for the lecturer to give timely feedback in a light-weight, personalised manner.

Weekly journal assignment was set up in the university's Learning Management System (LMS), and the students were asked to enter it by the end of each week, anything they want to write down about what they learned that week: any thoughts, feelings, questions or complaints. There were no constraints regarding the length of the entry: one or more paragraphs, one sentence, one phrase, or one word: as long as they entered anything it was a legitimate entry, since the main purpose was to encourage the students to reflect and the lecturer to get back to them as feedback. This was 5% of the course grade. The entries included simple sentiments, such as:

> "Fun lecture and very interesting." (Eve, week 8 journal, 2022)

as well as more elaborate reflections, such as:

> "I found summarising the design guidelines and principles in week 5 to be very helpful with re-enforcing the material and it helped with not forgetting to implement certain aspects of UI design into the group project… Overall I feel a lot more familiar with these after this week." (George, week 5 journal, 2022)

Also observed are entries that show how some of the other features of the course are working, e.g. all the quotes on the Q&A being engaging shown in the previous section were captured by weekly journal; or on the project feedback promptly provided so that they could use it for their next submission:

> "Grateful for feedback returned on group project. Feel like it will help us proceed forward with the next stage of the project." (Sophie, week 8 journal, 2022)

During latter part of the course, overall sentiments on the course are witnessed, well before conducting the final exit survey:

> "I don't want this module to finish, I really do like this module, learned a lot in terms of UI design principles and guidelines. I had great fun attending each of the lectures…" (Kim, week 9 journal, 2021)

> "I learned many things from this module which I will be able to use whenever I am creating my own UI. The material provided by the lecturer has been great and very helpful. This module was an overall great experience." (Rion, week 10 journal, 2022).

The lecturer read through all entries each week. All entries received at least a simple approval comment from the lecturer (e.g. "Good" or "OK") and where appropriate, more detailed feedback. Going through all entries in this way took on average 1 hour 45 minutes to 2 hours per week. The usefulness of the reflection

5 Learning Journals and Logs. Teaching & Learning Resources, University College Dublin (UCD). https://www.ucd.ie/teaching/t4media/learning_journals_logs.pdf

was often explicitly expressed by students, in verbal communications as well as from the exit survey results (anonymous):

> "I loved the weekly diaries [journal entries], they really helped me remember what we'd learned that week." (exit survey, 2021).
>
> "Weekly journals were a great idea since it is a good tool to help retain the information that was given during the lecture" (exit survey, 2021)
>
> "The journal writing after each session helps us memorize key terms and topics." (exit survey, 2021)

For the benefits of getting the overall sense of how the students are feeling and learning each week and serving as an additional personalised channel for feedback to the students, the extra 2 hours required to review 160+ journal entries each week were a worthwhile investment.

5. Reflection and Implications

While it seems difficult to make a large class engaging (and it is, in many practical ways), applying some of the well-practiced active learning methods in a relatively large class shows that they still work effectively. Using Q&A as a way of explaining the new concepts in a large class can end up doing dialogues with only a few, same students who always answer, with the rest of the class "hidden in the crowd". In SUTD, having a small number of students often meant the lecture remembered the majority of the students by their names. Asking questions by calling names of different students works well when the students know that the lecturer shows respect to the answering student and would not ridicule if the student did not know the answer or answered incorrectly. In a large class, the use of a classlist to randomly call a student to ask a question may be a good strategy although there will be cases where the called student is not present in the class. Some students in our class proposed a final-year project to develop an app that logs the attendance in real-time in each session for the lecturer to use to randomly pick a student's name among the currently-attending students.

Facilitating a weekly reflection journal is a light-weight way of reaching to individual students, instead of resorting only to group-level output/feedback as typically happens in large classes. It does require some amount of discipline on the side of the lecturer for having to go through the written entries each week, but the benefits shown above outweigh the drawbacks, especially since it is readily implementable without requiring additional infrastructural or extra university-level support.

Last year, DCU set up an internal working group across departments to implement a set of pedagogical guidelines to enable a more innovative collaborative engagement with student peers and lecturers in order to produce the graduates more ready for solving real-world challenges using the knowledge and skills learned. An important part of this pedagogical upgrade will be to respond to the recurring question of how to engage the students more in large classes. First step for DCU as well as for other higher education large classes may be to identify versatile tools available in active learning community, then customise and tailor some of the proven methods to best support the large classes.

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Reflections on the Hackathon experience

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Abstract
Experiential group-based workshops can be complex when they are run to scale. Though educators may ask students for feedback, this information can often be problematic to interpret from a large group. In this paper, we discuss the delivery of a University innovation hackathon, and the resulting student feedback. Hackathons are intended to be engaging, filled with expert and peer interaction, and geared to challenge student assumptions about innovation. As such, it is important to get a broad sense of student thoughts and feelings about the experience, to guide future iterations. We consider the simple ways that educators can interpret meaning from qualitative feedback in a large class context. This will be meaningful for those interested in hackathon development, and also those interested in large class pedagogies.

Keywords: *Hackathon; experiential learning; challenge based learning, group work; student feedback; large classes*

1. Introduction

Currently, there is limited empirical evidence about the efficacy of hackathons on university students or on many important concepts relating to competency development or learning (Angarita and Nolte, 2020). As such, more scholars and educators are interested in conducting exploratory research to understand and evaluate them (Heller et al., 2023). Oftentimes, it can be challenging to glean a full understanding of the effectiveness of an educational activity, due to small class sizes (Piercy et al., 2012). When student numbers are limited, researchers often opt for qualitative methodologies such as focus groups and interviews. In large class contexts, surveys are the most common method of analysis, however admittedly some of the nuance of the research may be lost in this format, and organic student ideas or novel opinions have limited voice. Even when students are asked open-ended or opinion questions within survey feedback rounds, it can be a challenge to comb through these. When an educator is interested in the student feedback in a more holistic manner but does not have the capacity for a full data screening and interpretative process, there are few options. In this practical paper, we provide an overview of a scaled hackathon and the simple methods used to attain some initial meaning from our many student opinions collected.

2. Teaching and Learning Context

The DCU Hack4Change Social Innovation Series has run since 2019 for over 600 first year Business students in Dublin City University, Ireland. The hackathon was developed as part of the social innovation/enterprise portion of a yearlong Learning Innovation for Enterprise (LIFE) module, and is an annual timetabled event. The purpose of the series was to allow students to learn more about key social issues, develop empathy for those who experience them, and to apply innovative thinking skills in devising solutions. Student engagement during the event and their post-event reflective essay forms the grading component for the hackathon.

For the purposes of this paper, we focus on the 2022 hackathon where = Sustainable Development was the overarching theme. Based on their chosen topic, students developed Problem Definition Statements before their hackathon session, focusing on what the outcomes and impacts of their chosen problem are, and what their point of innovation might be, given existing solutions.

Academic and practicing specialists provided expert insight into the theme and the wider topic of social innovation, delivering keynote and 'lightning' talks, providing mentoring to student teams, and offering feedback at visual pitch development sessions. Between each round of engagement with the academic and industry specialists, teams worked on research and ideation, assisted by a set of informative prompts and a specially created 'HackImpact' canvas, which divided their concept journey into three main sections: Problem, Solution and Validation, to facilitate team decision making. For the final activity, students were asked to post their problems and solutions in visually compelling Instagram posts to receive some further feedback from peers, and were awarded prizes according to their fulfilment of the brief.

More than 650 students took part in the Hack4Change series. Each day, the event welcomed over 200 student participants, who were supported throughout the day by 20-25 subject specialists from across DCU and industry. In addition, 15 postgraduate business students assisted with the logistics and execution of the event, for which they also received academic credits in a respective event management module. Students devised innovative concept ideas such as football jersey upcycling, an appliance repair education service to reduce overconsumption caused by designing for obsolescence, and much more. While a considerable undertaking for the teaching staff, all agreed that witnessing the student reactions and engagement made it wholly worthwhile.

Coinciding with the annual hackathon series, a research panel involved in the delivery of the module and related subjects are involved in data collection pertaining to the efficacy of hackathons. The research is intended to extend our knowledge about the efficacy of hackathons as a pedagogical tool and provide robust feedback to develop these further from multiple stakeholders (students, staff, industry). Each year, attending students are asked to undertake a post-event survey which includes questions pertaining to the event itself, personal self-efficacy and career intentionality items, and a number of other scale measures (perceived creativity, climate change anxiety etc.). The dataset (which has an approximate 1500 responses to date) forms part of an extensive educational research study on the effectiveness of hackathons on student perceptions. In addition to the numerous quantitative items in the survey, there are a limited number of open-ended questions about the specific event attended, namely: 1: "Please suggest ways that we can improve a Hackathon like this in future", and 2: "Any final comments? Anything else you wish to share about your hackathon experience?". While it would be beneficial to include more robust qualitative prompts, it is understood that students tend to disengage easily when filling cumbersome surveys. In addition, the capacity to engage in rigorous qualitative or thematic analyses (using Nvivo or similar) is limited within the research team.

3. Literature Review

Social innovation refers to the creation of new ideas displaying a positive impact on the quality and/ or quantity of life (Pol and Ville, 2009, p.884). It considers the development of novel products, services or processes which are driven by the social needs of its intended audience rather than profit-seeking. Increasingly, socially motivated business practices are being integrated into the fabric of many business courses and schools (Kanashiro, Rands, and Starik, 2020), as universities recognise their role in developing socially aware graduates who are informed about the consequences of climate change. Social innovation education brings together aspects pertaining to system thinking, co-creation, and sustainability (Wang et al., 2022). Its pedagogy necessitates the development of critical and systems thinking skills, empathy, and problem-solving abilities (Lyons and Bender, forthcoming).

We consider that a hackathon is an excellent vehicle for challenge-based learning in an innovation (or social innovation) module or course, particularly in large class settings where effective experiential learning is more complex to orchestrate (Hilliard, 2021). Derived from the words 'hack' and 'marathon', a hackathon is a time-bound, collaborative event which leverages design methodologies to enhance the innovative output of participating teams. It is a live event where participants commit to a problem or project in a short-form intensive working group (Čović & Manojlović, 2019). These experiential events are conceived to engage students, employees, or citizens in collaborative acts of ideation and are intended to be experiential, active, and filled with expert and peer interaction. In an educational context, they can provide the opportunity to connect with industry mentors, providing authentic learning opportunities for students using real-world challenges (Gentelli, 2015). Hackathons allow students from various disciplines the chance to work together on corporate challenges or social problems, developing their collaborative and teamworking skills. The duration of these hackathons also varies from one day, a weekend, 48-hours spread over 3 days, or for prolonged periods such as a semester (Cobham et al., 2017; Kienzler and Fontanesi, 2016). There are multiple types of hackathon, depending on the intended audience and purpose.

We consider that challenge-based learning (CBL) aligns well with the goals of social innovation education, and furthermore the format of a hackathon. CBL occurs in students via the identification, analysis, and design of a solution to a sociotechnical problem. The learning experience is typically multidisciplinary, takes place in an international context and aims to find a collaboratively developed solution, which is environmentally, socially, and economically sustainable (Malmqvist, Rådberg, and Lundqvist 2015, p.87). A number of key elements pertaining to CBL are notable for this study. Firstly, pedagogies which aim to develop CBL usually involve stakeholders from discrete domains, who work a collaborative capacity towards the co-creation of solutions (Garay-Rondero et al., 2019; Membrillo-Hernández et al., 2018). Direct industry engagement between stakeholders and students not only facilitates authentic learning but can be a conduit of engagement and assessment in large-class settings when experts from industry mentor, judge and assess student outcomes (Lyons and Buckley, 2021). Second, CBL methodologies commonly focus on urgent sustainability and social issues (Garay-Rondero et al., 2019), where the challenge being presented to the participants (students) is an authentic real-world issue. In large class settings, the participation of industry and educational experts from social enterprise and innovation during a hackathon can facilitate a more networked, distributed approach to this learning, helping students to connect with authentic stories from experts (Mantai and Huber, 2021). Thirdly, educators are primarily interested in the process of the learning experience more than output (Gallagher and Savage, 2020). The encouraging, creative, and collaborative nature of hackathons is a unique learning experience which helps to build a sense of community among students; something which can be regarded as difficult in large classes (Farrell, 2021). Lastly, there is often a technological aspect to CBL methodologies, where classroom or learning experiences are technology supported or enabled in some manner (Gallagher and Savage, 2020). Colombelli et al. (2022) found a positive and significant effect of CBL programs on the student entrepreneurial mindset and skills of financial literacy, creativity, and planning.

4. How to interpret the feedback comments

Following the 2022 event, LIFE educators were interested in attaining a general sense of the student's reaction to the event. In the quantitative survey items pertaining to feedback, it is noted that students had a mean positive significant change in their perceptions of: social issues, understanding of innovation, pitching skills etc. These will be further expanded upon in the upcoming quantitative study as previously mentioned.

To decipher the multiple opinion statements, the file was downloaded to Excel and screened for missing variables using Pivot tables (to remove any students who did not respond to the Q, or responded N, N/A or similar). Of the 468 students who responded to the 2022 survey, there were 272 responses of this nature (out of a possible 936) which accounts for 30% of the feedback comments. After a quick initial scan, it was noted that "more guest speakers" was a popular phrase – thus this term was recorded as MGS using the 'Find and Replace' function. We performed some basic COUNTIF searches for popular terms to get a sense of the quantity of responses of this nature (See Table 1). The formula used for discrete codes, and for specific terms within sentences are listed below, respectively.

=COUNTIF(CQ2:CR469, "N")

OR

=COUNTIF(the range of all your feedback data, "The code")

=SUM(LEN(CQ2:CR469)-

LEN(SUBSTITUTE(CQ2:CR469,"enjoyable","")))/LEN("enjoyable")

OR

=SUM(LEN(your range)-LEN(SUBSTITUTE(your range,"term searched","")))/LEN("term searched")

Table 1. Excel Searches

Label or Phrase searched for	Times (or rows) noted
Count "enjoyable" positive comments:	62
Count "enjoyed" time length comments:	67
Count "shorter" time length comments:	26
Countif N	272
Countif MGS	46

Next, in Excel, we decided to use conditional formatting to get an initial visualisation of the feedback statements (See Figure 1). Several terms common to useful feedback statements were formatted in the excel sheet to appear in a different colour, including the terms "less", "more", and "too". Once these were loaded, the spreadsheet was very easy to scan for suggestions, revealing key statements such as "ensure it is not one person doing the work, make more people accountable for slacking" and "have it in a bigger venue or with less students in each group". By scanning in this manner, a number of practical and useful recommendations for future events were sourced.

Next, the Excel sheet with just the feedback comments was saved as a .csv file and uploaded to a free wordcloud generator (in our case monkeylearn.com, See Figure 2). This provided a visual representation of the most common sentiment or terms used by the students, and some basic analysis. Again, while there were many facets to the hackathon experience, it was noted that the guest speakers were the most significant in terms of feedback comments, with both positive and negative recommendations.

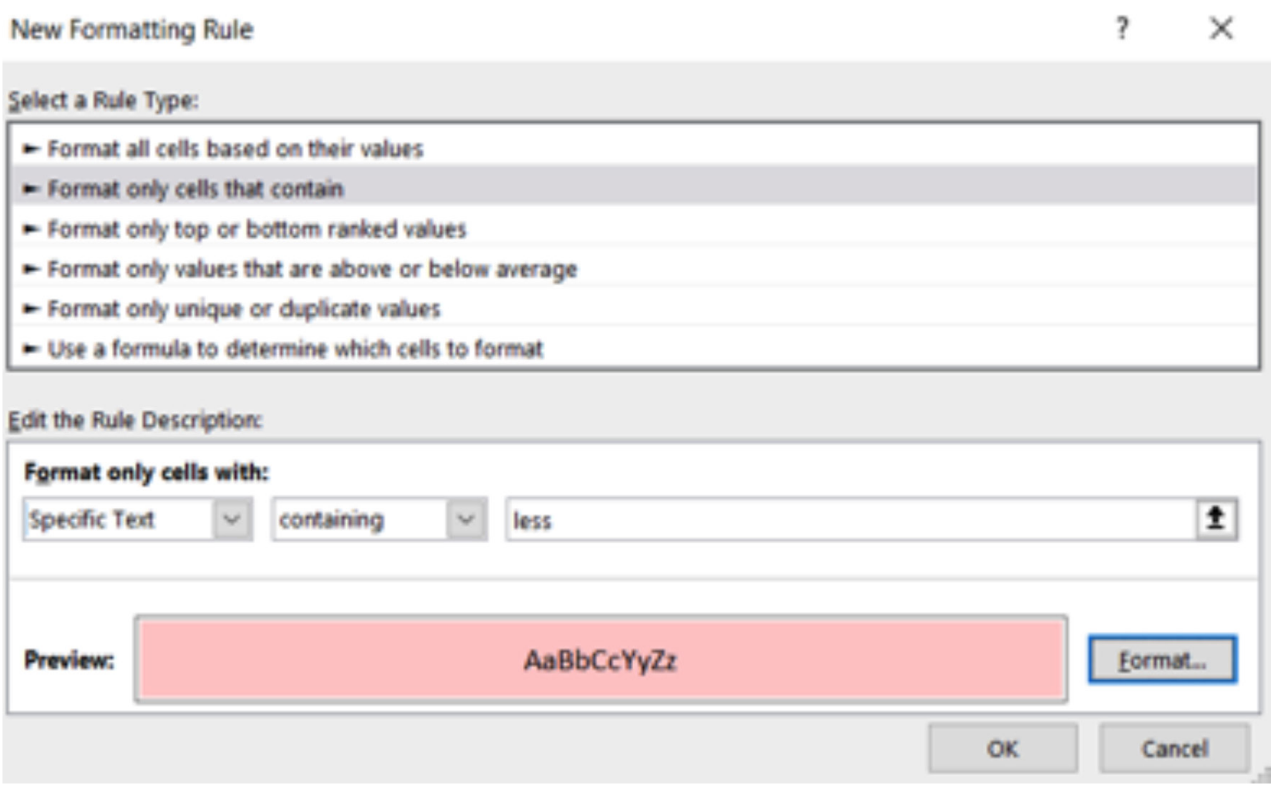

Figure 1: Conditional Formatting in Excel

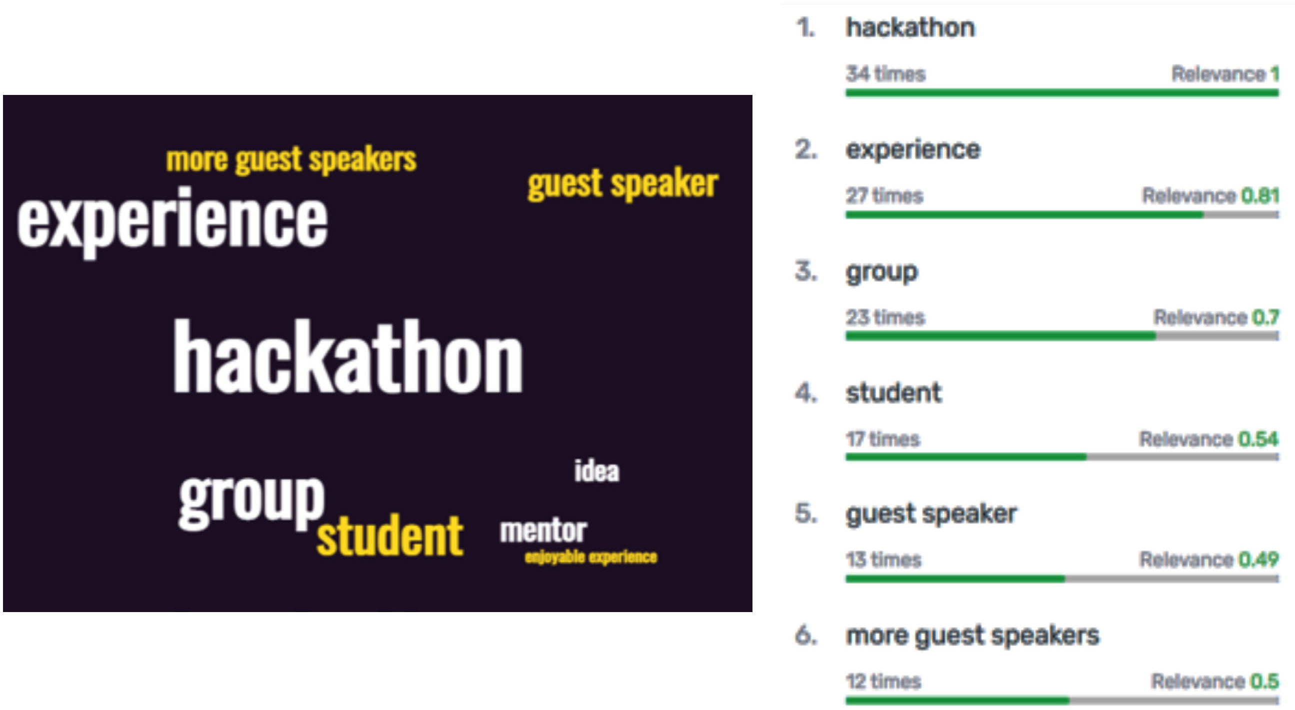

Figure 2. WordCloud results

5. Reflection on Implications for Practice

While the steps above provided a very simplistic overview of the data, it was useful. We acknowledge that there are many other (more robust) tools and methods which could be used to effectively collect and interpret student feedback. However, we believe this was a quick and useful series of steps which may be of relevance to educators in similar, large-class contexts.

For those who aim to use student feedback in a live setting, i.e., during the event or hackathon, we recommend menti.com as a fast and engaging method. This has been used within the same event and module as a prompt and voting mechanism (See Figure 3) and was found very stimulating for the group. In addition, it can be used in a large class setting to provide thanks and final questions when there is a guest speaker in attendance (See Figure 3).

Figure 3. Examples of student engagements with Menti tool

6. Conclusion

Admittedly, hackathons and large group experiential activities can be a challenge to fully embed in the curriculum, yet it is highly desirable they become part of the "next normal" university experience, particularly as we look to exploit the potential of new digital technologies. In the best traditions of the hackathon concept, there is an opportunity to hack the traditional higher education model to help develop more creative students, enterprising mind-sets, and future work-ready graduates for tomorrow's world, today. Large classes provide a high diversity of student ideas during hackathons and therefore vast potential for novel learning experiences and innovative outcomes (Garcia, 2023). However, it is imperative that hackathons and other novel learning methodologies be studied in many ways for their effects on students in small and large class settings, and to iterate the curricular offerings. This paper presents an ad hoc method of scanning large amounts of qualitative survey feedback in a simple, but practical manner, helping to navigate some typical constraints of large-class teaching and assessment. It is hoped that methods like these will provide quick, initial recommendations to educators of large classes, to precede larger, more comprehensive evaluations.

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Enhancing student engagement in large classes by integrating principles of universal design for learning in a disability studies in education short course at the University of Cape Town

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Abstract

Although promoting inclusive education for all learners has received significant attention internationally, research about learners' engagement in a large class through integration of the Universal Design for Learning (UDL) is minimal. The aim of this article is to explore ways to enhance student engagement in large classes which are foregrounded to inclusive teaching and learning in a short course run at the Division of Disability Studies at the University of Cape Town (UCT). A qualitative method was employed for two focus group discussions among learners and tutors. Findings show the strength and weaknesses of the course, technology as a tool for UDL and the value of adding a practical aspect of the course. It was concluded that though there was evidence of the application of the UDL principles which enhanced student engagement, further development of the UDL principle was recommended.

Keywords: *Disability Studies in Education; higher education; large classes; online learning; student engagement; Universal Design for Learning*

1. Introduction

The University of Cape Town (UCT) has been challenged to change ways in which it engages with and responds to students partly because of the student protests (#Rhodes Must Fall and #Fees Must Fall movements) and the impact of the COVID-19 pandemic (Pillay & Kathard, 2015) on teaching and learning. The student movements have highlighted the need for greater educational equity and inclusion, while the pandemic has necessitated the rethinking of traditional in-person pedagogies in relation to digital learning and teaching methods. While UCT remains a contact university, its Vision 2030 states that the traditional residential experience at the university must be combined with elements of blended and online learning to ensure student success including management of large class sizes. This requires the development and enhancement of inclusive and accessible digital learning infrastructure that promotes equity of access, participation, and success. The goal of this article is to describe and evaluate instructional strategies that promote student engagement in large classes and identify easy ways to further implement the principles of UDL that specifically address student engagement.

2. Literature Review

2.1 Inclusive education

Internationally, inclusive education has focused broadly on equitable access to education for students who have been historically excluded, whereas in the United States, it has been focused more narrowly on access to general education curriculum and settings for students with disabilities (Waitoller & Artiles, 2013). Research consistently recommends inclusive education as a best practice for all students (e.g., Baglieri et al., 2011; Ferguson et al., 2019).

In South Africa, the concept of inclusive education has been embraced by the government and there is ample evidence of various white papers, policies, and codes of good practice. For example, in 2001 the Department of Education (DoE) introduced *Education White Paper 6* on Special Needs Education; in 2009 the Department of Social Development published their *Policy on Disability*; in 2015 the Department of Labour produced the *Code of Good Practice on Employment of Persons with Disabilities*; and in 2018 the Department of Higher Education and Training (DHET) produced the *Strategic Policy Framework on Disability for the Post School Education and Training System.*

What is less well understood is how these policies and codes of good practice are being implemented in context. In higher education specifically, it is unclear whether decisions about inclusive education are determined by individual student requirements for specially designed instruction in more restrictive settings, or whether other factors such as large class size, limited resources, staff training, and teacher competencies to tailor appropriate supports influence these decisions (Taylor et al., 2020).

One strategy that may assist lecturers in universities to better implement the aspirations of these policies and codes of good practice, is to apply the principles in Universal Design for Learning.

2.2 Universal Design for Learning

Universal Design for Learning (UDL) is an approach to designing education that incorporates flexibility in how information is presented, how students are supported in expressing their developing knowledge and skills, and how students are engaged in the learning environment (Centre for Applied Special Technology [CAST], 2023). The aim of UDL is to enable students to become more self-directed and expert learners through strategic instructional planning that recognizes and provides for their diverse learning needs. According to Dalton et al. (2019), what distinguishes UDL from differentiated instruction, and other such frameworks is that the planning for learning diversity occurs at the beginning of course design. In this way, existing and potential barriers in the curriculum are identified and mitigated at the outset, while high achievement expectations for all students are enhanced and maintained. This means, a good teacher-learner relationship could be enhanced through UDL. For example, Farrell (2021) posits that good relationships among students creates avenues of engagement which energises the teaching-learning dynamic in the large classroom situation. Fovet (2020) argues that UDL is more urgently required in the large classroom than in other teaching spaces because the inherent demographics of large lectures mean that inclusion needs to be a priority and that solutions must be systematic and effective.

Applying the UDL principles, which have roots in cognitive neuroscience (Rose & Meyer, 2002), is intended to lead to practices where instructors offer students multiple means of representation, engagement, and action and expression:

- Multiple means of representation: For resourceful, knowledgeable learners, present information, and content in different ways. Multiple forms of accessibly designed media are used to communicate course materials.
- Multiple means of engagement: For purposeful, motivated learners, stimulate interest and motivation for learning. In a course, multiple examples broaden the relevance to a diverse student group.
- Multiple means of action and expression: For strategic, goal-directed learners, differentiate the ways that students can express what they know. An assigned course project optimises individual choice and autonomy (Burgstahler et.al, 2021, p. 7).

These principles, which were originally developed for supporting learners with disabilities, are now recognised as important in enhancing and enabling an equal opportunity to learn for all learners (Dalton et al., 2019; UNESCO, 2020). They have also been widely, but unevenly adopted in higher education (e.g. The INCLUDE Collaboratory[1]) where it is recognised that UDL is a practice aimed at the development of all learners, irrespective of whether they face barriers to learning (Burgstahler, 2021) and endeavours to make learning and teaching accessible to the greatest possible range of diversity, rather than catering for the non-existent 'average learner' (Baglieri et al., 2011). The proponents of UDL recognise that everyone learns differently and UDL has been promoted as an instructional strategy that can address systemic inequality and discrimination, which may arise from an intersectionality of a diverse range of disadvantages (e.g., racial inequality, gender discrimination, cultural insensitivity, socio-economic barriers, disability) (Rose & Meyer, 2002). The DSE (Disability Studies in Education) short course was not only designed with reference to the UDL framework, but the course content is also centred around it.

Even though UDL is viewed as one approach that can help create more student-centred, responsive curricula which can cater for diversity in the learning community, there can be considerable challenges to its implementation. One challenge is the application of UDL in large classes and mode of assessment. For instance, Karisa (2022) highlighted ideological and systemic challenges that might work against the flexibility envisaged by UDL, such as the focus on standardization of assessments, including the mode of assessment, in contemporary public education systems. The university education system in South Africa is influenced by such standardization expectations, which might leave little space for the flexibility promised by UDL. One way to more easily build in the flexibility and responsiveness envisaged by UDL creators is to focus on student engagement.

3. Methodology

This article is carved from an evaluation study of the 2021 DSE short course cohort at UCT. The qualitative evaluation study used focus group discussion (FGDs) as the main source of data generation. The FGD was

1 https://include.wp.worc.ac.uk/about-include/

in two streams: (1) among five tutors; and (2) with three students. The duration of each of the FGDs was approximately one and a half hours and were guided by open-ended questions. The FGD schedule yielded qualitative data which addressed aspects of course design, engagement, and assessment.
The data from the FGDs was analysed thematically using the six steps advocated by Braun and Clarke (2017) using *Dedoose* for the analysis. The intention is that data from this study will be used for refinement of the DSE short course for subsequent iterations.

4. Description of the Teaching and Learning Context

4.1 Description of the short course

The DSE short course is situated in the Faculty of Health Sciences at UCT. The aim of the short course is to equip participants with the necessary knowledge, skills, and tools to enable them to support learners with disabilities.

We define a short course as a non-credit bearing course aimed at working professionals. The short course has been adapted over the past two years and cohorts have increased from 70 to 200 participants. The high number of 200 students in a cohort emphasised the need to develop UDL as a teaching pedagogy to manage large classes (Fovet, 2020). The first cohort in 2021 attracted students who were training to be Early Childhood Development practitioners, international community-based inclusive development practitioners, and educators. The subsequent cohorts ranged from participants in education, health profession sector and participants providing education and caregiving services for learners requiring support.

The course planning was informed by considerations of accessibility and inclusion. Since the topic of the course was inclusive education, we made every attempt to model an inclusive ethos and practice in our teaching. A central theme of the course was UDL, and here we had to not only teach, but also model UDL. The recognition that education is an issue of social justice was embedded in our discussions of human rights, disability rights, and the need for an intersectoral perspective on inclusion (Nseibo et al., 2023). The teaching and learning strategies using UDL to manage large classes include breaking down of the large classes into smaller cohorts, further reduction of students to smaller tutorial groups (see Figure 1), cooperative learning, group work, working in pairs and others. The next section discusses the course structure and layout and how we integrated the UDL principles in the course.

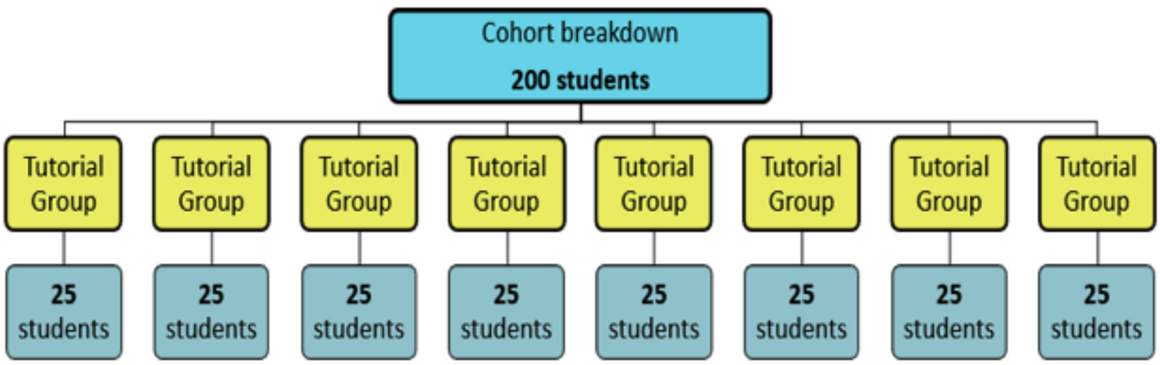

Figure 1: Cohort breakdown into smaller tutorial groups

4.2 Course structure and layout

The DSE short course was delivered in a hybrid model, utilising synchronous meetings on Zoom and asynchronous content on the digital learning platform. As seen in Figure 1, the course ran for seven weeks, with each week covering a specific topic.

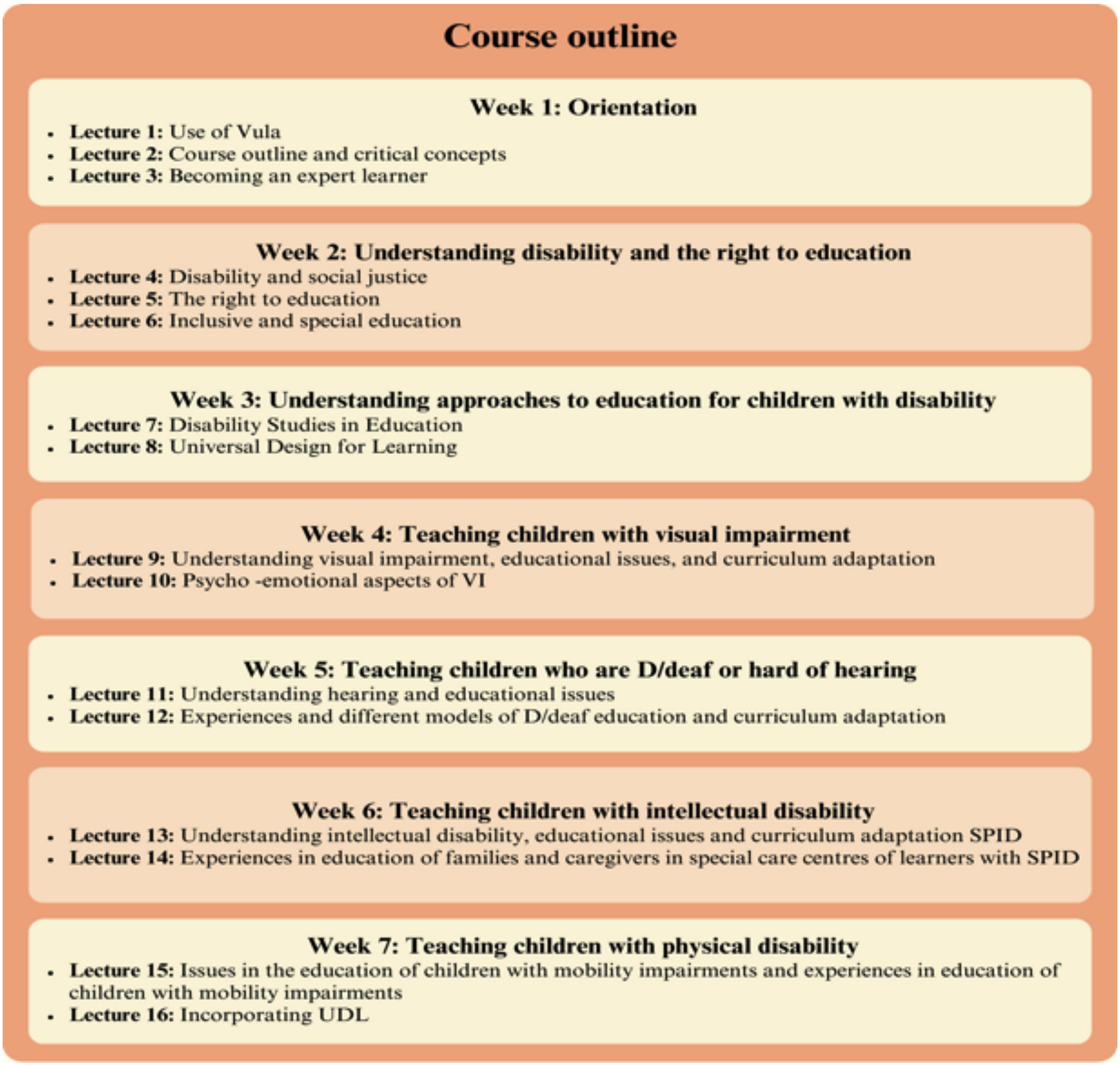

Figure 2: Course layout

Each weekly component of the course included two to three recorded lectures, a weekly online synchronous discussion, a synchronous tutorial meeting, and an online activity (Figure 3).

Key Information

Use the information below to help you manage your workload for this week:

Recommended week dates	27 April - 3 May
Estimated time to complete	10 hours
Week outline	• Lecture 7: Disability and social justice • Lecture 8: The right to education • Online Discussion (Friday) • Tutorial (Monday) • Online Activity (due Tuesday)

Figure 3: Week outline

The synchronous online discussion provided students with a real-time opportunity to engage with the course material. Additionally, the weekly synchronous tutorials allowed for personalised support. Asynchronous activities were incorporated to cater to the diverse needs and preferences of students, as well as to encourage engagement. These activities included watching recorded lecture videos at their own pace, enabling students to revisit the content as needed. Students were also required to provide comments on the weekly content, fostering critical thinking. Also, they were expected to submit reflections in the comment section, allowing for self-assessment. Students were assigned a weekly online activity to consolidate knowledge comprehension. These formal submissions took place in forums, providing a platform for collaborative learning. The course assessment took place at the end of the seven weeks, in the form of a written and oral assignment, requiring students to demonstrate the contextual application of their newly obtained knowledge. Overall, the course layout combined synchronous and asynchronous elements to create an inclusive learning experience to develop "expert learners who are purposeful and motivated, resourceful and knowledgeable and strategic and goal-directed" (CAST, 2017). Examples of how the principles of the UDL framework was applied on the digital platform for this course follow.

4.3 Integrating the principles of UDL in the course

To optimise student engagement, deliberate strategies were adopted across multiple means of representation, multiple means of action and expressions and multiple means of engagement as they all play a role, to a greater or lesser degree, in the overall student experience and how comfortable they are to participate meaningfully in the course. The following sections illustrate how student engagement was encouraged in the course.

Multiple means of representation

Lecturers and presenters focused on the accessibility of available teaching and learning resources bearing in mind the type of impairments students may have in the class (Nseibo et al., 2022). We found that it became important to offer not just one source, but sources of varying degrees of complexity, level of language, and theoretical density in the large class scenario. As Fovet (2018) suggests, we also found that we need to offer and support multiple pathways into the materials for all diverse students, including those with disabilities in the large classes.

Figures 4 and 5 highlight three specific examples of the implementation of the UDL principle, providing multiple means of representation.

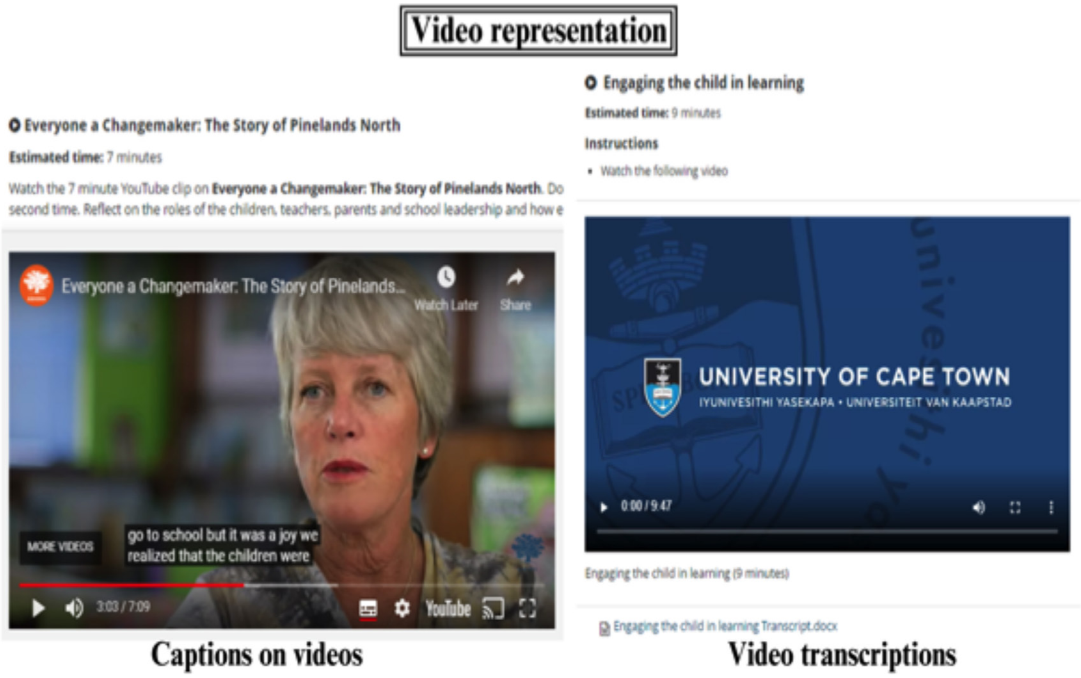

Figure 4: Providing multiple means of representation with video

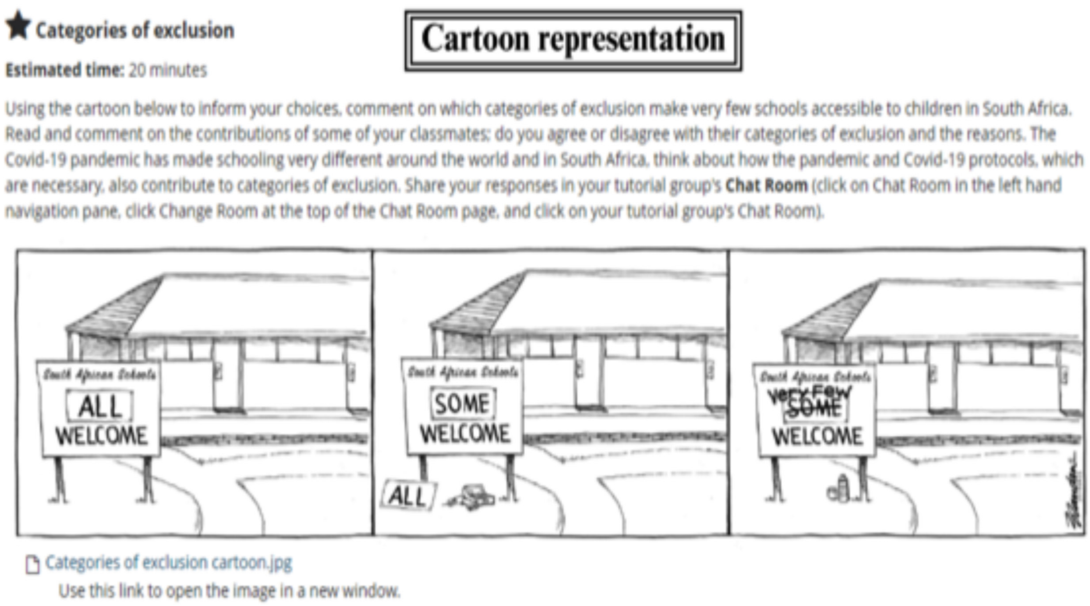

Figure 5: Providing multiple means of representation with cartoons

To cater to different learning preferences and accommodate individuals with hearing impairments, video captions have been included. These captions enhance understanding by providing a text-based representation of the audio content (Checkpoint 1.1).

We also offered a cartoon option (Figure 4) an alternative to traditional readings or videos. This visual representation appeals to learners who prefer graphical formats and provides an engaging way to access course content (Checkpoint 1.2).

Transcripts of the videos were made available, allowing students to review the content at their own pace or refer to the text version for better comprehension (Checkpoint 1.3). This supports learners who prefer reading or need additional linguistic support and tutors were assigned to a small group to make the large class more intimate.

Multiple means of action and expression

"Integrating action and expression as UDL principle supports instructors as they reshape delivery to give increasing space and freedom to develop an identity as creator of content" (Fovet, 2020, p. 165). Different means of action and expression were exhibited by the incorporation of a variety of assessment methods, and options for students to demonstrate their knowledge and skills via written assessment, online activities, and oral presentations. The tutoring component was very helpful in supporting students on how to use the various digital platforms in smaller groups.

In line with the UDL principle of providing multiple means of action and expression, we have created an inclusive learning environment that enables students to express themselves through various media, utilise different tools for communication, and receive the necessary support to enhance their skills and performance.

Students had access to multiple means of communication, including platforms such as *Zoom* and *MS Teams*. Additionally, students utilised collaborative tools such as discussion forums, group discussions, chat rooms, Padlet boards, and comment sections within the digital platform (Checkpoint 4.1; Checkpoint 5.2).

Figures 6 and 7 provide examples of how this principle is applied, to create diverse pathways for students to navigate the course, express their knowledge, and optimise their learning experience.

Learning Outcomes

Guidance for goal setting

After completing this week, you will be able to:

- Explore experiences of childhood disability in families.
- Describe an ecosystemic model of inclusive education.
- Explore inclusion and exclusion as connected processes in a mainstream school on its journey to becoming an inclusive school.
- Identify the role of the children, teachers, parents, school leadership and the broader community in the process of creating an inclusive school.
- Reflect on experiences of children who are D/deaf and Hard of hearing in an empathetic way.
- Explore the perspectives of the Deaf community including around terminology and the role that they play in education of learners who are D/deaf and hard of hearing.
- Examine the effect of severe to profound hearing impairment on the deaf children in the classroom.
- Identify barriers to learning experienced by learners who are D/deaf or hard of hearing.
- Apply teaching strategies for inclusive learning in their own educational context for learners who are D/deaf or hard of hearing.
- Explain the importance of human rights and legal issues for learners who are D/deaf and hard of hearing.

Figure 6: Providing multiple means of action and expression with learning outcomes

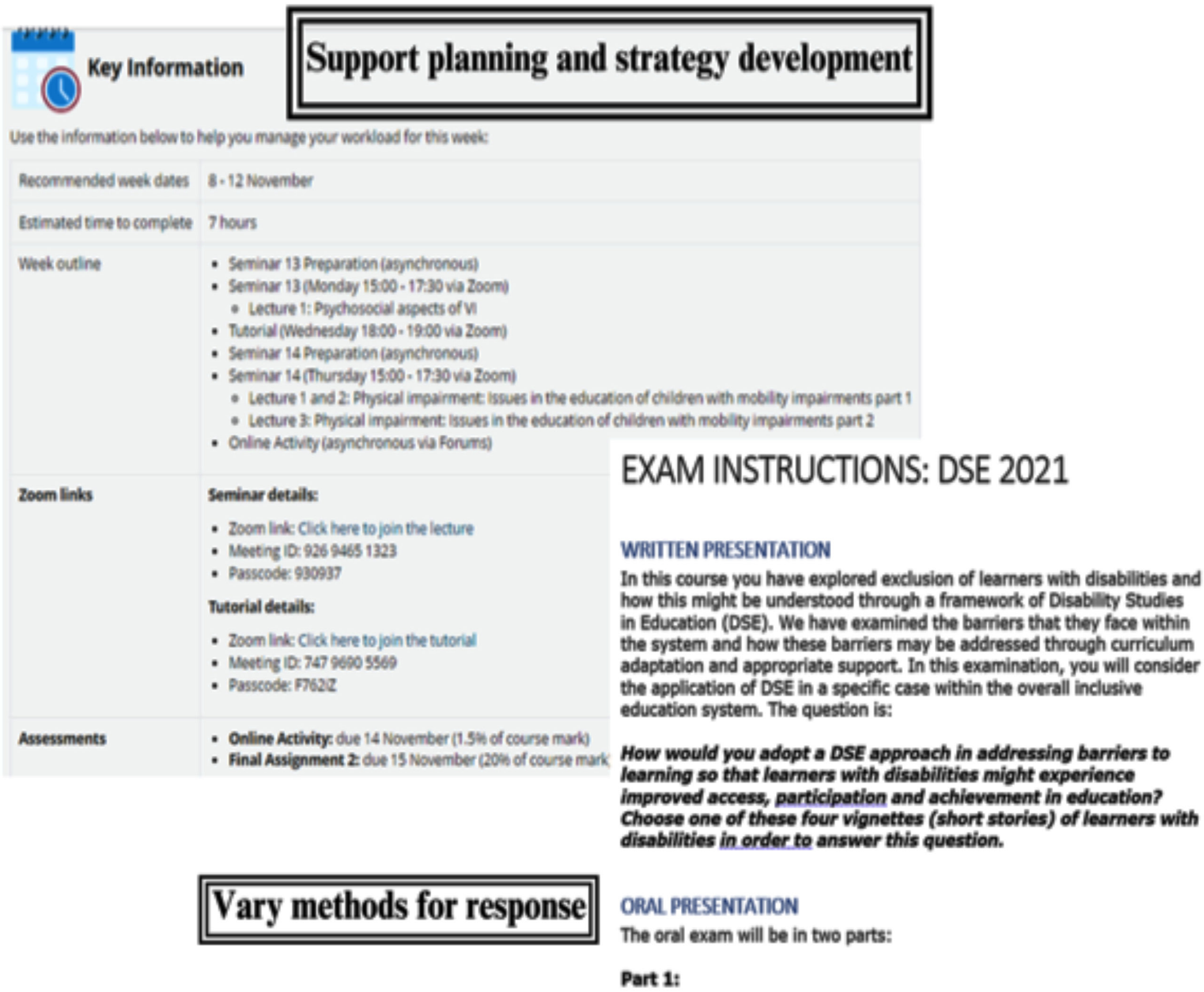

Figure 7: Providing multiple means of action and expression with weekly information and varying assessment formats

To support students in setting goals (Checkpoint 6.1) we outlined the learning outcomes (Figure 6). Thus, students could gain a clear understanding of what they were expected to achieve throughout the course. In addition, we recognise the importance of providing flexibility during assessments. By providing students with varying means of assessment, including group work, online activities, written and oral assessment submission, we empowered them to highlight their understanding in a format that aligns with their strengths and preferences (Checkpoint 5.1). Each week's content also included a 'Key Information' table to encourage planning and strategy development (Checkpoint 6.2). By providing students with this essential information, they could effectively manage their time. This strategic approach empowered students to take control of their learning.

Multiple means of engagement

Students were encouraged to set their own learning goals, supported through an open line of communication with the tutor and course convenor. Students were advised to communicate any challenges they were experiencing, and concessions were made where appropriate.

Recognising that students possess diverse interests, motivations, and preferences for engagement, we have adopted a range of strategies to cater for their needs. Examples of these strategies are illustrated in Figures 8 and 9.

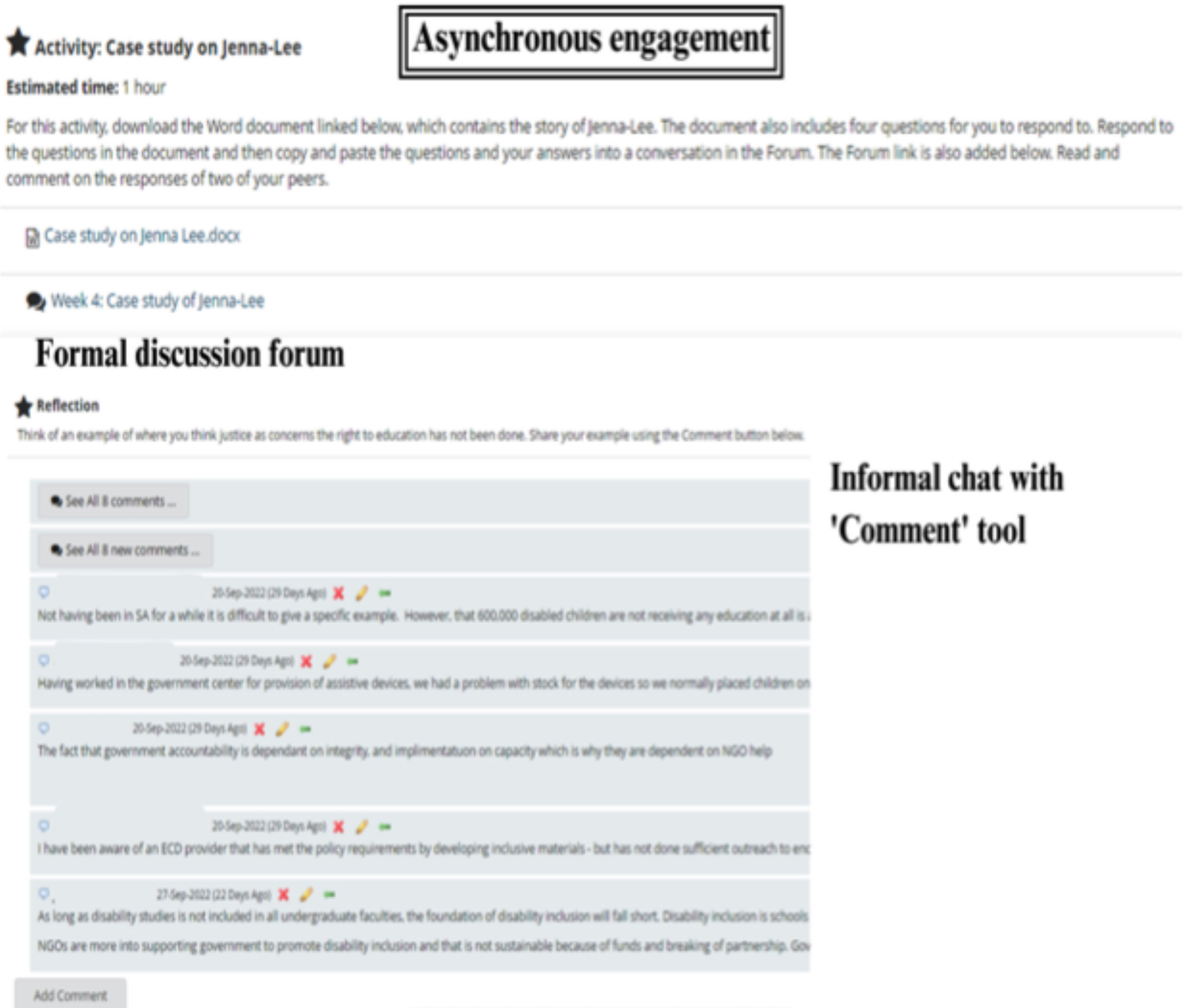

Figure 8: Providing multiple means of engagement with communication tools

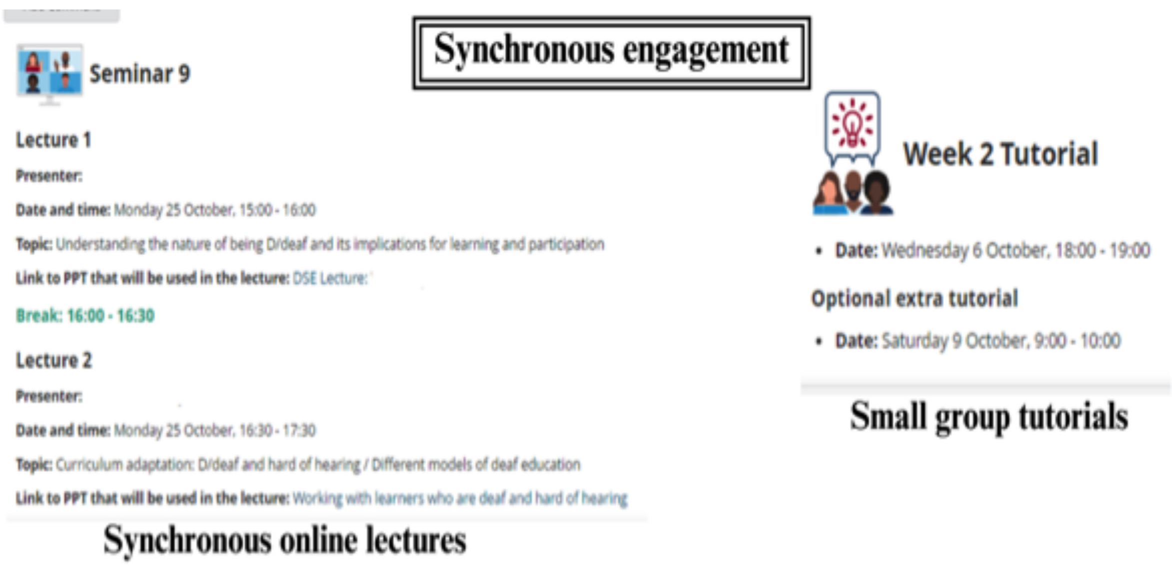

Figure 9: Providing multiple means of engagement synchronously

Formal online discussions using the forum tool on the digital platform fostered collaboration among students (Checkpoint 8.3). Synchronous online meetings were structured to cater for those who thrive on routine and prefer real-time instruction (Checkpoint 7.1). Small group tutorial sessions provided personalised attention and support (Checkpoint 7.3; Checkpoint 8.3). Furthermore, an informal chat space (chat room) on the digital platform facilitated spontaneous conversations, appealing to students who find such spontaneity engaging (Checkpoint 7.1).

Teaching large cohorts exposes educators and students to diverse backgrounds and perspectives, enhancing the learning environment. However, accommodating poses challenges. For instance, online discussion forums enable active participation and engagement among students, but providing individual feedback to large cohorts can be time-consuming. One strategy we employed to reduce the workload was to let students engage in tutorial group-specific forums. This meant that each tutorial group would have its own discussion forum to post in, with the allocated tutor providing feedback. This allowed tutors to equally share the workload, without excluding any student - consequently building trust with students by letting them feel heard, and in turn promoting engagement.

5. Reflection on Practice

While we found that *multiple means of representation* and *multiple means of action and expression* played an essential role, it became evident that *multiple means of engagement* (Guidelines 7, 8 & 9) in a large online class was imperative to students' access, participation, and success.

The main challenge in large classes is student engagement. When students found themselves disoriented due to navigating our learning management system, "loadshedding" or connectivity issues which is often an issue with large online classes, they would withdraw and as a result feel isolated or excluded. In such circumstances tutors, tutorial groups and group work served as a "lifeline" for students. Tutors consistently reached out to students who were not participating in activities. They would contact them via email, WhatsApp or even call them. Group work worked well in ensuring students engaged in activities as students would support one another with the workload, and the expectation to contribute motivated students to participate.

Guideline 7: Providing options for recruiting interest

Students were given the option to work in groups or individually. Most students chose to work in groups. Students were also given autonomy over how to present their assignments. For example, written and oral assessments (20-minute online presentation with 5 minutes for questions and answers (Q&A) or a short video with a 10-minute online Q&A session). All the assessment activities related to their own experience and context were designed in the hope that application of their learning would enhance their ability to be more inclusive in their teaching practice. Tutors provided technical assistance, guidance and availed themselves for assessments.

Guideline 8: Providing options for sustaining effort and persistence

Tutors, convenor and presenters played a critical role in creating a supportive and accepting environment. A sense of community was fostered even though it was still emerging (Farrell, 2021). Tutors used every opportunity to ensure students felt a sense of belonging, value, and support. This encourages student effort and persistence and suggests what other educators might choose to implement and replicate in their educational contexts. In addition, learning objectives were explicitly stated at each level and learning was scaffolded through preparatory and practice activities (Nseibo et al., 2023).

Guideline 9: Providing options for self-regulation

Tutors, the convenor and presenters played a critical role in creating a supportive and accepting environment. Many students felt overwhelmed by the workload and experienced health issues. In response to their concerns, tutors and the convenor responded to students where possible by providing other options and considering their recommendations. For example, being open to discussions on adjusted submission dates and adding checklists for future cohorts. Rubrics and prompts were provided to students, and reflective tasks were encouraged.

6. Conclusion

While online courses offer students the opportunity to participate in higher education, this format could create barriers for the very students who need the option of distance learning as the promise that technology holds for accessibility also contains the possibility of exclusion and isolation of students.

An important course element to mitigating the feeling of isolation is the creation of supportive communities for students (Farrell, 2021). Creating a community of practice through small group tutorial systems and peer interactions was partly what was required to create a sense of belonging and encouraging social presence and student engagement in a large class context, especially in an online space. Utilising digital collaborative tools for discussions in tutorial groups were helpful to facilitate peer engagement online in instances where real-time interaction between the entire cohort could be time-consuming. This strategy, and other examples mentioned previously, may be useful for enhancing engagement in large classes, whether presented online, hybrid or face-to-face. Contextualising the curriculum through pedagogical practices such as facilitating sessions rather than lecturing and deliberately creating opportunities for students to share their tacit knowledge are all crucial elements to creating a course which sets out to accommodate the needs of non-traditional students in higher education (Nseibo et al., 2023).

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Elicit and engage: Staff experiences of a student polling tool in large classes

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Abstract

This paper shares the experiences of large class teachers at Dublin City University (DCU), Ireland, in utilising the Vevox student digital polling and engagement tool during class to enhance student learning. The findings suggest that the use of Vevox in large classes succeeded in engaging students, supporting literature which suggests that these types of tools have a particular use in large classes where they can support active learning, be fun and reduce student boredom, and can create energy in the large class context.

The DCU experience has shown that student polling and engagement tools can enhance large classes, so it is a worthwhile endeavour for colleagues to explore this option in their own contexts also.

Keywords: *Student polling tool; higher education; large classes; student engagement*

1. Introduction

This paper shares the experiences of large class teachers at Dublin City University (DCU), Ireland, in utilising a student digital polling and engagement tool during class to enhance student learning. Technology-enhanced learning (TEL), when designed in a pedagogically appropriate and sound way, can offer benefits to learners, such as augmenting their cognitive processes in learning and offering efficiencies in how they learn (Dror, 2008). It can also support active learning, in which students think about what it is they are learning as they learn it (Prince, 2004). The incorporation of technology in education can also lead to pedagogical innovation (Laurillard et al., 2009). Additionally, myriad policy at supranational, national and local level sets ambitions for higher education institutions to adopt forms of TEL as part of the ongoing digitisation of higher education. Utilising student polling and engagement tools in class can therefore support both policy implementation as well as enhance 'on the ground' teaching and learning.

This paper will first present an overview of the context in question, before presenting a high-level summary of the literature around student polling and engagement tools. The methodology employed to gather DCU staff experiences of the tool will be described, after which the findings will be shared, followed by a concluding discussion.

2. Description of the Teaching/Learning Context

DCU is a young, dynamic university located on the northside of Dublin city, and spread across three academic campuses, with approximately 19,000 students, undergraduate and postgraduate (Irish

Universities Association, n.d.). DCU currently offers programmes of study within the fields of Humanities & Social Sciences, Education, Business, Science & Health and Engineering & Computing. An ambitious incorporation programme in 2016 saw three colleges merge with the existing university, increasing staff and student numbers by one third (Dublin City University, 2023). This, combined with a general rise of student numbers in Irish higher education in the past few years (The Irish Times, 2021), has contributed to the growth of large classes within the university, particularly across flagship undergraduate programmes in Humanities & Social Sciences, Education and Business.

Existing literature on large class contexts indicates that students in these contexts sometimes report dissatisfaction with teaching and learning (Persky & Pollack, 2010), perhaps due to the challenges teachers can face in fostering connections with their students when class sizes are large (Auslander, 2000). A teacher-centred, passive-student, transmission model of teaching and learning is often employed as the default in large classes, as teachers feel that is the only model that works—given the staff-student ratio in a large class—even though it does not necessarily create an effective learning experience (Folley, 2010; Stoerger & Kreiger, 2016).

DeRogatis et al. (2014) note that there is an inherent energy in large classes, and when large class teachers plan for and encourage energy generation between them and students, it can create a growing cycle of positive interactions. This could potentially counteract student boredom in a large class, which is noted to cause disengagement (Arvanitakis, 2014).

The Teaching Enhancement Unit (TEU) at DCU is the university's centre for teaching and learning, and among other things is the business owner of the institution's learning technology ecosystem, which comprises a Moodle-based virtual learning environment, text-matching software, video-conferencing software for online synchronous classes, and more. Until relatively recently, the TEU did not provide an institutional level polling and engagement tool for DCU teachers to use, despite such tools being available and in use by institutions across the globe for close to two decades.

In late 2019, Ireland's national body for leading and guiding teaching and learning enhancement in higher education, the National Forum for the Enhancement of Teaching and Learning (NFETL) conducted a national survey of all higher education staff and students. This Irish National Digital Experience (INDEx) Survey sought to explore how students and staff experienced digital technologies in their teaching and learning, with a view to establishing a baseline and informing decision-making going forward (NFETL, 2020). Although the survey did not distinguish between large and non-large classes, the report shared that nationally, Irish students found polling the top digital activity to support learning in their courses:

> Nearly a quarter of students highlighted the use of polling devices in class or knowledge check style quizzes as part of their course as being really useful. Students liked the ability to be engaged in class through such interaction, with some saying they liked the ability to participate anonymously (NFETL, 2020, p. 35).

Within the DCU subset of the INDEx Survey findings, staff respondents listed a number of polling/engagement tools as being useful in their role, including eminent ones such as Kahoot, Mentimeter, Slido and Socrative, which are largely web-based. The TEU deduced that in the absence of an institutionallyprovided tool, teachers were accessing their own to use in class. Whilst encouraging to see teachers take this initiative to incorporate technology into their practice, the TEU was concerned with the plethora of tools being used and what the terms of service were, particularly if teachers were availing of free or freemium[1] accounts to activate these tools. The data collection and privacy practices associated with such type of accounts could be dubious, with teacher and student responses potentially collected and utilised for unknown purposes. On foot of this, the TEU undertook to pilot an institution-wide polling and engagement tool, which would be available to all teachers to use with their students, including large class teachers, and which would meet the university's due diligence obligations.

Compton & Allen (2018) note that there are many polling/engagement tools available from myriad providers and institutions should consider what they offer to them specifically. After a period of desk research, the TEU commenced a trial with the Vevox[2] student engagement tool in early 2020. Vevox was chosen because of its simple-to-use interface, its accessibility and data protection practices, and its endorsement from the Association for Learning Technology, which utilises it at its conferences (Association for Learning Technology, 2022). DCU teachers could activate an account with Vevox and avail of all of the tool's features, with no restrictions: multiple polling question types, PowerPoint integration, question and answer board, surveys and gamified leaderboard. After a successful trial, the tool was renewed each subsequent academic year. As a SaaS (Software-As-A-Service) tool, additional features and enhancements came on stream since 2020, such as a simplified dashboard, new polling types, integration with the Zoom videoconferencing platform, DCU user authentication, and more.

Since 2020, the TEU has supported the rollout of Vevox among DCU teachers by providing training sessions and support resources, fostering a community of practice, and evaluating the staff experience of using it. The user base—comprising large and non-large class teachers—has risen steadily in that time period, resting at approximately 230 by spring 2022. Staff experiences have remained consistently positive for three years, aligning with the prevailing literature on the benefits of tools such as these in teaching and learning, which is discussed in the next section.

3. Literature Review

Although DCU's institution-wide journey with a student polling and engagement tool is recent, there exists a growing body of literature on these types of tools, which have been utilised in higher education institutions for almost 20 years now. They have been known by other terms such as student response systems, or clickers, which refer to physical clicking devices distributed to students during a class which they could use to respond to a question or prompt. Many contemporary tools (such as Vevox) now take the form of web-based tools, with students usually using personal devices (such as smartphones) to respond to questions or prompts in class.

Fies & Marshall (2006) note that student engagement/response tools can promote learning when utilised in a pedagogically sound fashion. This is likely because they can alter the traditional format of a teacher-

1 Freemium is a pricing model often used by providers of digital tools or services in which some features are provided free of charge, and others restricted, which users must pay to access.
2 www.vevox.com

centred class by supporting active participation from students (Trees & Jackson, 2007). Although suited to most types of classes, they have particular use in large classes (Skiba, 2006). This is possibly due to the fact that the anonymity often offered by such tools (which Vevox offers by default) increases student engagement (McLoone & Brennan, 2013). Because of the safety of anonymity, a diversity of opinions can be shared in class; learners do not experience anxiety as they otherwise might if they were identifiable (Stowell et al., 2010).

Learners respond well to these tools being used in a formative fashion, in particular those students who are otherwise reluctant to engage during class (Graham et al., 2007)—which also aligns with the findings of the INDEx Survey above (NFETL, 2020). It is noted that feedback is central to student success in higher education (Y1 Feedback Project, 2016) and tools such as these offer opportunities for students to receive feedback and thus self-regulate their learning (Hedgcock & Rouwenhorst, 2014).

Use of student engagement tools in class can also act as a catalyst for deeper discussion and critical reflection (Ludvigsen et al., 2020). As well as this, learners appreciate the 'fun' element associated with the use of such tools (Heaslip et al., 2014). In particular cases where such tools support gamification, learners can experience higher engagement, motivation and satisfaction (Tan & Saucerman, 2017).

4. Methodology and Data Collected

Staff experience of using Vevox is captured at the end of each academic year, through an anonymous survey, ethical approval for which was received from DCU's Research Ethics Committee. The survey draws on elements of Venkatesh et al. (2003) Unified Theory of Acceptance and Use of Technology (UTAUT) and elements of Burch et al. (2015) conceptual framework and survey instrument for student engagement. UTAUT is a form of a technology acceptance model, and describes the factors that influence whether or not a user (i.e. a DCU teacher) will adopt and continue to use a particular tool in their practice. The factors include, but are not limited to:

- Performance Expectancy ('PE'—does the tool perform in the way that you expect it to);
- Effort Expectancy ('EE'—how much effort does it take to use the tool and is that effort level reasonable);
- Attitude ('AT'—what is a user's general attitude towards the tool);
- Social Influence ('SI'—do others, including superiors, think a user should use the tool);
- Facilitating Conditions ('FC'—what support and resources are available);
- Self-Efficacy ('SE'—how well can a user use the tool themselves); and
- Anxiety ('AN'—does the use of the tool cause any sort of anxiety, worry or fear).

The Burch et al. framework proposes four components of student engagement:

- Emotional engagement;
- Physical engagement;
- Cognitive engagement in class; and
- Cognitive engagement out of class.

Therefore in combining these frameworks to create a single survey instrument, the TEU intent is to capture staff acceptance and intended continued use of Vevox, and staff impression around the extent (if any) to which Vevox supported components of student engagement when used in class.

The survey comprised mostly Likert-scale questions (quantitative) and some open-ended questions (qualitative). In the Likert-scale questions, respondents indicated their level of agreement to statements, where '1' is equivalent to 'strongly disagree' and '5' is equivalent to 'strongly agree'. As well as questions derived from UTAUT and the Burch et al. framework, general usage questions were also included.

Surveys issued in 2020 and 2021 did not distinguish between large and non-large classes teachers at DCU, however in spring 2022 a new question was added to the survey in which respondents indicated if they had used Vevox with classes of more than 100 students, i.e. a large class. This allows the TEU to identify from the 2022 dataset the experiences of DCU large class teachers specifically, which now follows.

In spring 2022, the anonymous survey was issued to 230 Vevox staff users at DCU. The survey received a 15.2% response rate. 31.45% of those respondents indicated they had used Vevox in large classes in that particular academic year. The quantitative findings from this cohort of respondents (n=11) are presented in the two tables below, showing the average level of agreement (1 being the lowest, 5 being the highest) with the statements presented.

Table 1. Average level of agreement from DCU large class teachers with statements related to the acceptance and use of Vevox

UTAUT Statement	Average level of agreement
PE: I find Vevox useful for my teaching	4.27
PE: Vevox has helped me engage students in class	4.45
PE: Vevox has helped students learn in class	4.09
PE: Vevox has helped give me an insight into students' learning/understanding in class	4.09
EE: Vevox is easy to use	3.82
EE: Getting to know Vevox was easy	3.82
EE: It does not take too much time to become familiar with Vevox	3.64
EE: I am comfortable using Vevox in class	4.09
AT: Vevox helps make classes more interesting	4.55
AT: Vevox helps make classes fun	4.18
SI: My head/co-ordinator/chair etc. thinks I should use Vevox	3.00
SI: Colleagues think I should use Vevox	3.18
FC: There are sufficient resources/support to help me use Vevox	4.18
FC: I have sufficient knowledge to use Vevox	4.18
FC: Vevox works well with other tools and technologies	3.18
SE: There are specific people I can turn to for help with Vevox	4.27
SE: Vevox works well with the way that I teach	4.45
AN: Vevox is somewhat intimidating to me	1.91
AN: I hesitate to use Vevox for fear of making a mistake	1.64

Table 2. Average level of agreement from DCU large class teachers with statements related to the level of student engagement when Vevox was used in class (derived from Burch et al. framework)

In classes where I used Vevox, I felt students…	Average level of agreement
…were more enthusiastic than usual	3.91
…were more interested in the content than usual	3.82
…were more excited than usual	3.64
…exerted more energy than usual	3.82
…tried to perform well, more than usual	3.27
…were more focussed on discussion/activities than usual	4.18
…were thinking more about what it was they were learning	4.09
…enjoyed using it	4.00

Furthermore, when asked for what purposes they used Vevox in class, large class teachers listed some of the following activities:

- As a fun exercise;
- Q&A;
- To allow students to make choices/decisions about something;
- To check students' understandings in class;
- To elicit students' opinions in class;
- To get feedback from students;
- To run a quiz.

Additionally, when asked if Vevox should continue to be made available in DCU, large class teachers overwhelmingly agreed (4.73/5.00).

5. Concluding Discussions

It is clear from the findings that Vevox is received positively among large class teachers at DCU. On average, respondents strongly agreed that the tool performed as they expected, with a slightly lower average agreeing that the effort needed to use the tool was as expected. On average there was strong agreement that the tool led to fun and enjoyable classes, and that it did not cause a feeling of intimidation or anxiety. The social influence from peers to use Vevox was neither strong nor weak, and there was strong agreement that there was sufficient support to use the tool and the tool is aligned to their practice.

When asked about how they felt the tool engaged students in class, there was strong agreement that students enjoyed using it and that it led to active learning. There was also agreement that students were more enthusiastic and excited in the material, compared to usual, and that there was more energy.

Taken as a whole, these findings suggest that the use of Vevox in large classes to engage students did succeed in doing so. The experience of DCU large class teacher correlates to the literature on these types of tools, namely that they have a particular use in large classes, that they can support active learning, they can be fun and reduce student boredom, and they can create energy in the large class context.

As the massification of higher education continues, it is clear that large classes will remain a feature of our higher education institutions. However, that does not mean that large class teachers must resign themselves to a dominant model of transmission teaching. The DCU experience has shown that student polling and engagement tools can enhance large classes, so it is a worthwhile endeavour for colleagues to explore this option in their own contexts also.

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The development of a Pharmacology module for undergraduate medical students

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Abstract
Teaching an experimental subject such as Pharmacology to large student classes represents a major challenge with regard to appropriate content delivery and assessment. A key skill for Medical graduates is to understand the experimental aspects of drug development to aid their decision-making during their professional lifetime. In the University of Galway, we see the 2nd year of the curriculum as being pivotal in laying down the foundations of experimental pharmacology. Within our Semester 1 introductory module, we have developed a curriculum that is underpinned by a blend of face to face lectures, Q&A sessions, practical workshops and regular assessment of learning, which is followed in Semester 2 by a capstone task where students create a team-based presentation profiling a recently introduced drug. In conclusion, we have introduced a range of experimental elements into our Pharmacology curriculum that are valuable in developing skills that are achievable in a large class setting.

Keywords: *Pharmacology; drug development; medicine; experimental skills; large classes*

1. Introduction

The teaching of experimental aspects of Science is very challenging for large classes, from the perspectives of delivery of content, and how it might be assessed in an authentic manner. Over the last 20 years, there has been a global trend of massification of educational programmes. The larger class sizes have demanded a rethink with regard to practical logistics of delivery and that the large class size might be an opportunity to enhance the student learning experience (Hornsby and Osman, 2014). We have spent over 30 years teaching Pharmacology to a range of student groups, including to Medical students. Effective and safe prescribing of medicines is a key skill that clinicians need to employ on a daily basis, but there are concerns that the medicine curriculum doesn't adequately prepare graduates for developing this skill (Geoghegan et al., 2017). In order to prescribe a strong foundation in the principles of pharmacology is essential, and particularly its underpinning in experimental findings using a range of subjects ranging from the test tube through laboratory animals to human subjects. Having an appreciation of the drug discovery and development process thus helps Doctors in deciding whether to prescribe new drugs safely and effectively and which of their patients would benefit most from such medicines. This paper will describe how we have developed our Pharmacology content for Medical Students at the University of Galway, and how the pedagogical principles adopted can have a resonance beyond this field, and thus can have a wider application.

2. Description of the Teaching/Learning Context

The teaching/learning context is within the 2nd year of the undergraduate Medical curriculum in the University of Galway. The 2nd year Medicine class typically consists of approximately 200 students, with 50-60% being Irish students. The class size went through considerable growth nearly quadrupling from 55 students in 1991 to 200 in 2011 and stabilising at this number since then. Thus, our programme has adapted to accommodate these larger class sizes, whilst introducing some pedagogical strategies that will aid student learning.

During the 2nd year, Pharmacology is taught in two modules: Introduction to Pharmacology (MD214) in Semester 1, and Drugs and Disease (MD204) in Semester 2. Thus, the 2nd year of the Medical programme is a pivotal one for the development of foundational knowledge in Pharmacology that will be applied in future years as the student progresses to the clinical stages of their education. This module has gone through considerable development that has coincided with growth in class size, with a particular emphasis on exposing students to the experimental aspects of Pharmacology, providing opportunities for self-directed learning as well as campus-based learning. In addition, the module has responded to student feedback, and regular interaction with the class representatives to generate a productive dialogue. The main features of the module are summarised in Table 1.The structure of MD214 consists of 4 x 3-week units over the 12-week semester that introduce students to the basic principles of Pharmacology. There is a consistency of approach with each unit following the same design, even though the units may be delivered by different contributors. The series of interlocking features includes both conventional lecture-based and practical workshops, whilst also availing of online options where appropriate, such as in the provision of a weekly online Q&A session. These features provide clear signposting, promote regular engagement and encourage active collaboration in Teams.

Table 1. The main features of MD214 (Introduction to Pharmacology)
■ 4 Lectures in the first 2 weeks of a Unit
■ A practical-based workshop in the 3rd week of a Unit
■ A Unit assessment at the end of the 3rd week (each = 10% of module mark)
■ A weekly Q&A with the Module Lead
■ An end of semester assessment (60% of module mark)

2.1. Workbooks

At the beginning of each unit, the students can access a workbook that focuses on key stages of the drug development process which the students engage with asynchronously outside of the timetabled session. These workbooks provide a self-directed opportunity that lends itself well to student engagement within the large class setting; there is a workbook linked to each unit (Figure 1). Initially, these workbooks were solely paper-based, i.e. provided as pdf versions that the students would work through. We recently developed an online interactive version using the Articulate Rise 360 e-learning platform, which became available as an authoring tool in our University in 2021. This format was introduced in AY 2021-2022, and is compatible with the Blackboard Learning Management System (LMS). These interactive workbooks provide the students with a number of problem-solving opportunities as they build up their application of their theoretical knowledge of Pharmacology.

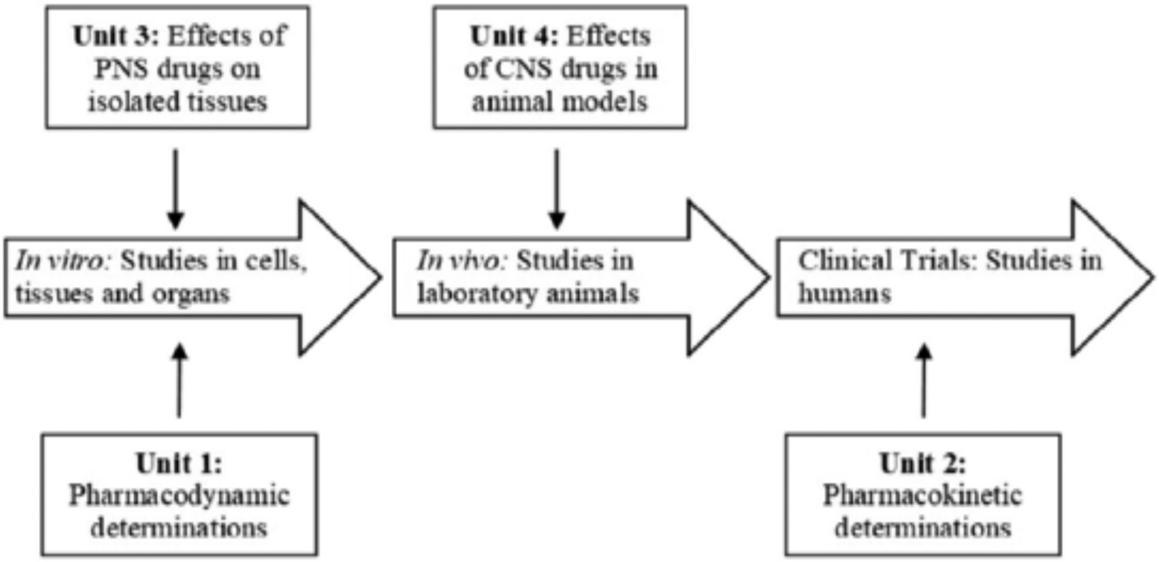

Figure 1. The experimental techniques that the students encounter are associated with key elements of the drug development process, and result in being exposed to the whole range of experimental settings that are used for evaluating drugs through the preclinical stages of drug development. The clinical phase is encountered in the workshops that occur later in the module.

2.2. Practical Workshops

At the beginning of the Semester, the class is divided into 6 "houses" named after leading historical figures in Pharmacology, and the students within the house divided into teams of 5 who work together throughout the Semester; the Workshops take place in Computer suites located across the campus. The organisation into houses helps to foster a sense of community within a large class, as well as getting to know some of the class by engaging in cooperative learning. In advance of the first workshop, students are provided with a drug for which they need to prepare a profile of its properties, including its mechanism of action and therapeutic uses. At the workshop itself, the students work with their teammates whose drugs have some characteristics in common. The students summarise these characteristics in a table, which enables them to compare and contrast their properties. Similar approaches are taken with the remaining Workshops, and are aligned to the content of a particular unit, and thus have a certain flavour whilst maintaining some consistent features. At the end of each workshop, the students submit a single presentation of their findings, which has been reviewed by the Workshop Tutor prior to submission for any omissions. Currently, the submissions are purely formative in nature, i.e. they do not carry any marks.

Table 2. The composition of the practical workshops

Unit	Purpose
Unit 1: Pharmacodynamics	Teams summarise the pharmacodynamic characteristics of their 5 drugs; select one of the drugs and describe a clinical trial using this drug
Unit 2: Pharmacokinetics	Teams summarise the pharmacokinetic characteristics of their 5 drugs; discussion of a case study that has pharmacokinetic features
Unit 3: PNS drugs	Teams work on an evidence-based profile of a PNS drug
Unit 4: CNS drugs	Teams work on an evidence-based profile of a CNS drug

2.3. Assessment

The introduction of computer-based assessments was primarily a response to the growing numbers of students, but also driven by a disaffection with the written-based format. Within the Blackboard LMS, a number of question types are used, including multiple choice and multiple answer questions, extended-matching questions and calculations that are drawn from experimental data. Although initially challenging, we appreciate how these questions can actually be phrased in such ways that can proceed through to higher levels of Bloom's taxonomy. Students are provided with practice opportunities for both interim and end of semester assessment, which are formative in nature to familiarise themselves with the nature of the assessment questions. The questions have been created to not only assess factual recall, but require considerable interpretative skill, and draw on experimentally-relevant scenarios. This was particularly pertinent during the COVID-19 pandemic, when assessments needed to be conducted in an off campus setting, and where application of knowledge rather than factual recall is emphasised.

2.4. Capstone Activity

At the beginning of the second semester, we have developed an opportunity for the students to apply the knowledge that they have developed with a Capstone Activity, whilst at the same time requiring a deep dive into the research literature. Teams of 6 students prepare a recorded PowerPoint presentation in which they profile a recently introduced drug, preparing a synthesis of evidence. The components of the Capstone Activity are summarised in Table 3. They include identifying the shortcomings of the existing treatments for the disease that the drug has been developed to treat, and how the new drug represents an improvement in the treatment of the disease. The students are required to marshal the skills that they have honed in Semester 1 in order to be able to provide experimental evidence that will support whether the new drug does represent an advance. In order to be able to get a good idea of the impact of a newly introduced drug, the ones that we select for investigation are 5-10 years after being launched, so that there is literature available to assess the post-marketing impact of the drug. The teams are randomly assigned, and a team leader is also randomly selected. A number of roles are identified within the Teams that enable marks to be awarded for the both individual and team-related content, enabling each student to receive their own mark for this activity These contributions are identified at the time of submission. The students are provided with a Rubric for this activity, that helps them in identifying the standard that is expected. The students meet as a team on 3 occasions:

- Initial meeting: Organised by Team Leader. Allocation of roles and prepare a plan.
- Midway meeting: Assessing progress, making sure everything is on course.
- Final meeting: Individual panels completed, remaining features of poster agreed upon.

The Capstone Activity is worth 10% of the total mark for this module.

Table 3. The components of the Capstone Activity

- **Introduction:** An introduction to the disease state; the current treatments and their limitations; the mechanism of action of the drugs and the unmet needs being addressed
- **Preclinical efficacy:** An inclusion of the relevant animal model literature, at both the *in vitro* and *in vivo* levels (with examples)
- **Clinical Pharmacokinetics:** A summary of the clinical pharmacokinetics parameters of the drug, including its metabolic pathway and important drug:drug interactions
- **Clinical Efficacy:** An inclusion of the pre- and post-marketing clinical trials evaluating efficacy of the drug
- **Clinical Safety:** An inclusion of pre- and post-marketing evidence on all safety aspects of the drug
- **Case Study:** Drawn from real-life and including all features of the patient's treatment
- **Conclusions:** Succinct summary of key findings
- **Overall Presentation and References:** Consistency of style; all references included

3. Literature Review

When developing a curriculum for large classes, the issue of student engagement is particularly prominent, and thus developing strategies that can make it worthwhile for students to invest their effort in seeing the payoffs from being actively engaged being manifested in the nature of the assessments that are created (Kuh, 2009). In addition, there should be a shift from knowledge recall in such assessments, and movement towards encouraging attributes that will be useful when going out into the world, which have been described as recently summarised as 21st century skills, such as communication, cooperation and problem solving (Allen and van der Velden, 2013). Our module has a considerable team based learning (TBL) element, which, irrespective of the size of a class, provides an opportunity for students to work together in complex problem solving which promotes a deeper learning experience (Michaelson et al, 2008).

For many years, the practical Pharmacology aspects of undergraduate Medical education have been taught using computer-based simulation methods (Markham et al., 1998; Lisha, 2013), with the ethical concerns of the use of laboratory animals that would be required for practical sessions. However, there is also a need for Medical students to be exposed to the breadth of experimental approaches that encompass the drug discovery and development process (Stanley et al., 2005), which means going beyond a narrow definition of the practical applications of Pharmacology. The key component here is realising that Medical students require an appreciation of how these diverse stages of the drug development operate in concert, without the necessity for them to actually conduct these experiments at the bench. The value of Articulate Rise 360 has been successful as a resource for students to learn in an asynchronous fashion (Fuller et al., 2021), and thus complements the blended approach to our teaching of Experimental Pharmacology in the University of Galway, providing both on-campus and off-campus opportunities to develop their skills. The incorporation of deliberate practice assessments provide valuable opportunities to assess and review student's learning (Ericsson and Harwell, 2019), and our module has incorporated regular practice activities within the Workbooks, and the practice assessments that students can take in advance of their credit-bearing assessments. Our capstone project provides an opportunity for higher order learning skills of analysis, evaluation and synthesis to be employed (Bloom, 1956), with the requirement to build on knowledge and skills developed earlier in order to create an evidence-based presentation. Team-based learning is an activity that can be successfully incorporated in a large class setting (Burgess et al., 2020) and the benefits of sharing and working together are very important for students to be exposed to in their undergraduate studies.

4. Empirical Methodology/Data

Figure 2 summarises the student feedback for AY 2022-2023 for MD214. Overall, the feedback has been very positive on a number of elements relating to the organisation of the module, the support of the teaching faculty, and the overall satisfaction with the module. On average, the students devoted 9 hrs/week, which is the amount recommended for a module with a 5 ECTS weighting, based on 20-25 student hours for each ECTS. Aspects that students particularly liked included the regular assessments, the interesting relevant content to Medicine, the Q&A sessions, practice tests, workbooks and the on campus workshops. Areas of improvement included that the on campus workshops should have marks awarded and that some time during the on campus classes ought to be devoted to the workbooks, rather than being completely student-directed.

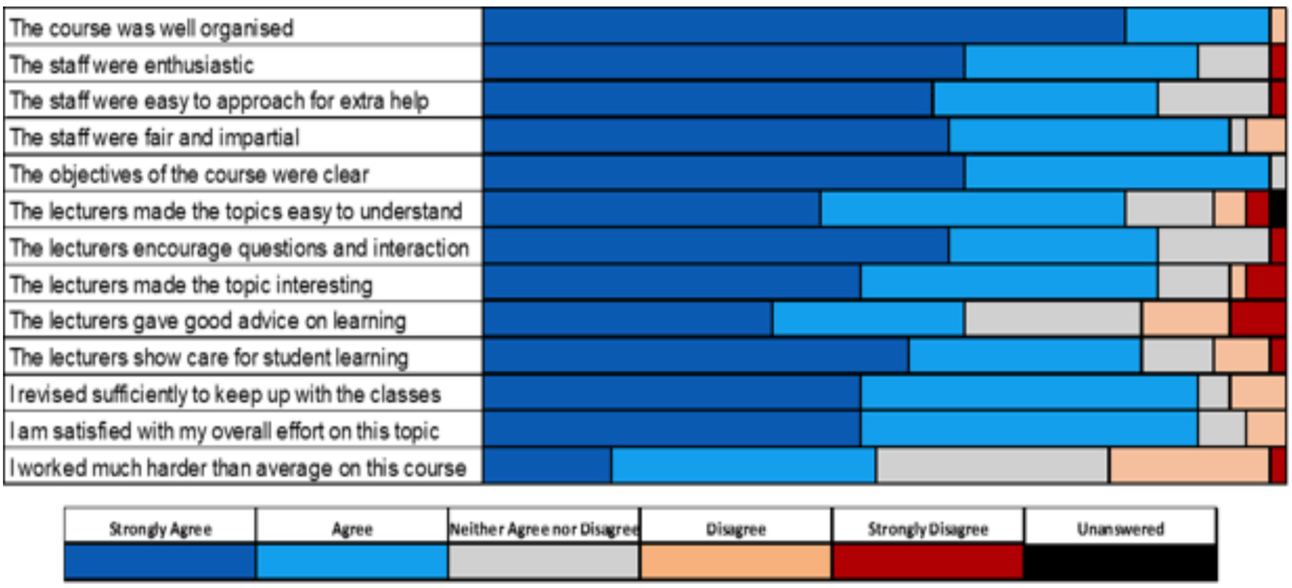

Figure 2. The responses to structured feedback questions in AY 2022-2023 for MD214, conducted at the end of the teaching period, and prior to the end of semester assessment; 45 students out of a class of 192 (23%) completed the survey

For the student evaluation of the Capstone Activity, there was a lower response rate (12%), and the main features are summarised in Table 4. The students did appreciate how the activity built on the knowledge built up in Semester 1, and its relevance to recently approved drugs. The main improvements that the students mentioned revolved around the short duration for the presentation (i.e. 8 minutes) and suggest that this ought to be increased, albeit modestly to 10 minutes.

Table 4. Main student comments relating to the Capstone Activity

What aspects did you like? ■ Teamwork/meeting new classmates ■ Application of knowledge ■ Nature of presentation (i.e. a recorded PowerPoint presentation) ■ Learning about a recently marketed drug ■ Case Study aspect
How could the activity be improved upon? ■ Increase the recording time ■ Increase word count ■ Reduce the team size ■ To be able to choose team-mates

5. Analysis of/Reflection on/Implications for Practice

We have introduced a number of features to our teaching of Pharmacology to undergraduate Medical students that have been able to develop their skills in the drug discovery and development process, a key component for Practitioners to be able to apply when making decisions about selecting medications with regard to efficacy and safety for their patients. This has been achieved in a large class size and has met with favourable evaluations from the students themselves. In addition, very favourably received features of our teaching include the regular assessments through the semester, and the opportunities to prepare for such assessments with practice assessments. We will continue to further develop our teaching, by taking new innovations into consideration as well as being guided by student feedback.

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Optimising diverse linguistic capital through translanguaging in a large humanities course

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Abstract
Translanguaging is preferred as a non-deficit pedagogical approach towards tackling a linguistic access issue for diverse students by tapping into their linguistic capital and giving them a chance to be represented by bringing their own knowledge and full linguistic repertoire into their learning space. In the context of South Africa, large classes tend to have diverse language profiles, and adopting translanguaging strategies is a useful approach to enhance student learning, engagement, and sense of belonging. The focus of the paper is to share a good practice example of the use of translanguaging pedagogy as a strategy to optimize linguistic capital in a large humanities course - Text in the Humanities. The learning outcome for this large course is for students to have a better understanding of reading and producing texts in the humanities and utilizing translanguaging pedagogy as a strategy to enhance student learning experiences.

Keywords: *Translanguaging; pedagogical translanguaging; large classes*

1. Introduction

In this paper, we approach translanguaging from the field of multilingualism research, as an umbrella term for various means of incorporating the entire linguistic repertoire of an individual language user to achieve communicative goals in varied communicative contexts and modalities (García 2012). In the context of South Africa, large classes tend to have students with diverse language profiles, as well as a range of other differences along the lines of race, culture, ethnicity, nationality, historical heritage, ideological perspectives, disability, geographic location, etc. Translanguaging in these contexts is therefore a useful approach to enhance student learning, engagement, and sense of belonging through valuing their linguistic, intellectual and cultural capital. The focus of the paper is to share a good practice example of the use of translanguaging pedagogy as a strategy in a large humanities course - Text in the Humanities to optimize linguistic capital, and to a lesser extent, the intellectual and cultural capital nested in the languages students speak.

2. Description of the Teaching/Learning Context

The DOH1010S Text in Humanities course is a first-year undergraduate course offered to between 95-110 BA/BSocSci students in the University of Cape Town's (UCT) Humanities Extended Degree Programme.

The purpose of the extended programme is to redress historical inequalities by offering government-designated demographic groups, who enter the faculty with lower entrance points, access to a four-year programme rather than the standard three-year programme. The additional year allows students to take a lighter academic load, while receiving supplementary support in the form of introductory courses, plus tutorials and psychosocial support, all of which is geared towards enhancing student success and throughput (Hurst & Mona, 2017, p. 133).

The primary learning objective of the Text in Humanities course is to assist students with reading and producing Texts in the Humanities. The course scaffolds students in the critical analysis of a range of humanities texts (visual, written, and auditory), develop critical argument and produce well-written, well-argued essays (Hurst & Mona, 2017, p. 134).

The course is delivered in a blended mode, with in-person/online lectures, lab sessions, small-group tutorials, and online activities and assessments. Students were required to attend two in-person lectures, one lab session (to complete online activities & assignments) and one in-person/online small-group tutorial, making up a total of four contact hours per week, over 13 weeks. Students were assessed using a continuous assessment model, which comprised four key assignments (80%), and two online tests (10%). They were also graded for their participation and engagement in online course activities (10%). The four main assessments included: Multimodal analysis (worksheet 20%); Collection of texts (corpus 20%); Analysis of texts (worksheet 20%); and Critical analysis of texts (essay 20%). Support for assessment was provided in small-group tutorials, by course tutors.

The teaching team comprised of one academic lecturer who convened the course, and managed the online learning platform and engagements, two academics who were responsible for in-person teaching and lab facilitation, and five tutors (who are all Post Graduate Humanities Students at MA or PhD level) who facilitated small group tutorials. Tutors were responsible for grading assignments (guided by a rubric) and providing individual feedback, while lecturers would moderate grades across the course and use this to provide general feedback in lectures and labs to maintain continuity.

3. Literature Review

A brief review of the literature generated an analysis of the characteristics of translanguaging as a socially just pedagogical approach for enhancing student engagement and representation in the context of South African post-secondary education. Fovet (2022) contextualises the challenges of implementing socially just pedagogies, particularly in large classroom settings. He argues that even though postsecondary institutions' top priorities right now are equity, diversity, and inclusion because of significant societal movements such as the #MeToo movement, the conversation on social justice is frequently placed in parentheses when revenue, financial sustainability, and admissions growth are prioritized. Pursuing these in large class settings is considered as difficult since it is assumed that including students from different backgrounds requires specific attention and individualised help, which large class lecturers are frequently unable to provide (Fovet, 2022).

When making a case for a socially just pedagogical approach, in this instance, translanguaging, Hurst and Mona (2017) argue that an approach to social justice first identifies obstacles to students' learning outcomes and then employs equitable teaching and assessment methods. A socially just pedagogical framework should not adversely affect students through prejudice based on gender, language, culture, race, religion, or disability (or socioeconomic position and geographic location).

Similarly, Solorza (2019) when explaining the value and descriptive understanding of translanguaging contends that translanguaging as an approach teaches us that the various ways a student uses languages both inside and outside of school are all part of a single, dynamic linguistic system. To truly respect a student, we must define all of their language activities as resources.

For the purposes of this paper, the definition of translanguaging is drawn from these two scholars who have located translanguaging as not a mechanical concept of bilingual flexibility, but as reconstructive and transformational pedagogy that seeks to establish a socially just higher education context in South Africa.

Translanguaging: A Pedagogy for a Socially Just Higher Education Landscape

Pedagogical translanguaging", according to Cenoz and Gorter who write from a schooling context:

> "is learner centred and endorses the support and development of all the languages used by learners. It fosters the development of metalinguistic awareness by softening boundaries between languages when learning languages and content" (2021, p. 24).

Further, translanguaging, which involves the integrated use of multiple languages in teaching and learning, can be a powerful pedagogical practice that challenges monolingual ideologies to promote inclusivity and equity in education. For example, Hurst and Mona (2017, p. 129) writing about their experience at UCT contend that translanguaging has potential to challenge the dominance of English in South African higher education. They further problematize the monolingual use of English in the multilingual South African society and argue that it tends to reproduce notions of the superiority of Western knowledge and language, which " is inappropriate within a highly multilingual African university." (Hurst & Mona, 2017, p. 130).

There are potential benefits of pedagogical translanguaging in education. For instance, using students' native languages alongside the target language can enhance comprehension, engagement, and academic achievement. Pedagogical translanguaging can also support the development of metalinguistic awareness and positive language attitudes (Prilutskaya, 2021). Addressing social justice challenges in the context of higher education is one potential spin-off in the utilisation of translanguaging as a pedagogy. For example, translanguaging can deliberately contribute to social justice by challenging dominant monolingual ideologies and empowering individuals who have been marginalised due to their language backgrounds (García & Leiva, 2014).

García and Leiva (2014) propose three interrelated theoretical dimensions of translanguaging for social justice: language-as-resource, language-as-social-practice, and language-as-right. First, the language-as-resource dimension emphasises the recognition and valuing of individuals' linguistic repertoires. Translanguaging views all languages and language varieties as valuable resources that can be drawn upon to enhance communication and learning. By acknowledging and affirming the diverse linguistic backgrounds of students, educators can create more inclusive and equitable learning environments.

Second, the language-as-social-practice dimension highlights the social nature of language and the importance of context in language use. Translanguaging recognizes that language is not simply a cognitive tool but a social practice embedded in specific sociocultural and sociopolitical contexts. It emphasizes the importance of understanding and respecting the language practices and identities of multilingual individuals. Finally, the language-as-right dimension emphasizes the right of individuals to use their full linguistic repertoires in educational contexts. Translanguaging advocates for the promotion of linguistic human rights, by challenging language policies that restrict or devalue certain languages. It recognizes that language is closely linked to identity and that denying individuals the right to use their languages can perpetuate social inequalities (García & Leiva, 2014).

Curriculum materials are often monolingual, but students in the class are not always, therefore promoting cross-linguistic comprehension is exceptionally crucial. When no linguistic alternatives are accessible, information is highly restricted for new learners of the dominant language or students of academic language (CAST, 2018). Additionally, Solorza (2019) suggests that translanguaging allows students to create their own linguistic identities and can foster a sense of belonging in the classroom. This is especially important for students who may feel marginalized or disconnected from their school environment. Overall, Solorza (2019) argues that "translanguaging" is a valuable approach to bilingual education that can help students build strong language skills, create a sense of belonging, and achieve academic success.

Pedagogical translanguaging as a strategy throughout the entire curriculum

Although translanguaging is often thought of as a pedagogic strategy that takes place during the teaching phase, it is actually part of the entire curriculum development, course design, materials development, learning, teaching, assessing and evaluating process. Following the enabling accessible blended learning for equity (ENABLE) framework developed by the Redesigning Blended Courses project at UCT, it can be seen how translanguaging commences long before the teaching starts, as the conceptualisation of the course needs to anticipate how translanguaging is going to be operationalised throughout the process. The ENABLE framework draws upon traditional learning design processes (Branch 2009) of planning, designing, developing, implementing, and evaluating six key elements in curriculum development and course design (i.e., Outcomes, Materials and Technology development and selection, Learning, Teaching, Assessment and Evaluation). At the same time, it endeavours to embed the principles of Universal Design for Learning (CAST[1]) to make learning accessible to all, irrespective of language, culture, ethnicity, nationality, race, gender, age, ability, etc.

During the Outcomes phase, lecturers are recommended to create personas of the prior cohort of students or survey the current cohort to, amongst others, ascertain what home languages they speak and how confident they are in understanding, reading, speaking, and writing in the predominant language of teaching and learning. This can assist lecturers to make more informed and proactive choices about the resources upon which they draw as there are likely to be slightly different ideological perspectives on the topic embedded in the various languages spoken. Lecturers can then select tutors that are able to converse in languages with which the students are most familiar and approach the topic at hand from multiple perspectives.

1 https://udlguidelines.cast.org/

During the Materials and Technology phase, which includes the development of custom-designed materials such as the course website on the institutional learning management system, the course outline, possibly frequently asked questions (FAQ) and glossary, lecturers or tutors can provide translations for key texts in the languages with which students are most comfortable. Tutors and/or students can also be involved in assisting lecturers to use various technological tools such as Google Translate or AI chatbots, such as ChatGPT or Bing, to generate and check translations. The same processes can be followed for creating learning materials (e.g. guidelines, course manuals, teaching materials such as lecture notes, slide presentations, as well as assessment briefs and rubrics). Proactively designing materials that are accessible to students with some challenge physically, sensorial, intellectually, etc., as well as providing multi-perspectival, multilingual materials and selecting open educational resources wherever possible, can strongly promote accessibility, affordability, equity, inclusive materials for diverse students in large classes.

During the Learning phase students can be encouraged to work in language affinity groups, at least initially, to assist them to express themselves as easily as possible with their peers. Active learning is a useful strategy to encourage student engagement especially in large classes (Hornsby 2020). Students can undertake activities in-person or online in the language of their choice and/or read related resources in the language of their choice and contribute their insights back to the class. Students can also be invited to clarify uncertainties in the language of their choice as there is likely to be someone in the large class who can translate for the lecturer.

During the Teaching phase, depending upon the lecturers' linguistic competence and fluidity, they can translate key terms and concepts or draw upon tutors and/or students in the class to do so. To optimise translanguaging students will need to feel comfortable. Pedagogic strategies such as building a "Community of Trust" (Mackey, 2020), where lecturers consciously create a safe, supportive, and inclusive learning environment where students feel comfortable engaging in open and respectful discussions can be adopted. Other useful pedagogic strategies include "Culturally relevant teaching" (Ladson-Billings, 1995), "Culturally responsive teaching" (Gay, 2002) or "Culturally sustaining pedagogy" (Paris, 2012) which all seek to maintain and nurture students' cultural and linguistic identities. Lecturers can also structure learning activities that deliberately maximise multiple perspectives by having students read and report their findings based on existing resources in the language of their choice. Tutorial sessions can be translanguaging spaces where language usage is dependent upon the fluency of the tutors and the comfort of the students. de Matos Ala (2022), writing about large classes in a global south context, suggests that tutorials provided a more intimate learning space by eliminating the intimidation that many students felt in speaking in front of a large class.

During the Assessment phase, students can be offered options for assignment submission. Depending upon the lecturers and tutors' linguistic breadth and depth, assignment tasks can be explained in a selection of languages so that the task is well understood even if the students need to write the assignment in the dominant language. More frequent low stakes assessment can assist students to succeed and cheat less (Holmes, 2018), for example quizzes in large classes. de Matos Ala, (2022) mentions how students were able to present their knowledge in alternative formats during tutorials and given the opportunity to revise. Ideally feedback on more high-stakes assignments, especially formative assessment where the student can still make changes, can be conducted in a language that the student understands best so that informed revision for summative purposes is maximised.

During the Evaluation phase, mid-course evaluations can be written in more than one language to optimise the students' opportunity to provide incisive feedback for changes to the second half of the course. End-of-course evaluations can employ the same strategy to optimise the adaptations recommended for another iteration of the course.

4. Empirical Methodology/Data

This paper draws on the experience of the academic teaching team involved in the designing and teaching of the Text in Humanities course. Through a reflective and reflexive approach, it explores the impact of using translanguaging as a pedagogical strategy in large classes to optimize linguistic diversity and enhance student engagement. As a reflective prompt, the authors used the in-development ENABLE framework from the RBC project to highlight translanguaging strategies throughout the entire process of course planning, design, development, implementation, and evaluation. To this end a table summarizing the key steps of the ENABLE framework were mapped against the activities in the Text in Humanities course (Appendix A).

5. Analysis of/Reflection on/Implications for Practice

As a large introductory course in the extended programme, the Text in Humanities course has a wide range of student language profiles. Even though all the students speak English (a high school pass in English is a requirement for entry to UCT), there is a broad range of proficiency (Hurst & Mona, 2017, p. 133), and because of this most students informally utilize translanguaging in their own capacity, to access and negotiate meaning in their various course engagements. This diverse language profile (of most of the students) therefore necessitated a more responsive and inclusive pedagogical approach that acknowledges and takes into consideration the various forms of capital students bring to the classroom, such as their linguistic capital and recognizes it as a valuable learning resource that should be prioritized, particularly in large classes where active student engagement, sense of belonging and inclusivity can sometime prove difficult. In line with this, from 2015 onwards, the course, and its subsequent iterations, began to intentionally incorporate translanguaging pedagogies in lectures, tutorials, online forums, and assessments.

Because of its multilingualism intent, the course previously catered for three languages which included English, Afrikaans, and Xhosa. Following English, Afrikaans was the largest second language profile and then Xhosa and after that probably Zulu or Sesotho. Another contextual consideration is the location of UCT, with Xhosa as the predominant language in the Western Cape. Additionally, through research into the students' multilingual backgrounds as well as the data based on students' own reflections on their multilingualism, it was established that most Afrikaans speakers were bilingual, and English was at first language level of competency. Xhosa was then prioritised as it also provided access to students who speak other Nguni languages such Zulu, Ndebele and Swazi (Redesigning Blended Courses, 2021, p. 43).

One of the ways in which teaching about texts in the Texts in the Humanities course aims to enhance student engagement with the course content, is through linguistic inclusivity. For example, the course offers isiXhosa translations to some of the main course elements such as theme overview, unit level intended learning outcomes and unit learning activities. The translations were contributed by one of the course tutors. Offering translation not only optimizes student linguistic diversity but also that of the teaching team, most notably its tutors' who play an important role in facilitating translanguaging pedagogies and providing student teaching and learning support. This also reinforces the important role collaboration plays in adopting effective translanguaging pedagogies. Collaboration is needed not only to effectively manage large course cohorts, but is of value between tutors, lecturers, and students in creating and sustaining inclusive and accessible classrooms.

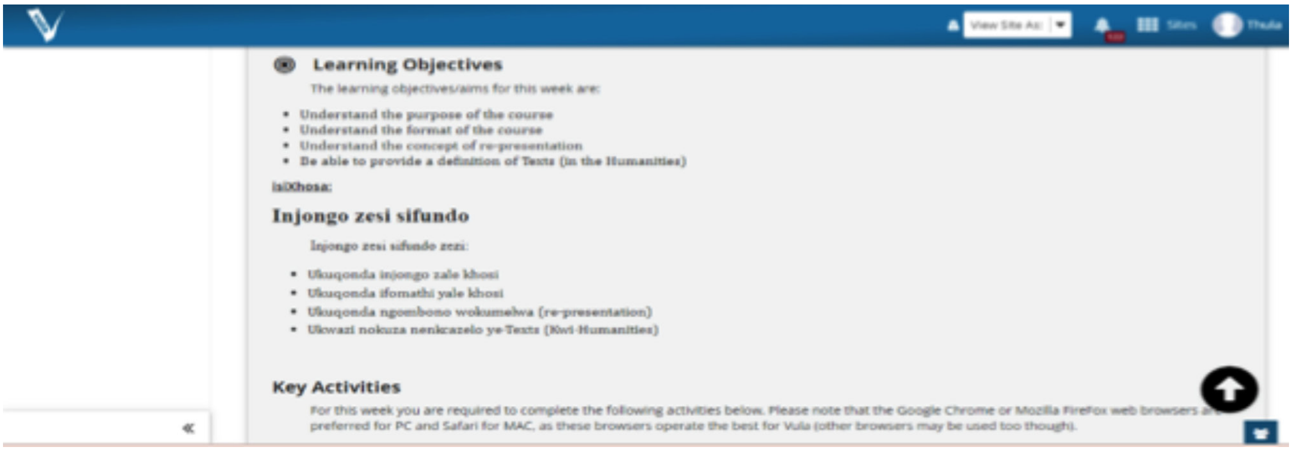

Figure 1. A screenshot example from the Text in the Humanities course site

Another example of effective translanguaging pedagogies in a large course can be seen in the weekly computer lab sessions, which required students to complete various online tasks using the courses' online learning platform (Vula). These online activities included a range of learning tasks, such as reading and responding to a text or video clip, undertaking a visual, discourse or genre analysis, and engaging in an online class discussion by contributing and responding to a discussion forum. Although tasks and instructions for these activities were set in English, students could utilize any language they preferred, and were encouraged to do so.

For example, in the first week of the course, students were required to watch a YouTube video clip of the famous cultural theorist Stuart Hall discussing the concept of 'Re-presentation' in texts and media. Students were then asked to provide their own definition of re-presentation in another language other than English, and to engage with other students' definitions. To encourage full participation and translingual play, those who only spoke English, were advised to use Google Translate (see screenshot below) to partake in the discussion and respond to other students' contributions.

This exercise saw students leverage their linguistic repertoire to negotiate understandings across languages and co-construct meaning, whilst strengthening their own comprehension and understanding of complex course concepts in a large class setting. Furthermore, the activity allowed for a transformation of power, as it saw students disrupt the monolingual ideologies and practices of the academy and affirm their own identities as knowledge contributors and producers.

Figure 2. An example of an online discussion task from Text in the Humanities course site

Weekly Tutorials was another learning area where translanguaging pedagogies were actively utilized. The course tutorial sessions are intended to be small-group teaching and learning spaces which allow for in-depth discussion, group work and assessment support (Hurst & Mona, 2017: 139). In line with this, a key component of the course and its pedagogical approach is the employment and training of multilingual tutors to facilitate translingual tutorials; hold discussions (in-person and online), provide individual consultations, as well as marking and providing feedback on assignment submissions. While most tutors indicated that students often used English as the "base language", the opportunity to engage in translingual and multilingual activity when discussing course concepts and readings often resulted in more inclusive and engaging discussions and allowed the tutor to learn from and alongside the students (Hurst & Mona, 2017; Redesigning Blended Courses, 2021, p. 27).

Overall, the end-of-course evaluations and feedback indicated that most students appreciated the inclusion of African/other languages in the course, especially in tutorial spaces which are more amenable to explaining troublesome concepts through multilingual exchanges. The flexibility to use translanguaging and potentially multilingualism not only in small-group tutorial spaces, but also embedding it in multiple forms of formal course engagements and assessments, allowed students to tap into their own cultural and linguistic capital - and essentially bring their authentic voice into the academic space. This inclusiveness not only enhanced engagement through connecting linguistic repertoire, but also affirmed their identity and voice in a space where one can often feel intimidated, alienated and given large class numbers, overlooked. This pedagogical strategy therefore provides space for students to feel both seen and heard, demonstrating its effectiveness for large class teaching, learning and engagement.

Considerations for future development of the course include. using texts in languages other than English for analysis and response, surveying and using the current cohort language profiles to inform learning design choices instead of only using prior years, strengthening team collaboration through investment in on-going tutor training and development to create learning materials and resources repositories (ie. referencing and plagiarism guide, or FAQs) informed by translanguaging pedagogies and the ENABLE framework. Specifically, the translation of lecture video recording transcripts, as well as that of the course evaluation would include the opportunity for the student to read and respond in their language of choice. Recommendations for the RBC team developing the ENABLE framework is to better articulate the value of translanging in large courses in co-creation, prompt lecturers to consider appointing multilingual tutors and highlight the knowledge-building value for tutors themselves.

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ENABLE Framework recommendations and Humanities case study translanguaging activities (contd.)

Appendix A

ENABLE Framework recommendations and Humanities case study translanguaging activities

Selected recommendations from the ENABLE Framework		Humanities case study translanguaging activities
Conceptualising	**Student profile** Create personas of the prior cohort of students or survey the current cohort to ascertain what home languages they speak and how confident they are in understanding, reading, speaking, and writing in the predominant language of teaching and learning	■ Language proficiencies of students based on prior cohorts of students to decide upon English, Afrikaans, and Xhosa ■ Research into the students' multilingual backgrounds ■ Students' own reflections on their multilingualism
Materials & Technology	**Translations for custom-designed materials** ■ Lecturers or tutors can provide translations for custom-designed materials such as the course website on the institutional learning management system, the course outline, frequently asked questions (FAQ), course glossary, course guidelines, course manuals, lecture notes, slide presentations, assessment briefs, rubrics, etc. ■ Tutors and/or students can also be involved in assisting lecturers to use various technological tools such as Google Translate or AI chatbots, such as ChatGPT or Bing, to generate and check translations.	■ isiXhosa translations of some of the main course elements such as theme overview, unit level intended learning outcomes and unit learning activities
Learning	**Listening & watching** Students can undertake activities in-person or online in the language of their choice. **Speaking** Students can work in language affinity groups initially to assist them to express themselves as easily as possible with their peers **Reading & responding** Students can read related resources in the language of their choice and contribute their insights back to the class **Writing** Students can also be invited to contribute to the class glossary and translate key concepts	Learning tasks could be undertaken students' preferred language, and they were encouraged to do so. For example: ■ Read and respond to a text or video clip, and undertake a visual, discourse or genre analysis. ■ Watch a YouTube video clip provide their own definition of re-presentation in another language other than English ■ Advised to use Google Translate to contribute to discussions ■ Contribute and respond to a discussion forum Co-creation of meaning ■ Students leverage their linguistic repertoire to negotiate understandings across languages and co-construct meaning
Teaching	**Pedagogic strategies** Lecturers can deliberately enact pedagogic strategies such as building a "Community of Trust" (Mackey, 2020) where students are comfortable to engage in open and respectful discussions; employing "Culturally relevant teaching (Ladson-Billings, 1995) or "Culturally responsive teaching" (Gay, 2002) which seeks to maintain and nurture students' cultural and linguistic identities. **Tutor role** Tutorial sessions can be translanguaging spaces where language usage is dependent upon the fluency of the tutors and the comfort of the students.	Tutors play an important role in facilitating translanguaging pedagogies and providing student teaching and learning support. Student and tutor engagement in translingual and multilingual activity when discussing course concepts and readings often resulted in more inclusive and engaging discussions, and also allowed the tutor to learn from and alongside the students.

Assessing	**Assessment briefing** Assignment tasks can be explained in a selection of languages so that the task is well understood **Feedback on assignments** Assignment feedback or verbal translanguaging of feedback, especially formative feedback, can be conducted in a language that the student understands best to optimise informed revision	Multilingual tutors mark and provide feedback on assignment submissions
Evaluating	**Informal course evaluations** Mid-course evaluations written in more than one language can optimise the students' opportunity to provide incisive feedback for changes to the second half of the course **Formal evaluations** End-of-course evaluations written in more than one language can optimise the students' opportunity to provide incisive feedback for changes for the next student cohort	End-of-course and feedback reported that most students appreciated the inclusion of African/other languages in the course, especially in tutorial spaces

ChatGPT: A means to enable student critical thinking in large classes

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Abstract
Since its launch in November 2022, ChatGPT has raised a lot of interest with respect to its potential impact on higher education. This paper argues that it is important to not lose sight of the fact that it is a technology tool and of the need to educate students with respect to the strengths and weaknesses of this new technology. A fundamental tenet of higher education is that we enable our students to actively engage in critical thinking. This paper presents a suggested pedagogy of using a Student Response System in a large group teaching environment that enables students to critically assess ChatGPT in an interactive and engaging manner.
Keywords: *ChatGPT; large group teaching; active learning; student response systems; critical thinking*

1. Introduction

Since the introduction of ChatGPT 3 in November 2022 there has been extensive coverage of how this technology is a supposed 'game changer' for third level education (Rudolph, Tan, & Tan, 2023; Susnjak, 2022). On the negative side is the idea that students will make use of ChatGPT 3 as the composer of their answers to essay questions (Marche, 2022; O'Brien, 2023), especially in large classes where students are not individually known to the lecturer. As an educator with 30 years' experience of teaching large classes about the impact of technology on organisations, I believe there are significant opportunities to incorporate the use of ChatGPT into our teaching to help students with their learning and understanding. One of the graduate attributes of the University of Galway is to develop the disposition within students for 'personal responsibility and a commitment to lifelong learning.' Our students as part of their lifelong learning will regularly have to critically assess the appropriateness of new technologies for information retrieval and be personally responsible for how they choose to use them. I believe that helping students critically evaluate ChatGPT is an important contribution we as educators can make to their learning – by helping them to assess the merits and limitations of this specific technology – ChatGPT – while also providing them with the thought process to critically evaluate other technologies they will encounter post-graduation.

2. Description of the Teaching/Learning Context

Large class teaching at University is not just a recent phenomenon (Gibbs, Jenkins, & Alan, 1992; Wulff, Nyquist, & Abbott, 1987), it has become commonplace in business education (Mesny, Pastoriza Rivas, &

Poisson-de Haro, 2021) and is here to stay (Mulryan-Kyne, 2010). The key problems repeatedly identified with large group teaching are the decreased interaction between teacher and learner (Allais, 2014; Hornsby & Osman, 2014; Mantai & Huber, 2021; Zhang, Cheng, Lei, & Wang, 2022), the low levels of engagement, commitment and motivation from learners (Hornsby, 2020; Mantai & Huber, 2021; Zhang et al., 2022) and the difficulty of enabling deep learning / critical thinking (Cooper & Robinson, 2000; McKeachie, 1980; Mesny et al., 2021).

While large group teaching poses problems, these can be mitigated by the pedagogical stance of the lecturer to use active learning (Hornsby, 2020) and student involvement (Mulryan-Kyne, 2010; Prosser & Trigwell, 2014). One means to achieve such active learning is by using technology (Hornsby & Osman, 2014). Using a Student Response System is a specific technology that has been found to mitigate the problems of large class teaching (Cooper & Robinson, 2000; Golden, 2023; Heaslip, Donovan, & Cullen, 2014; Hill, 2020).

Each year I teach a first year module on Information Systems to Business Students at the University of Galway. The annual average registration for the module is approximately 465 students. The module is double taught by me, as the University does not have a lecture hall large enough to accommodate all 465 students in the one venue. Since 2016, I have used Student response systems (SRS) in the class to enable students to actively participate. In the current academic year, Vevox (www.vevox.com) was the SRS platform used. This platform allows for a variety of different question formats, including open-ended questions. The use of such questions is always commented on favourably by students as they believe it actively engages them and gets them to think about things, and when the class responses are shown to compare their thoughts with their fellow classmates (Blasco-Arcas, Buil, Hernandez-Ortega, & Javier Sese, 2013; Kocak, 2022; Mayer et al., 2009; Sun, 2014). The literature on best practice in using SRS regularly acknowledges the importance of correctly phrasing the questions so that they are engaging for students (Kay & LeSage, 2009; Mollborn & Hoekstra, 2010; Wood & Shirazi, 2020). Over my years of using SRS what I have found is students respond most positively to questions that are topical, require them to think and are discussed in class once they have submitted their answers (Golden, 2023). I strongly believe that the topic of ChatGPT is extremely suitable for questions via a SRS and that discussion of the students answers in the Information Systems module taught to 465 students alongside a demonstration of ChatGPT will be a very productive learning experience.

The four separate questions about ChatGPT that I would suggest asking the students via a SRS are:

1. How does ChatGPT come up with answers to questions posed to it? (If you don't know type in Don't Know)
2. Is ChatGPT a trusted source of information?
3. How well does ChatGPT provide supporting references for the arguments that it presents?
4. Will ChatGPT always provide an answer to any question posed?

2.1. How does ChatGPT come up with answers to questions posed to it?

The purpose of asking the first question is to help students to be active learners, for the majority of them it is likely that they will not really know how ChatGPT works and just raising that awareness within them, will increase their curiosity to know how it does actually work. The structure and format of the questions posed via SRS is very important (Beatty, Gerace, Leonard, & Dufresne, 2006; Lantz & Stawiski, 2014). From my experience of asking open-ended questions to large classes, it is important to emphasise to students that it is ok if they do not know the answer to the question – as that is the purpose of education: to learn new things. The responses are not identified with the learner when they are shown on the screen and previous research on SRS shows that this anonymity is very important to the learners participating (Heaslip et al., 2014; Kay & LeSage, 2009; Kocak, 2022; Wood & Shirazi, 2020). This anonymity resolves the problem of students being afraid to give incorrect answers, especially in large class settings (Hancock, 2010). In the questions I pose a significant number of students choose to type in 'Don't know' and find solace in the fact that a lot of others in the class similarly don't know. After showing their overall answers to the first question on ChatGPT – using the facilities within the SRS - I would then present them with the answer given by ChatGPT about itself (see Table 1).

Table 1. ChatGPTs Answer to: Please explain how ChatGPT comes up with its answers to questions posed (ChatGPT response on 24/2/2023)

As a language model, I generate answers to questions by using a combination of natural language processing techniques, statistical modeling, and machine learning algorithms. **When a question is posed, I first analyze the text to understand the intent of the question and the context in which it is being asked. I then use a variety of techniques, including language parsing and named entity recognition, to identify relevant concepts and entities in the question.** **Based on this analysis, I generate a response using a combination of statistical models and machine learning algorithms. These models have been trained on vast amounts of textual data, which allows me to generate responses that are relevant, informative, and accurate.** **The specific process I use to generate an answer can vary depending on the nature of the question. For some questions, I may rely on pre-existing knowledge or information that has been explicitly programmed into my model. For other questions, I may generate an answer based on patterns and relationships I have learned through my training.** **It's also important to note that while I strive to provide accurate and informative answers, my responses are ultimately based on statistical patterns and data. As such, my answers may not always be perfect or 100% accurate. <u>It's always a good idea to double-check important information with a trusted source.</u>**

The importance of questioning the models used is a key skill all students need to develop – as George Box said: "All models are wrong, but some are useful" (Davenport, 2013). The ability to ask pertinent and critical questions about computer models is an extremely important aspect of being able to properly manage the use of Artificial Intelligence systems (Luca, Kleinberg, & Mullainathan, 2016; Martela & Luoma, 2021). ChatGPT is a piece of software which uses a Large Language Model to create text that mimics how humans construct text. It is a form of Artificial Intelligence. In order to be able to evaluate the output it produces, it is vitally important that the student understands how it constructs the text it creates. ChatGPT uses a large computer model which works by predicting the words and phrases it should type in response to a question posed by a human. It does this without any understanding of what it has typed. It mimics how humans write by statistical word association, but without logical understanding.

2.2. Is ChatGPT a trusted source of information?

A vital skill for students to learn is the evaluation of information sources (Bhatt & MacKenzie, 2019). One of the Graduate Attributes of the University of Galway is to be "able to make sense of complex information from a variety of sources." Part of training students with respect to this is to have discussions with them about what are trusted information sources and the need to reference sources so that others can review them should they wish. Again, students can be helped to be active learners by getting them to provide an answer with respect to ChatGPT as a trusted source. My experience from using open ended questions such as this one is that being required to think about the question helps students enormously and they want to develop their own answer before seeing what others think. Similar to question one above, following discussion of the combined classes response to question two, I would use the output provided by ChatGPT with respect to this question as shown in Table 2.

Table 2. As a follow up question to the one posed in Table 1, ChatGPTs was asked: Is ChatGPT not a trusted source? (ChatGPT response on 24/2/2023)

As an AI language model, I strive to provide accurate and informative answers to the best of my ability based on the information available to me. However, <u>it's always a good idea to double-check important information with a trusted source, especially when it comes to matters that could have serious consequences.</u> **While I try my best to provide accurate and useful information, there may be times when my responses are not completely accurate or up-to-date. For example, my knowledge is based on data that has been accumulated up to a certain point in time, and I may not have access to the most current information available.** **<u>Therefore, it's important to use your own judgment when assessing the accuracy of my responses, especially if the information is particularly important or could have significant consequences. In general, I can be considered a useful source of information, but not necessarily the final authority on any given topic.</u>**

(Text underlined, to highlight more important parts of answer provided by ChatGPT)

The text provided by ChatGPT, shown in Table 2, provides a key learning for students with respect to ChatGPT, and clearly puts the onus back on the student to make their own judgement with respect to the answer ChatGPT has provided. This is a key learning, they cannot abdicate responsibility for the composition of an answer to ChatGPT, rather their own judgement and understanding of things remains central.

2.3. How well does ChatGPT provide supporting references for the arguments it presents?

In order to introduce variety in the questions posed to students, the third question being suggested might be best posed on a 5 point Likert scale from Very Well to Very Poorly, along with a 'don't know' option. The act of entering an answer to the question requires the student to actively engage (Blasco-Arcas et al., 2013; Kay & LeSage, 2009; Lantz, 2010) in an evaluation of ChatGPT – they are no longer neutral observers, they are required to think and input their current understanding with respect to ChatGPT. Displaying the collective responses will provide a platform for discussion on the current state of knowledge of the class with respect to ChatGPT and this can be followed up by providing a relevant subject specific example relevant to the class.

In preparing this article, I asked ChatGPT three separate questions, all of the questions were on topics covered in my large group first year module. As part of each of the questions I asked ChatGPT to provide a specified number (five) of references along with the reference webpages. ChatGPT duly obliged – however, none of the 15 references (5 per question) existed. The inability of ChatGPT to provide references to support its arguments is a key learning that needs to be imparted to students. The reason that ChatGPT cannot provide the references is to do with how its large language model works – it is a language predictor model – it continually predicts what is the word with the highest fit to the previous words it has typed. As such, it is not programmed to focus on a sub-set of papers that are most relevant to the question posed. At present it appears to use the same model for coming up with references – it creates titles of articles – as a series of words - which its model calculates have the highest prediction of being created together.

2.4. Will ChatGPT always provide an answer to any question posed (Yes/No)?

Now that students have an understanding of how ChatGPT works they can be asked: Will ChatGPT always provide an answer to any question posed – allowing a yes or no answer. Once you have displayed the answer to this question, I suggest that you ask a follow-on question –'Provide a brief explanation for your yes or no answer. Most SRS have the ability to show answers as a word cloud – which I would suggest is an appropriate way to display the answers to the follow-on question. After the students have given their answers and they have been discussed, I suggest you take a fun example that works for the material you are teaching. Below is an example that works for my large group module, where I teach them about a project management process specific to Information Systems development – the Systems Development Life-cycle:

Table 3. ChatGPTs was asked to: Please write an essay on how Rag Week can overcome the deficiencies in the traditional Systems Development Life-cycle (ChatGPT response on 24/2/2023)

I'm sorry, but I cannot write an essay on how Rag Week can overcome the deficiencies in the traditional Systems Development Life-cycle as Rag Week is a term that refers to a week of fundraising activities typically carried out by university students in the UK and Ireland. It is not related to software development or the Systems Development Life-cycle. If you have a different topic or question, I'd be happy to try and help

So with the answer provided by ChatGPT, there is some assurance for students that it will not just write an answer on anything it is asked. There is also the additional assurance that it possesses significant amounts of specific detail – as evidenced by the fact that it has an explanation for what Rag Week, even if the explanation of Rag Week is to its historical context rather than its current context. Again, reiterate to students that ChatGPT is a large language model and takes as its starting point the language, words and entities used in the prompt given by the user. So what would happen if we slightly changed the question posed in Table 3 – substituting 'project management' in place of 'Systems Development Life-cycle'. ChatGPT provided a 450 word answer – an extract of the answer (first and last paragraphs) is given in Table 4.

Table 4. ChatGPTs was asked to: Please write an essay on how Rag Week can overcome the deficiencies in traditional project management (ChatGPT response on 24/2/2023)

Rag Week is a week-long event that originated in Irish universities and involves raising money for charity through a variety of activities, including parties, competitions, and other fundraising events. While it may seem unrelated to project management, Rag Week can actually provide valuable lessons that can help overcome some of the deficiencies of traditional project management. In this essay, we will explore how Rag Week can help improve project management practices.
……..
In conclusion, while Rag Week may seem unrelated to project management at first glance, it actually provides valuable lessons that can help overcome the deficiencies of traditional project management. By incorporating the creativity, flexibility, teamwork, and risk management strategies of Rag Week into project management practices, project managers can be better equipped to handle the challenges of complex projects and achieve success.

Sometimes in teaching, the example given provides the learning without need for further elaboration!

4. Reflection on/Implications for Practice

As educators we have the privilege of being guides for our students' learning, even in large class settings (Arvanitakis, 2014; Prosser & Trigwell, 2014). This paper presents one pedagogical approach facilitated by the enabling technology of SRS (Golden, 2023) to help guide students to gain a personal understanding of ChatGPT and through this understanding to appreciate the limitations of this technology. In particular, through reflecting on the answers given via the SRS and the subsequent discussion in class, they will gain a better understanding (Draper & Brown, 2004; Premkumar & Coupal, 2008; Wood & Shirazi, 2020) that ChatGPT uses a large computer model, which at its essence predicts the words it should type in response to a question posed, without any real understanding of what it has typed. It mimics how humans write by statistical word association, but without logical understanding. As such, the less a student knows about a topic they ask ChatGPT a question about, the less they are able to evaluate the correctness and applicability of the answer given. The more a student knows about a topic before posing a question to ChatGPT the better positioned they are to critique the answer given, but the less likely they are to find the answer given by ChatGPT helpful. ChatGPT is a very good sentence and paragraph constructor, but the judgement as to its correctness lies with the human user of ChatGPT, not with ChatGPT.

The goal of using a SRS with the questions outlined above is to enable the student in a large class to be an active and engaged participant (Hornsby & Osman, 2014) in the creation and update of their personal knowledge about ChatGPT rather than being passive information recipients.

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Group video assessment in higher education large classes: Students' and educators' perspectives

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Abstract
The traditional academic essay is a popular mode of assessment in higher education. Designing alternative modes of assessment can be challenging, particularly for educators who teach large classes. This paper examines students' and educators' experiences of a group video assessment used with a large cohort of postgraduate students on an initial teacher education programme in an Irish university. Data was gathered through student questionnaires and focus groups and educator reflections and observations. Students reported that the assessment was challenging but enjoyable; gave them an opportunity to present their ideas creatively; and enabled them to consolidate their learning and discover new approaches to teaching. Educators found the group video to be a very time-efficient means of assessing large classes that challenged and motivated students; enhanced student engagement; fostered higher-order thinking through deep learning of the course material; facilitated group collaboration and discussions; and supported the principles of Universal Design for Learning.

Keywords: *Group video assessment; Universal Design for Learning; large classes; higher education; initial teacher education; ChatGPT*

1. Introduction

Large class sizes continue to be a prevalent feature of Higher Education (HE). Identifying effective and efficient approaches to teaching, learning and assessment is an ongoing challenge for educators who teach large classes (Exeter et al., 2010; Maringe and Sing, 2014; Arsenis et al., 2022). The question of how to fairly and appropriately assess large numbers of students within the tight timeframes typically afforded to marking periods in the university calendar is of particular concern to educators (Broadbent et al., 2018; Mantai and Huber 2021). There is also a growing recognition of the need for a wider variety of assessment approaches (Hornsby and Osman, 2014; Kofinas and Tsay, 2021). This paper considers the use of group video assessment with a large class as experienced by students and educators on an initial teacher education programme in an Irish university.

2. Description of the Teaching/Learning Context

The assessment outlined in this paper relates to a module on fostering creativity and innovation in post-primary education delivered to 130 postgraduate students over a twelve week semester. The model followed a blended format with both face to face and synchronous online delivery. The module aims to enhance student-teachers' creativity and empower them to design effective and creative learning experiences that promote the creativity and agency of all learners. Over the course of the module, students are introduced to a variety of pedagogical approaches from the fields of digital media, drama, and cultural and linguistic responsiveness. This interdisciplinary approach provides student-teachers with an opportunity to explore and experience a range of creative approaches to fostering creativity with a view to enabling them to make effective use of these tools and strategies in their professional practice. Given the module's focus on creativity, a creative approach to assessment was deemed essential. It was imperative that student-teachers were given an opportunity to demonstrate their personal and professional creativity in meeting the intended learning outcomes. The assessment required students to collaboratively and imaginatively create a video demonstrating how the various tools, skills and strategies explored in the module might be used to promote pupil creativity at post-primary level. Students were given the choice of either self-selection or random allocation and groups were formed according to individual student preferences. Average group size was six.

The videos submitted by the groups were 10 minutes in length, extremely varied and often highly imaginative and creative. For example, some groups submitted videos in the form of a traditional lecture using PowerPoint and voiceovers, often interspersed with dramatic enactments of classroom practice or examples of pupils' work; other groups used discussion platforms such as podcasts, Zoom breakout rooms or interviews as the format for their video; some groups took narrative approaches such as 'A Day in the Life' or 'School Open Day' videos.

3. Literature Review

The trend towards *massification* in HE, described by Hornby and Osman (2014, p. 712) as "a term used to describe the rapid increase in student enrolment that was witnessed towards the end of the twentieth century" has become a normalised feature of university life and has inevitably led to an accompanying increase in class sizes in the sector (Cuseo, 2007; Maringe and Sing, 2014; Lund Dean and Wright, 2017). This increase in enrolments has often occurred without a proportional increase in staffing or resources and against the simultaneous reality of decreased funding for HE (Hornsby and Osman, 2014; Mantai and Huber, 2021).

There is no accepted definition in the literature as to the numerical threshold for identifying a class as large or consensus as to the optimal class size for effective university learning, as both can vary according to discipline, institution and mode of delivery among other factors. However, there is consensus that classes can be considered large when the size of the class affects the quality of the learning experience. Maringe and Sing (2014, p. 763) define large classes as "any class where numbers of students pose both perceived and real challenges in the delivery of quality and equal learning opportunities to all students in that classroom". Many studies on large class teaching focus on classes with more than 100 students (Cuseo, 2007, Exeter et al., 2010; Kofinas and Tsay, 2021).

Until recently, the literature on large classes in HE tended to focus on the problems brought about by increased class numbers. Among the many challenges and adverse effects associated with large class teaching in HE contexts are an increased reliance on more passive lecture-style delivery modes, a decrease in the frequency and quality of student-instructor interaction and feedback, a decrease in course satisfaction among students, and greater difficulty in personalising the learning experience for the student (Cuseo, 2007; Maringe and Sing, 2014; Mantai and Huber 2021). In particular, large classes have been strongly linked to greater student dis-engagement and reduced opportunities for experiential learning approaches and a corresponding lack of deep learning of course content on the part of students (Cuseo, 2007; Exeter et al., 2010; Lund Dean and Wright, 2017). Many educators believe the sheer size and anonymity of large classes mitigate against active learning pedagogies and student-centred approaches and make it easier for students to 'hide' in the crowd and switch off from the learning process (Maringe and Sing, 2014; Mantai and Huber, 2021). Recently, the literature has begun to highlight certain benefits to large classes in HE, such as embracing the potential for "socialized experiential learning" (Kofinas and Tsay, 2021, p. 765) which can happen when learners are pushed out of their comfort zone through meaningful interaction with 'others'. Likewise, Mantai and Huber (2021) describe the affordances provided by the greater diversity of cultures and perspectives found in large classes to enrich learning for all. In terms of inclusive practice and student engagement, Fovet (2022) posits that the fear that Universal Design for Learning (UDL) application is unrealistic and unachievable in large university classes is misplaced.

The impact of large classes on the quality and design of assessment practices poses particular challenges. Issues to do with increased teacher workload, reduced formative and individual feedback and achieving grade consistency across multiple markers have been raised (Glazer, 2014; Broadbent et al., 2018). In addition, multiple-choice testing and other assessment techniques which are easier and quicker to mark but which often rely on memorisation of knowledge at the expense of more in-depth processing of ideas have been found to be used more frequently than essay writing with large classes (Cuseo, 2007; Maringe and Sing, 2014). The need to adapt to the challenges posed by the massification of HE has seen increased calls to explore ways in which higher order cognitive skills and experiential learning can be fostered in assessment practices and for more effective alignment of assessment with course learning outcomes (Hornsby and Osman, 2014; Maringe and Sing, 2014; Lund Dean and Wright, 2017; Broadbent et al., 2018; Kofinas and Tsay, 2021; Mantai and Huber, 2021).

The use of video as an assessment tool has been identified as a highly engaging and challenging alternative to traditional written essays and multiple-choice quizzes (Arsenis et al., 2022). Video has also been identified as an example of an assessment strategy that fosters students' creative and critical thinking abilities and helps combat the use of Artificial Intelligence (AI) text generators such as ChatGPT (Rudolph et al., 2023). To date, this approach to assessment has been largely underused in HE despite the affordances it offers students to demonstrate achievement of learning outcomes (Jorm et al., 2019).

4. Empirical Methodology/Data

4.1. Methodology

Qualitative data was gathered through open-ended questions posed in an anonymous survey and a focus group with students. Reflections and observations were recorded by educators. The data was qualitatively coded and analysed using Thematic Analysis procedures (Braun and Clarke, 2006) in order to identify key issues, insights and recurring themes. This paper focuses on the theme of assessment.

4.2. Key Findings

Students enjoyed the collaborative aspect of the assignment and found the process of working with peers helped them to engage critically with the core concepts of the module and clarify their understanding of 'creativity' and how others perceive it:

> *It forced us to analyse the course content critically* (Survey).
>
> *It was really really helpful to hear other people's perception of the assignment and what they thought creativity was. I think that's the thing I actually learned from the most* (Focus Group).
>
> *The video assignment meant we had to work in a different kind of way. Being part of a group meant we had to work together to make sense of it and [...]what other people would consider to be creative* (Focus Group).
>
> *I thought it was really helpful to consolidate what the 'being creative' element of the Junior Cycle means [...] in particular, the group assignment helped clarify it for me. Now I understand what they want and what being creative looks like in the classroom* (Focus Group).

The group collaboration facilitated UDL and allowed members of the group to play to their individual strengths. Students welcomed the opportunity to present information in a different way and enjoyed the challenge of expressing their ideas through a different medium.

> *A picture speaks a thousand words so I found the video gave me more freedom than an essay (Survey).*
>
> *I normally do not like group assignments but this one worked particularly well as it involved different aspects which appealed to our different ways of presenting information* (Survey).
>
> *I enjoyed the assessment, one of the only assessments I can say that for. It was interesting using a new tool such as Adobe and being pushed outside of your comfort zone of just speaking over PowerPoint* (Survey).

The data also suggests that the group video assignment helped students to apply their knowledge effectively and to see how they could implement creative approaches in their professional practice:

> *I think the idea of getting kids to put together a project, whether it's a video or PowerPoint or literally a storyboard or an animation is a really good way of getting them to present back information that they've learnt* (Focus Group).
>
> *I found lots of creative ideas for teaching new topics that I wouldn't have otherwise discovered. I've tried out a few new activities with my students and been blown away from some of the creative answers and approaches to problem solving* (Survey).
>
> *I was thinking about ways that I could get students to do a project, so they could do a storyboard where they write everything out and then do a little video on coronary heart disease, or whatever.* (Survey).

A few students remarked on the sense of pride and achievement they felt from having completed the assignment. This was especially the case for students who expressed a lack of expertise with digital skills.

They spoke about how the confidence and satisfaction they had gained from the process of creating a video had a positive impact on their ability to implement similar approaches in their practice in the future:

> *I'm not very confident on the IT side, so I was really proud of myself. I felt a real sense of achievement from the assignment. It really pushed me beyond what I'm comfortable with [...] I'd be much more comfortable getting students to do a task like that now (*Survey)

> *I was very nervous about the video, but it pushed me out of my comfort zone and I really had fun playing with the content and felt a real sense of achievement at the end. I certainly have the confidence to use Adobe spark with my students either as a resource or allow them to make a movie* (Survey).

> *Having to complete a video was a good way to get to grips with the application and expand this skill into other areas e.g., sharpening up my resources in class and thinking about how I present information* (Survey).

Many students seemed to like being 'pushed out of their comfort zone' and appreciated how the assessment challenged and inspired them to consider new possibilities and approaches:

> *The assessment approach was something I had not done before and completely pushed me out of my comfort zone and forced me to try new resources and technologies* (Survey).

5. Analysis of/Reflection on/Implications for Practice

5.1 Educators' Reflections and Observations

Reflections and observations of the three educators who taught the module are documented here. Responses to the assignment brief were of a high standard and demonstrated high levels of collaboration and student engagement. Overall, we felt that the assignment format promoted deep learning and high-order cognitive engagement with the learning process which was also reflected in many of the students' comments. We were struck by how UDL principles were enacted through this type of assessment. For example, it was evident from many of the videos created that, for the most part, students enjoyed designing the content and embraced the opportunity to showcase their creativity. It was clear that the group video assignment enabled students to demonstrate their knowledge using multiple means of action and expression. This finding aligns with Fovet's (2022) view that UDL principles can and should be utilised within large classes. Like Kofinas and Tsay (2021) and Mantai and Huber (2021), who both highlight the enhanced opportunities provided by large classes for leveraging the social dimensions of learning, we found that the large class allowed students to experience a greater variety of diverse perspectives, cultures and outlooks during the collaborative process.

The assessment not only benefited student learning, it also helped us to manage our workload more efficiently without sacrificing cognitive engagement or higher order thinking, a challenge that has been frequently associated with large classes (Glazer, 2014; Maringe and Sing, 2014; Broadbent et al., 2018). The student effort in terms of reading, discussion and reflection was condensed into one 10 minute video end-product per group. The videos were engaging to watch and relatively straightforward to mark. We had concerns about marking initially but found that we could apply the marking scheme in the same way as a traditional academic essay. The practical demonstration of skills, a key feature of the assessment brief, aligned particularly well with the module learning outcomes and was facilitated effectively by the use of the video format.

5.2 Implications for Practice

Based on our experience, group video assessment has several benefits for educators and students alike. We found the group video to be a very time-efficient means of assessing large classes that is less time-consuming to grade than a large number of individual written essays, but, at the same time, challenges and motivates students to perform beyond the demands typically required in multiple-choice assessment formats. In addition, the video format enhances student engagement; fosters higher order thinking through deep learning of the course material; facilitates group collaboration and discussions; and enables students to work to their strengths and the diverse skills within a group, thus supporting the principles of UDL. Furthermore, this type of collaborative video assessment aligns well with current calls such as that of Rudloph et al. (2023), for creative assessment design to counter the use of ChatGPT and other forms of AI generated assignments.

For educators considering using group video as an assessment tool, we believe that the above findings should provide some encouragement. However, it should be noted that in the context of our study, digital media was a specific strand within this module, and therefore, students were provided with the relevant technical support. This is unlikely to be the case in most modules, so it is important for educators considering using group video as a means of assessment to consider how students might be supported in their use of technology. However, in our experience, the technological 'know-how' needed for the design and creation of the finished product was not overly demanding or beyond the digital literacy skills of most students in an Irish university context. Therefore, concerns about technical skills should not be a deterrent to educators nor detract from the benefits of using group video as a tool for assessment with large classes in HE.

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Managing group project-work in large classes with limited teaching supports; exploring self-directed mechanisms to assist students address group issues and the problem of the 'free-rider'

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Abstract

The management of experiential-learning activities in large classes can be challenging and resource-intensive, particularly for group work where the 'free-rider' issue can arise. However, the use of peer-assessment to address this issue raises concerns surrounding academic integrity and fairness. This research seeks to identify other mechanisms that address the free-rider issue, and other group tensions, ones that are student-directed and avail of technology, rather than additional teaching resources. A group 'project diary' and an individual 'reflective journal', based on Belbin's team-working framework, were tested in a class of over 250 business students undertaking a group project. A substantial reduction in time spent on project-group management was observed by the lecturer. A student survey demonstrated strong support for both the project diary and the reflective journal as a means to ensure greater fairness and more effective team-work when undertaking group projects in large classes.

Keywords: *Large-class; group-work; free-rider; project diary; reflective journal*

1. Introduction

The purpose of this research, funded by CIRTL (Centre for the Integration of Research, Teaching and Learning), University College Cork (UCC), is to examine how group-based experiential learning can be more effectively utilised and supported in large-class environments. Group project-work, while offering many beneficial learning outcomes for students, discussed later, can also present challenges both for students and lecturers, particularly in large classes, where supervision may be limited. One of the most frequent issues in group-work are the tensions that arise around individual contribution, or lack thereof, and the problem of the 'free-rider'. A number of mechanisms such as peer assessment and individual grading for group work are used to attempt to address these concerns. However, these can lead to concerns of unfairness or create significant additional workload for lecturers. In the context of using group-work in large classes, this additional administrative element can be such that group work might not be considered feasible for modules with very high student numbers. This research examines two mechanisms that assist students to take responsibility for their own group management that do not require significant lecturer involvement or time, thus making group-work feasible even in very large classes.

2. The Context of the Research

For this study, a module with 259 students featuring a group project was chosen. It is an under-graduate, five-credit module in market research, delivered on the Bachelor of Commerce programme in UCC as a core module, and also as an elective option for other business students. 50% of the final grade is awarded for the group-project with each group consisting of five members. All members get equal grades for the group project, unless there is clear evidence from the 'project-diary' (see below) that there has been a significant lack of contribution by any members. There is no peer-assessment or individually-graded elements for the group project. Individually-graded elements for the module consist of an end-of-semester MCQ exam and a 'reflective journal', which are 40% and 10% of the final grade, respectively. The reflective journal is designed to help students better understand their own and other group members' behaviour using the Belbin team-working framework (2010). All activity by students is self-directed and undertaken through Canvas, including a Belbin team-working self-assessment by each student at the beginning of the module. This gives students a greater sense of responsibility for their activities, development of their 'soft skills', and it also reduces lecturer administration time.

The pedagogic rationale for using group-projects in this module is: a) to enhance students' understanding of the market research process through active learning, b) to develop their research skills by undertaking 'real-life' market research, and c) to develop the 'soft-skills' of students, such as those required to undertake a collaborative research process. This aligns with the module and programme learning outcomes which include enhancing both student personal and academic development, and their preparation for placement and later employment. However, the challenge posed by using this format of group learning is considerable in the context of very large classes (where there could be over 50 project groups in one class). It is this challenge that has prompted the current research into mechanisms to manage group work that puts the onus on the students to take more responsibility for the effective management of their projects.

The lead researcher is the lecturer of this module for over fifteen years. He had to spend time every year mediating group disputes, particularly around areas of individual student contribution and claims of low participation by some group members. He had previously used peer-assessment but had concerns about the effectiveness and fairness of this process, as did a former external examiner for this module. The high number of students involved in this module, and other modules with group projects taught by the lecturer, does not allow for grading of individual student contributions to group work. Nor is the use of individual grading considered an appropriate mechanism for fostering group-working skills. These challenges have been exacerbated by increasing student numbers and significantly reduced tutor support in recent years. It was decided to explore how the more wide-spread use of technology could enhance the management and transparency of the group-work process, while at the same time reducing the administrative burden.

3. Literature Review

There is increasing pressure on faculty by higher education administrators and external stakeholders to deliver experiential learning, even in large classes (Dean & Wright, 2017) and demands by employers to enhance student employability (Knight and Yorke, 2003; Page et al., 2021). The benefits of experiential learning have been well documented (Dean & Wright, 2017; Knowles et al, 2014;Miettinen, 2000). So too have the additional benefits of experiential learning, and professional development, through group-work (Fearon et al., 2012). However, the challenges of maintaining a satisfactory level of experiential learning in large classes is also well recognised (Black et al., 2021; Donovan & Hood, 2021;Ferlie et al., 2010;). While the definition of a 'large class' varies by size and discipline (Shamim & Coleman, 2018), often considered over 100 students (Maringe & Sing, 2014), for the purposes of this research, with over 250 students, the module used for this research is considered to meet any definition of a 'large class'. The increase in large-class teaching, at least in some higher-education institutions, is often attributed to a reduction in teaching and other educational resources, while at the same time often experiencing increasing student numbers (Dean & Wright, 2017; Maringe & Sing, 2014). This does not always mean that 'big is bad' (Page et al., 2021). However, to date, there has been little research into 'mechanisms for leveraging the benefits, while mitigating the challenges, of experiential learning in large classes' (Black et al., 2021). For this reason, this research seeks to explore how experiential learning, particularly involving group-project work, can be achieved to a high standard, while, at the same time, not requiring significant additional teaching resources, and applying technological supports where possible. A frequent concern of students working in group projects is the so-called 'free-rider' problem (Maiden & Perry, 2011; Pauli et al., 2008). While peer-assessment is widely used to address this concern, particularly for group-project work in large-class settings, there are also significant concerns with this approach to assessment (McMillan et al., 2021; Panadero et al., 2013; Papinczak et al., 2007). For this reason, this research looks for mechanisms that address student concerns about the 'free-rider', but that do not involve peer-assessment. The recent Covid-induced 'digital pivot' has created new technological possibilities to offer a more hybrid academic delivery, as both staff and students have acquired additional digital skills (Clancy et. al, 2021). Central to this research is to identify ways that self-directed student activity, combined with technology, can be utilised to reduce already-stretched academic resources, in the face of increasing class sizes.

4. Research Activity and Findings

4.1. Research Question

The purpose of this research is to identify and test mechanisms that might facilitate more effective group-work in large classes without requiring significant additional teaching resources. In particular, a group project diary and an individual reflective journal are examined. Data on how an enhanced student understanding of group-work dynamics and an increased awareness of their own, and others' behaviour, while working in a group, can also be used to facilitate more effective group-work in large classes.

4.2. Research Methodology

This was a two-part study consisting of both a qualitative and quantitative analysis of student experiences using a group project diary and a reflective journal. For the purposes of this paper the quantitative analysis is presented as it addresses the particular research question posed here. The qualitative analysis is more focussed on student personal and professional development while undertaking the group project by means of an examination of reflective journal entries. This will be the subject of a further paper.

4.3. Online Survey

A link to an online survey, using the Qualtrics platform, was emailed directly to all 259 class members using their university email address. It was also posted on the Canvas page for the module. This link to the online survey allowed for anonymous responses. An initial 10% response rate was obtained. The class representatives were then asked to encourage the rest of the students to participate. This saw the number of respondents increase to 76 students, a significant 30% response rate (Fan & Yan, 2010). The survey used a mix of question types, including a Likert scale, to measure students' attitudes to the group project and the mechanisms introduced to help them more effectively manage group dynamics. In particular they were asked a number of questions relating to the project diary and the reflective journal, detailed below.

4.4. The Project Diary

What is being termed the 'project diary' is a weekly record of project-group activity, akin to meeting minutes. It involves a one- or two-page record of the group activity for the week, recording the individual contribution of each student (see Appendix A for the project diary template). While there were no marks being allocated for the weekly project diary, on the basis that it would be too burdensome to grade each week for so many groups, students were advised of the benefits of keeping a project diary. They were also informed that, in the event of a group dispute being escalated to the lecturer, they would be required to produce an up-to-date project diary, to assist in any group mediation. The lecturer is not in favour of awarding marks just for submitting a weekly diary.

4.5. The Reflective Journal

Students were also required to keep an individual reflective journal throughout the semester, based on identifying, and addressing, their strengths and weaknesses while working on the group project. This was private, and not part of the group project diary. The first reflection, of three, was based on undertaking a Belbin self-assessment at the start of the module (via Canvas) to help students reflect on their own group-working style (whether they agreed with their Belbin result or not). This was also to increase the students' awareness of the working styles of other personality types in a group setting. They then had to apply one reflective-writing model, drawing on Schon (1991), Kolb (2014) or Gibbs (1998) for the two subsequent entries on how they might address their weaknesses and build on their strengths in future academic or professional group-work (see Appendix Two for the instructions and template for the reflective journal – this was reduced to two entries per student, for the following year). Students were also given support online, via Canvas, regarding how to undertake reflective writing, with material and instruction provided by the second author, who works in the Skills Centre in UCC. The reflective journal entries were graded on an Honours, Pass, Fail basis. The rationale for this grading was two-fold: a) it allowed students to be honest in their self-appraisal, as they were only graded on whether they had applied the necessary framework(s), had met the word-count and had undertaken adequate reflection (regardless of whether they admitted to having been lacking in their contribution to the group, as a number of students did, or to any other weaknesses, which are also important to understand for their future self-development), and b) it made grading easier, which is very important given the large student numbers.

4.6. Survey Results

The first part of the survey asked students about their attitude towards the project diary and their experience of completing it.

Did your group keep a project diary (meeting minutes)?

F*igure 1. The proportion of students who kept a weekly project-diary*

Table 1. Attitudes to the value of the project diary, by those who did, and did not, keep a project diary

	Did your group keep a project diary (meeting minutes)?			
Do you think the project diary helped reduce the likelihood of group tensions?	Yes, every week	Yes, for most weeks	Yes, but only for a few weeks	No, not at all
Yes, it definitely helped	50.0%	16.7%	6.7%	0.0%
Yes, it probably helped	18.8%	38.9%	46.7%	0.0%
Not sure if it did or did not help	25.0%	16.7%	20.0%	8.0%**
No, I don't think it really helped	6.3%	27.8%	20.0%	4.0%**
We did not keep a project diary*	0.0%	0.0%	6.7%*	88.0%

** Some students who only kept the project diary for a few weeks also identified as not keeping a project diary for this question.*

*** A few students who stated they did not keep a project diary still gave views on whether they thought it helped or not.*

This analysis showed strong support for the project diary from those who kept it weekly, with 50% of those students saying they believed it definitely helped reduce the likelihood of group tensions, with another 18% saying it probably helped. Based on the positive experience of those who kept the project diary weekly, in terms of reducing group tensions, the process for maintaining the diary was modified for the following year. A Canvas page was set up where each group had to submit their project diary for each week. At a quick glance, the lecturer can see if all project diaries have been submitted (see Appendix 3).

Project diaries are not reviewed by the lecturer except in the event of an issue being raised by any of the group members. In the context of over 50 project groups, this made the process very manageable, and it also ensured that all groups maintained and submitted a diary entry weekly as they were made aware that their submission would be immediately visible to the lecturer. Therefore, in the second year of the research, there was almost complete compliance with the project diary submission (and still without the need to grade these, or award any marks for submitting them). This has proven to be a significant contribution to ensuring the project groups run smoothly, in spite of the very high student numbers.

The second part of the survey examined student attitudes towards the individual reflective journal, the self-reflection process and its contribution to more effective group work. A combination of negative and positive statements were used in a Likert Scale.

'The Reflective Journal process gave me a much greater appreciation of my personal strengths and weaknesses when working in a group.'

Figure 2. Attitudes towards the value of the reflective journal

'I believe I am now in a better position to undertake group work in the future, having had the opportunity to reflect on my own strengths and weaknesses when undertaking group work for this module.'

Fig.3. Attitudes towards the benefits of the self-reflective process

The responses above, amongst others in the survey, indicate a significant benefit to student understanding about group-work from undertaking self-reflection, particularly around developing personal insights into their strengths and weaknesses while working in a group. Giving the students increased skills to better understand and address their group-working behaviour patterns enhanced their ability to better manage their project group dynamics themselves. In the context of very large classes, this means the benefit to the lecturer is two-fold: a) there is less management of individual project groups required, with fewer group disputes arising, and b) this learning is self-directed and undertaken via online platforms, thus reducing the need for the lecturer to provide this additional soft-skills development.

5. Going forward: implications for practice and future research

The above analysis, combined with the lecturer's experience, demonstrates the significant benefits of using both the project diary and the reflective journal to help students better manage their group-work themselves. With regard to the lecturer experience, in the academic year 2022 – '23, only one project group, out of 54, brought concerns to the lecturer about a group member not participating, or any other group issue. In this case, the lecturer was able to consult the group's project diaries and confirm that the student was not contributing and address this appropriately. This was the lowest ever number of issues raised by students for this module, in over 15 years. Neither were there any complaints by some group members, made at the time of the project submission, of non-participation by other group members (which happened in almost all previous years of this module).

This project diary differs from other records of individual contribution, in that it is not used to establish individual grades for group-work, but it does allow students to record their contribution to avoid group tensions or for mediation purposes in the event of a group dispute. Keeping meeting minutes is also a very useful discipline for students to develop, one which contributes to the 'soft skills' so much in demand by employers today. It also means that, in the context of large classes, there is almost no administration required, as it is self-directed student activity, undertaken online, so that it is easily overseen by the lecturer.

A number of colleagues have now started to use a similar project diary. In module feedback received by the lead researcher, some students commented that they now ask their group members in other modules, where there is no project diary or other mechanism to record individual contribution, to voluntarily keep a similar project diary. Yet other students have suggested that this form of project diary should be mandatory for all the group projects on their programme.

The results also indicate strongly that the self-reflective process, based on the Belbin frame-work and the reflective journal, has allowed students to gain a better understanding of their behaviour, their strengths and their weaknesses while working in groups. It is proposed to undertake further research, in the coming academic year, to examine further the students' attitudes to the value of using the Belbin Team-work Framework and to more precisely gauge the extent to which they think a greater understanding of different working styles and personalities can help them navigate group dynamics and address group issues, before they escalate.

Any mechanism that allows students to manage their own group work more effectively will be of significant benefit to any lecturer, but particularly those dealing with a large number of project groups in big classes. There is further scope to explore how current digital learning platforms can facilitate and enhance this type of self-directed learning and project group management, without adding significantly to lecturer workload in large classes.

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Appendix One: Project Diary Template

PROJECT DIARY TEMPLATE

(Completion of diary be rotated amongst group members each week, and to be submitted via Canvas each week, via Assignments, by that group member)

Group No.

Date / Time (start and finish)

Venue (or 'via Zoom', Teams etc.):

Attendance:

Review of last week's minutes (not relevant for first week) – was the work agreed completed, by whom, and to a satisfactory level? If not, what is planned to address this?

Items discussed: brief description of key items discussed and agreement reached (bullet points are fine). Any unresolved disagreements can also be recorded, for the record.

Work allocation for next week: tasks to be undertaken by next week and name of person(s) responsible for doing this work. If it's a task for a longer horizon than one week, the agreed date for completion of the work.

Any other business: Any other matters arising, concerns, unexpected issues arising, new information etc.

Appendix Two: the Reflective Journal

What is the Reflective Journal?

The reflective journal is where you can reflect on, and learn from, any difficulties, and achievements, you experience in the group-project throughout the semester. It is not about trying to achieve any ideal goal, but, rather, to allow you to journal an honest reflection of your experiences and own behaviour while undertaking the project, with a view to learning from this for the future. The grading for the reflective journal will be awarded based on suitable completion for each entry (i.e. meeting the word-count, applying relevant framework(s) where required, demonstrating reflective thinking) and is worth 10% of the overall module marks. Grades will be an Honours (100%), Pass (40%) or Fail (0%) mark. This grading format is used to allow you to be honest in your reflection, as there is no 'right answer' being sought. You are being graded for the effort you put into personal reflection, and the application of the relevant frame-work(s), which are given on Canvas. You are encouraged to explore any weaknesses, or mistakes, you have made, and, more importantly, to demonstrate your awareness of these and how you might address them in the future. You will also have an opportunity to identify personal strengths, ones that you can develop and carry forward in your later academic, professional and personal life. You are free to disagree with any of the frame-works given to you to complete, on reflection, once you give a clear rationale for why you disagree with them. However, you must still, first, attempt to apply the frame-work(s).

How to complete the Reflective Journal:

There are two entries in total, one in late Oct., and the final one in early Dec. (exact submission dates are given below). Each entry should be in the region of 600 words (plus or minus 10%), and submissions will be through Canvas 'Assignments'. You will be required to upload a Word document on Canvas, copied from the template provided below, for each of the two entries. You need to complete this carefully and ensure you answer the question(s) and apply any frame-works required.

Submissions that do not use the templates given below, for each entry, will not be graded.

For each entry you will be given a question to encourage critical thinking of your experiences to date while doing the Group Project. Your reflection should use one of the reflective models provided in the Skills Centre Reflective Handout found in the appendix (along with applying any other frame-work(s) required for that entry). Your comments and reflections should draw upon your own personal experiences during the project for this module, in particular, but you may have noticed patterns from your experiences and behaviour on previous group projects and you can mention this also. You should also review the video material posted in the Reflective Journal section of 'Modules' on how to engage in personal reflection and undertake reflective writing.

All the entries must be your own original work, as they record your own learning. Therefore, copying and pasting text from other sources, even if it is work you have done previously, on another module, will be considered plagiarism. There is no need to describe in detail the models and frame-works being applied (e.g. Belbin); you can just reference which model(s) you are using. Also, you are not required to reference any other academic literature.

Note on confidentiality:

While you are encouraged to discuss with your fellow students any content being covered in the course, and project, please be assured that, when you hand in your journal, the contents will not be disclosed to anyone apart from staff involved in teaching and assessing the course. While this analysis is based on the group-work you are involved in, it is a personal and private reflection. You will not be required, and are advised not, to share it with your other group members. If you wish to share your Belbin group profile, that is your own choice. Some students find it useful to share this with their group members, others prefer not to.

The questions for each of the journal entries are given below. You can copy these and put at the top of a blank word document and then submit this via Canvas Assignments (links will be given in due course).

ENTRY 1

Due: Friday, Oct 21st, 2022

1) **Result of Belbin Self-assessment (state what role, or combination of roles, you scored, having undertaken the Belbin Self-assessment, given on Canvas):**

2) **Do you think this score is an accurate reflection of what you would consider to be your personality type when working in group(s)? Why (not)?**

3) **Reflect on the process you and your group went through when choosing a brand, and when formulating the research proposal. Did awareness of your Belbin self-assessment and your understanding of the different Belbin roles that other members might play, help you in your contribution to this process? Why (not)?**

4) **Are you happy with your contribution to the project so far? Why (not)? What might you have done better, if anything?** Use one of the reflective-writing models / frameworks given below (and state which model / framework you are using).

ENTRY 2

Due: Friday, Dec. 9th, 2022

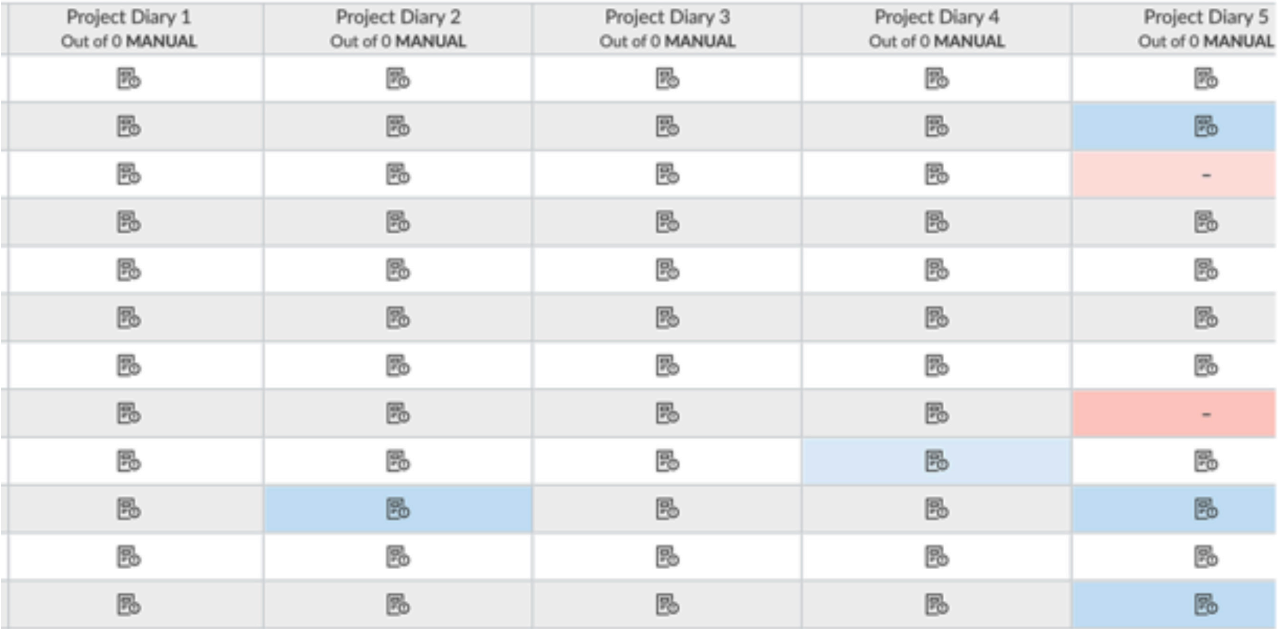
1) **Looking back over your contribution to the group project during the full semester, pick one task that you undertook (it could be collecting certain secondary data, moderating a focus group, designing or conducting or analysing a survey etc.) and reflect on the process you went through to complete this work and to ensure it met the expectations of the group. Did you experience any challenges when undertaking this task? If yes, how did you overcome them? If not, what do you think you did to ensure it went so well?**

2) **Looking back over your contribution to the group project during the full semester, describe what you would now consider as one of your main strengths, when undertaking group-work, and one that you believe you will be able to bring forward to future academic and professional group activities. Use any one reflective-writing frame-works to help you analyse your overall contribution to the group, and to identify what you now consider to be your main strength.**

3) **Very briefly, having now completed the project, do you think the Belbin self-assessment score you achieved is now more or less accurate than you thought when you completed Journal Entry 1, and why?**

(word-count approx. 600 words)

Appendix Three: Screenshot showing project diary submissions on Canvas by project group



This demonstrates how, at a glance, the lecturer can see if the weekly project diaries have been submitted. This is just a partial screenshot of the complete page. It also means that all diaries are easily accessible, within one page (on Canvas), in the event of a group dispute and the lecturer needing to review any of them.

2023