"Changing myself as an effective teacher for improving student needs & meeting them"

Proceedings of the 22nd Annual SLAIHEE Conference on Higher Education in Sri Lanka

organised by

Sri Lanka Association for Improving Higher Education Effectiveness (SLAIHEE)

supported by Informatics Institute of Technology (IIT)

Friday, 24 July 2026

9.00 a.m. to 5.00 p.m.

held at

National Library of Sri Lanka Auditorium

No 14, Independence Avenue, Colombo 07

DEDICATION

Dedicated to the ever-reminiscent memory of Dr Shrinika Weerakoon

BSc, MSc, MBA (Perth), DBA (Bath, UK), SEDA Accredited Teacher, ASTHE

- an irreplaceable Higher Educational Developer
- a colleague, a friend, a guide, a change agent: who always found time to be there for you
- who epitomised a life that: “what you leave behind is not what is engraved in stone monuments, but what is woven into the lives of others" (Pericles)

and

- in whose memory SLAIHEE has instituted an annual Award: "Dr Shrinika Weerakoon Memorial Award for the Best Paper in Changing HE student skills”

SLAIHEE Conference 2026

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22nd SLAIHEE Higher Education Conference

on

"***Changing myself as an effective teacher for improving student needs and meeting them"***
Friday, 24 July 2026, 9.00 a.m. to 5.00 p.m., held at National Library of Sri Lanka Auditorium, Colombo 07

(the materials of this conference are available at www.slaihee.org)

A WARM WELCOME TO THE CONFERENCE

This is the twenty second year since Sri Lanka Association for Improving Higher Education Effectiveness (SLAIHEE) was established as a non-profit voluntary organization. Since its establishment in 2005, SLAIHEE has organised an annual conference, taking pleasure in providing the only opportunity in Sri Lanka for our university staff to document and discuss the learning enhancements that they have been able to achieve through their subject-related teaching. For the first eleven years, the Staff Development Centre (SDC) at the University of Colombo was the organisational partner hosting this annual conference. Then, in its 12th year, the SLAIHEE-SDC conference was hosted by the Staff Development Centre, Wayamba University of Sri Lanka and in the 13th year, it was hosted by the Open University of Sri Lanka. 14th year, the host became a private Higher Education Institute (HEI), the Sri Lanka Technological Campus with its newly established Centre of Excellence in Teaching, Learning & Innovation (CETLI). The 15th conference was hosted by the Staff Development Centre, Moratuwa University of Sri Lanka. The 16th, 17th and 18th conferences were held online via Zoom due to the COVID-19 pandemic-related restrictions. From 2023, SLAIHEE resumed the face-to-face format for the annual conference. Since 2023, SLAIHEE conferences have been supported by the Informatics Institute of Technology (IIT), a private Higher Education (HE) provider and its Academy for Learning & Teaching Effectiveness Facilitation (ALTEF).

This conference has become a Community of Practice and the only national conference in Sri Lanka that focuses exclusively on learning and teaching in the HE context (SoTL, Scholarship of Teaching and Learning). This year's conference celebrates the twenty second year of SLAIHEE and over 27 years since the first SDC was established in Sri Lanka (at the University of Colombo). Such a 27-year history gives us the opportunity to look back and use that experience to question our 'maturity' and where we are, specially with the untimely death of Dr Shrinika Weerakoon who stood, with immense credibility among academics, at the forefront of HE change and improvement in Sri Lanka. She played her role excellently and moved on, much to our disbelief and sorrow. What we will have to say, and do, over the next ten to twenty years is now up to you all and to SLAIHEE. As pioneers in striving to maintain the quality enhancement of HE in Sri Lanka, SLAIHEE has faced and traversed huge challenges and our simple beginnings have enabled us to face these. What challenges the future holds are already palpable, specially with a change in training quality offered at SDC's of many Universities. It is therefore noteworthy that ALTEF is progressing with plans to make its courses accredited with the UK Advance Higher Education (Advance HE, formerly: Higher Education Academy).

This year's conference theme, "Changing myself as an effective teacher for improving student needs and meeting them" (for previous conference themes and proceedings, see: www.slaihee.org) is relevant because, unless "teacher change" take place, the lowered quality of HE teaching and the quality of training programmes for HE teachers will remain unchanged. This year's Conference was preceded by a few training workshops that ATLE conducted to have academics trained to write Action Learning abstracts such as those presented at this Conference and recorded in this Proceedings volume.

This year's theme relates directly also to the current (Gen Z) Higher Education students about whom teachers usually complain that they are very dependent in expecting everything to be told/given to them rather than taking initiative, lack interest in learning the subject other than in passing, are focused on LOTS, are very anxiety prone including at examinations, easily lose attention and engagement, etc. As HE teaching is not aligned to meet such lower-level "needs" of students, they soon lose interest and attention. Thus, it seemed that the above "needs" that these students feel (that HE should "meet") would first require to be changed or reoriented by the teacher, through a changed teaching approach that teachers have adopted. Thereafter, it is these "improved HE student needs" that teachers should meet in HE teaching, with appropriate improvements in teaching. In this way, the theme required, as a first step, a change in the teacher's approach, that allowed the teacher to change what students feel should be the actual HE student 'needs', such as engaging in HOTS, skills development, discovery learning. As a second step, it is these "improved needs" of the students that the teacher had planned to meet, and collect data, with improved teaching activities.

Therefore, the papers presented on this conference theme are significant to show conference attendees how, when lecturers receive effective targeted training and support to bring about change, they will rise to the occasion to develop the much-needed voicing skill in our HE students.

We take great pleasure in welcoming you, our invited guests and our Keynote speaker, Dr. H.G.P.A Ratnaweera, Past President SLAIHEE, Senior Lecturer (Grade I), Civil Engineering, Faculty of Engineering Technology, The Open University Sri Lanka. The conference is of particular interest to all those with a concern and commitment to the quality and fate of future Higher Education in Sri Lanka, including; lecturers, managers and administrators in Higher Education, educational and staff developers, and policy makers

We hope you have an extremely enjoyable experience that will motivate all of us to enhance the quality and usefulness of the higher education experience, mainly to our students.

From SLAIHEE – a big thank you;

- for your participation,
- to the presenters for reporting how they have reduced and managed performance anxieties through their teaching learning experience in their classrooms while addressing the challenges faced by both HE teachers and students in the 21st Century,
- to Dr. H.G.P.A. Ratnaweera for the Keynote speech
- to Mr Mohan Fernando, CEO of Informatics Institute of Technology (IIT)
- specially to Professor Suki Ekaratne, for his guidance and services to HE,
- to all the special invitees, and to the reviewers for their speedy reviews with helpful feedback.
- to National Library of Sri Lanka staff for providing support during the conference

The Conference Organising Committee;

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PROGRAMME

Conference Theme: **Changing myself as an effective teacher for improving student needs and meeting them**

08:30 – 08:55 a.m.	Registration
Inauguration	
09:00 – 09:05 a.m.	Conference Announcements by Dr Iroja Caldera, Past President/ SLAIHEE
09:05 – 09:10 a.m.	Welcome address by Dr Jinendra Dissanayake, President/ SLAIHEE
09:10 – 09:40 a.m.	**Keynote Address** by Dr. H.G.P.A Ratnaweera (Past President SLAIHEE) Senior Lecturer (Grade I) Civil Engineering, Faculty of Engineering Technology The Open University of Sri Lanka
09:40 – 9:50 a.m.	- Award Presentation – Dr Shrinika Weerakoon Memorial Award for the Best Paper at the 2025 Conference - Introduction to the Dr Shrinika Weerakoon Memorial Award for the Best Paper at 2026 Conference
09:50– 09:55 a.m.	Announcements & Vote of Thanks by Ms. Abarnah Kirupananda, President Elect/ SLAIHEE
09:55 – 10:25 a.m.	Morning Tea (with Networking in Lobby)
<u>Paper Presentations</u> with selecting the 'Best Paper' in **Changing myself as an effective teacher for improving student needs and meeting them**	
10:35 – 10:45 a.m.	Address by Guest of Honour: Mr. Mohan Fernando, CEO/Informatics Institute of Technology
10:50 – 12:50 p.m.	Presentations and discussion of peer-reviewed papers (Morning **Session**) Session chair Session 1A – Ms Shalini Kaduwela Session chair Session 1B – Ms Sapna Kumarapathirage
13:00 – 13:50 p.m.	LUNCH - Non-Members (Floor 2) LUNCH - Members (after **Annual General Meeting**, Floor 2)
14:00 –16:00 p.m.	Presentations and discussion of peer-reviewed papers (Afternoon **Session**) Session chair Session 2A – Dr. Pushpa Kulanatha Session chair Session 2B – Ms Nadeeka Rathnabahu
16:00 – 16:10 p.m.	**Feedback F**orm Completion (online)
16:10 – 16:30 p.m.	**Afternoon tea** with conference closure

SLAIHEE Conference, 24th July 2026 - Session Timetable (page #s refer to pages in Conference Proceedings Book)		
Parallel Sessions of Paper Presentations		
Session /venue:	Session 1A [Venue: Auditorium, National Library of Sri Lanka]	Session 1B [Venue: Seminar Room, National Library of Sri Lanka]
Session Chair	Ms Shalini Kaduwela	Ms Sapna Kumarapathirage
Time	Paper #, Paper Title. author(s), page numbers	Paper #, Paper Title. author(s), page numbers
10.50 – 11.05	A.1 – on pp. 1-5 (by) W.D.T. Alwis	B.1 – on pp. 41-45 (by) D. Alwils
	Changing myself to make student thinking visible in digital circuit learning using VARK Model	Changing myself from evaluator to facilitator to improve evaluative judgement among undergraduates through peer evaluations
11.05 – 11.20	A.2 – on pp. 6-10 (by) P.K. Herath	B.2 – on pp. 46-50 (by) M.R.N. Tharinduni
	Changing My Teaching Practice Using Structured Lesson Break Activities to Improve Students' Communication Skills	Changing Teaching to Transform Passive Mathematics Learning through Collaborative Case-Based Teaching and Formative Assessment
11.20 – 11.35	A.3 – on pp. 11-15 (by) A. Silva*, T. Wirasingha, S. Bhavanishankar	B.3 – on pp. 51-55 (by) P.D.J.A Harischandra
	Changing Ourselves as Educators: From Traditional Lecturing to Active Pedagogy in Computing Education	Reflective Teaching to Reorient Student Motivation in a Theory-Intensive Database Module: A Perception Study
11.35 – 11.50	A.4 – on pp. 16-20 (by) K.D.M.S. Abeythunga	B.4 – on pp. 56-60 (by) B.T.N. Perera*, H.P. Samarage
	Adapting the PREP Framework to Structure Teaching and Improve Impromptu Speaking among EAP Students	Students' Perceptions of Structured Peer Feedback as a Teaching Change to Motivate Students and Improve Low Fidelity Prototype Design in Computing Education
11.50– 12.05	A.5 – on pp. 21-25 (by) W.A.D.M.S. Wijesekara	B.5 – on pp. 61-64 (by) W.N.S. Ariyasena
	Teaching Changes from Deductive to Inductive Small-Group Activities to Improve Theory Application in Managerial Economics	Changing Teaching to Reduce Cognitive Overload Using a Scaffolded Reflective Writing Framework in English for Academic Purposes

12.05 - 12.20	A.6 – on pp. 26-30 (by) S. Samarasekara*, S. Bhavanishankar, Y. Marambage	B.6 – on pp. 65-69 (by) M.K. Naidu
	Changing Ourselves as Effective Teachers by Shifting from Technical Perfection to Audience Clarity	Changing myself to Reorient Passive Gen-Z Learners towards Active Accountability through Structured Cooperative Learning
12.20 – 12.35	A.7 – on pp. 31-35 (by) Herath A	B.7 – on pp. 70-74 (by) U. Athukorala
	From Lecturer to Learning Facilitator: Student Perceptions of a Small-Group Approach to Supporting HOTS in Foundation Mathematics	Student Perceptions on Changing Assessment from Multiple Written Assignments to a Mini Project-Based Format in a Digital Electronics Module
12.35 – 12.50	A.8 – on pp. 36-40 (by) S R.W.V.J. Weranja	B.8 – on pp. 75-78 (by) M. Shankeerna
	Changing Tutorial Activity Alignment Towards Assessment Tasks to Improve Attendance, Engagement and Perceived Performance Readiness	Enhancing Clinical Engagement through Role-Play- Transforming Gen Z Learning Approach
Session /venue:	Session 2A [Venue: Auditorium, National Library of Sri Lanka]	Session 2B [Venue: Seminar Room, National Library of Sri Lanka]
Session Chair	Dr. Pushpa Kulanatha	Ms Nadeeka Rathnabahu
Time	Paper #, Paper Title. author(s), page numbers	Paper #, Paper Title. author(s), page numbers
14.00 – 14.15	A.9 – on pp. 80-84 (by) D. Silva	B.9 – on pp. 115-119 (by) B.T.N. Perera*, Y. Marambage
	Changing Teaching with Group Work Strategies to Address Diverse Learning Levels in Database Systems Education	Students' perceptions on changing lectures to integrate model question discussions to improve student learning in server-side web development
14.15 – 14.30	A.10 – on pp. 85-89 (by) T.C.K. Rangamaarachchi*, Rajapakse EMMN	B.10 – on pp. 120-124 (by) F. Hassan
	Supporting Gen-Z learners through changing myself as a resilient teacher to improve student engagement	Student Perceptions on Scaffolded Note-Taking Support in Lectures to Change from Passive Listening to Active Learning
14.30 – 14.45	A.11 – on pp. 90-94 (by) S.H. Widanapathirana	B.11 – on pp. 125-129 (by) D.M. Jayasena*, M.K.S.M. Samaranayake
	My Transformed Self as a Teacher Guide that Develop Students' Responsible AI Use by Socratic Role-play Activities	Students' Perceptions on Changing Teaching by Incorporating Experiential Learning with Field Visits to Bridge the Theory–Practice

		Learning Gap
14.45 – 15.00	A.12 – on pp. 95- 99 (by) S. Suwandaratna	B.12 – on pp. 130-134 (by) C.D. Padmaperuma
	Changing teaching to enhance teaching quality, student engagement and learning using the Minute Paper	Changing Lectures with Interactive Memory Recall Activities to Enhance Student Attention & Engagement
15.00 – 15.15	A.13 – on pp. 100-104 (by) S. Haniff	B.13 – on pp. 135-139 (by) K. Senanayake*, K.R.M. Chandrathilaka, D.G.Y. Sanduni
	Reorienting my teaching and improving Gen-Z student performance via Interleaved Micro-Learning	Perception of Physiotherapy Students on the Usefulness of Video Portfolios for Learning Basic Physiotherapy Skills
15.15 – 15.30	A.14 – on pp. 105- 109 (by) M. Azhar	B.14 – on pp. 138- 142 (by) U.R.S.R.K. Senarathne, A.M.N.V. Bandara
	Changing teaching from Unfamiliar to familiar to Bridge the Gen Z Gap in Object-Oriented Programming	Impact of Classroom Equity on Student Motivation and Academic Engagement in Space Retrieval Practice on Undergraduate Teaching

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The paper submission and peer-review process: papers that appear in this Book of Proceedings are in the form of `Full Papers', made up of sections comprised of Background / Purpose (i.e., Introduction), Methodology, Results, Discussion and Conclusions, References. Each paper has been accepted and e-printed after a thorough and rigorous double-blind peer-review process. In this process, an Abstract had first been submitted together with a Self-assessment Scoring Sheet. These abstracts were reviewed by the "Papers Committee", and relevant authors were invited to submit Full Papers. Each `Full Paper' then underwent a double-refereeing process by two independent reviewers who provided referee reports and supportive feedback to be sent to authors justifying acceptance, improvement or non-acceptability of each submission. A third referee was used whenever the first two referees were in disagreement. The reports of both referees were discussed, collated and this feedback was sent to authors to accept, reject or to do modifications, if any, to the Full Papers as recommended by both referees to meet the 'quality standards'. Authors had the option of not making the changes if they were able to justify why the referee-recommended modifications were not acceptable. Abstracts that were rejected, or not received by the deadline with the recommended modifications, were not 'accepted' and so, do not appear in this Book of Papers.

Abstracts/ papers plagiarised from others' work, when not acknowledged in the submitted material or have a substantial component of plagiarised material, are in general rejected and followed-up by formally writing to the authors, through their institution heads, as practices that are unacceptable and looked down by the entire academic community worldwide.

All referees and presenters have, in this way, collaboratively contributed to enhancing the quality of Higher Education in our motherland. Even where papers were not accepted, we hope the detailed feedback given would have helped authors to improve their subsequent writing and submissions.

Changing myself to make student thinking visible in digital circuit learning using VARK Model

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Abstract

When teaching was limited to lecture-based delivery with theoretical explanations of logic gates, Boolean algebra, and circuit diagrams in a Level - 3 Digital electronics course followed by 33 students without prior experience handling electronic components or constructing circuits, they struggled to connect these abstract concepts with real circuit behaviour. After having followed the Teaching Development MaTE course, I changed teaching to facilitate hands-on Visual, Aural, Read-write, Kinesthetic model-based (VARK) activities to support diverse learning preferences. The change was also guided by Dale's Cone of Experience, which highlighted the effectiveness of learning through active participation. I implemented structured hands-on activities in the tutorial session, incorporating VARK model through circuit diagrams (visual), instructor explanations and peer discussions (auditory), datasheet interpretation and written logic expressions (read/write), and practical circuit construction (kinesthetic). Students designed and implemented combinational circuits including half adders, full adders, and a 4-bit binary adder using IC packages on breadboards. In line with Dale's Cone of Experience, students learned by actively constructing and testing circuits. The effectiveness of the intervention was evaluated through observation, task completion records, and surveys. The activities resulted in bringing down the failure rate to 0%, from a previous 12%. During the survey conducted during the last week of the semester, where 25 students responded 100% recommended similar practical activities in the module. Students demonstrated 100% improved ability to interpret datasheets, identify IC pins, and verify circuit outputs. Integrating VARK model with experiential activities inspired by Dale's Cone of Experience enhanced student engagement and conceptual comprehension. Hands-on circuit construction enabled students to connect theoretical knowledge with real-world application, making their thinking visible and strengthening problem-solving skills in digital electronics learning.

Purpose and Background

Digital electronics is often introduced through theoretical concepts such as logic gates, Boolean algebra, and circuit simplification. Since the teaching approach was heavily lecture centric, students had limited opportunities for hands on experience. To address this gap, I decided to adopt a more practical teaching method. In designing this teaching intervention, I was inspired by Edgar Dale's Cone of Experience theory, which emphasizes that learners understand and retain knowledge more effectively when they actively engage in practical and experiential learning rather than relying solely on passive learning methods such as reading or listening. In addition, the intervention was guided by the VARK Learning Model framework, which recognizes that students learn through different modes including visual, auditory, reading/writing, and kinesthetic experiences. By combining experiential learning with multimodal teaching strategies, the activity aimed to improve both conceptual understanding and student engagement in digital electronics.

While theoretical concepts are essential, I observed that many students struggle to connect these abstract ideas to real world applications, especially when they lack exposure to actual circuit building or hands on practice. This issue became evident during a class discussion when a student used a fruit basket analogy to explain an OR gate and expressed confusion over its logic. He stated, "If I have a fruit basket and must choose between an apple and an orange, I have to pick both for it to be true. Otherwise, it's false. But when choosing 'apple OR orange,' if I select both, it feels illogical that it should still be true." His misunderstanding stemmed from reasoning with everyday logic instead of digital logic. This prompted me to recognize that while students were memorizing theoretical rules, they lacked the practical intuition that comes from working with actual digital circuits.

To address this gap, I changed my teaching and learning activities a hands on teaching and learning activity where students could design, build, and test digital circuits using IC packages. This intervention was conducted within the DOC 325 Digital Circuits and Design course at the Informatics Institute of Technology Galle center, targeting foundation level students who had no prior experience working with electronics or ICs. Prior to this session, students had essentially zero exposure to tools like breadboards, logic ICs, or even simple measurements using multimeters. The course itself forms part of a broader curriculum aimed at developing practical competencies in computing and engineering disciplines. It is essential to move beyond theoretical lectures and introduce students to real world applications through hands on circuit design using actual components. The intervention was therefore designed to align with both Dale's experiential learning perspective and the VARK learning approach. Visual learners benefited from circuit diagrams and truth tables, auditory learners engaged through explanations and discussions, reading/writing learners referred to worksheets and Boolean expressions, while kinesthetic learners gained by physically assembling and testing circuits using IC components and breadboards. Through this combined approach, students were encouraged not only to grasp theoretical concepts, but also to experience how digital logic behaves in real electronic systems.

Methodology

I transformed the DOC 325: Digital Circuits and Design tutorial sessions into a structured hands on learning activity aimed at improving students' practical understanding of combinational circuits using IC packages. The session was specifically designed to help students connect theoretical digital logic concepts with real physical circuit behavior. The participant group consisted of 33 foundation level students from the January 2025 intake, none of whom had prior experience working with digital electronic components, breadboards, or circuit construction.

The intervention was designed based on the principles of the VARK Learning Model to accommodate different learning preferences among students. Visual learning was supported through circuit diagrams, truth tables, Boolean expressions, and live demonstrations. Auditory learning was encouraged through instructor explanations, discussions, and peer interaction. Reading/writing learning was facilitated using datasheets, worksheets, and logic derivations, while kinesthetic learning was emphasized through direct hands on circuit building, testing, and troubleshooting using electronic components.

I began with a preliminary setup phase where the key learning objectives were identified, as given below

1. introducing logic ICs including 7408 (AND), 7486 (XOR), 7432 (OR), and 74283 (binary adder)
2. guiding students in datasheet interpretation and pin identification
3. facilitating the design and construction of basic combinational circuits such as half adders and full adders
4. extending student understanding to higher level implementations such as 4-bit binary adders
5. reinforcing theoretical knowledge through truth tables and real-time output testing.

To support the activity, I invested in reusable laboratory equipment including a 5V DC power supply, digital multimeters, breadboards, IC packages, LEDs, resistors, jumper wires, and toggle switches, with a total session cost of Rs 3,640.

The session followed a structured step wise format. I began with a motivational introduction connecting digital electronics theory to real world applications and explained the expected learning outcomes. Students were then introduced to the physical components by exploring IC packages, examining datasheets, and identifying pin configurations. A basic breadboard setup using LED resistor series connections was first demonstrated to familiarize students with practical implementation techniques. The core learning activity was divided into three progressively challenging stages where stage 1 was Half Adder ,stage 2 was Full Adder and stage 3 was 4-bit Binary Addition. For each stage, students were guided through truth table construction, Boolean expression derivation, circuit diagram development, and physical implementation using IC packages on breadboards. During the testing and evaluation phase, students tested different input combinations and compared the observed outputs with the expected truth table results. Peer discussions and instructor walkthroughs were conducted to clarify misconceptions and reinforce conceptual understanding.

At the end of the 2 hour session students were required to explain the relationship between the Boolean expressions, circuit design, and observed outputs, enabling them to demonstrate both theoretical understanding and practical application of digital logic concepts.

Results

The session achieved full participation from the Galle foundation January 2025 batch, with notably high levels of enthusiasm. Students who were previously hesitant during theoretical discussions became actively engaged and collaborative during the group based hands on activity.A survey was conducted among 33 students out of which 25 students responded. Survey results confirmed the effectiveness: 88% of students rated the session as 5 out of 5, with the remaining 12% giving a rating of 4, indicating a very high satisfaction rate. Importantly, 100% of students agreed that hands on learning should be integrated more frequently into the course. Students were genuinely excited to see theoretical logic implemented in real circuits. Many commented that the session clarified prior confusion from lecture based learning, and several students proactively requested similar hands on sessions to be conducted more regularly in the future.

Students successfully implemented a range of combinational circuits during the session, applying theoretical knowledge to real hardware. I observed that 88% built a half adder, 84% built a full adder, and 36% implemented the more advanced 4-bit binary adder. Additionally, 80% of students used datasheets effectively to identify IC pin configurations, and 72% used multimeters to verify logic outputs, reinforcing the relationship between input conditions and expected results. These outcomes demonstrate that students developed practical competencies in circuit design and troubleshooting.

Before the session, I observed that a majority of students lacked confidence in understanding logic gates and combinational circuits. According to the feedback, 64% felt slightly confused, 12% were neutral, and 20% were completely confused. Only 4% felt somewhat confident, and no students reported feeling very confident. These results indicated that most students entered the session with uncertainty and limited hands on experience. Following the session, there was a remarkable shift: 36% of students reported feeling very confident and 64% stated they felt more confident than before. Importantly, no students remained in the confused or neutral categories. This dramatic transformation demonstrates the significant impact of the handson teaching and learning activity on learner self-assurance.

Discussion and Conclusion

The hands on teaching and learning activity I implemented in DOC 325: Digital Circuits and Design proved to be transformative for improving student engagement, confidence, and conceptual knowledge. Before this intervention, students had no practical exposure to digital electronics hardware. Their learning was limited to theoretical constructs with minimal connection to real world circuit behavior. By engaging students in circuit building identifying IC pins, interpreting datasheets, wiring breadboards, and testing with truth tables I enabled them to make their thinking visible and tangible. Students transitioned from passive recipients of information to active participants in their own learning, developing abilities to design, implement, and troubleshoot circuits independently.

Student voice and feedback underscore the session's impact. Students expressed strong appreciation for the opportunity to work with real components, noting that "hands-on experience made theory clear" and that "learning to read datasheets and use ICs" helped bridge the gap between abstract learning and practical application. This feedback reflects a genuine shift from passive to active learning. However, students also identified challenges such as identifying IC pins and time constraints, suggesting that future sessions would benefit from pre-lab demonstrations and extended duration. I recommend establishing a structured sequence of six practicals across the semester to promote progressive skill development, incorporating practicals into continuous assessment with meaningful weightage, and aligning practical activities directly with lecture content.

In conclusion, the success of this hands on teaching and learning activity confirms that practical exposure is not supplementary but essential in technical subjects like digital electronics. When students are given meaningful opportunities to apply theory through direct engagement with real components, learning becomes more engaging, intuitive, and impactful. The documented improvements in student confidence (from 4% somewhat confident to 100% confident), engagement (100% support for more hands on activities), and practical competencies (88% successful circuit implementation) validate the effectiveness of this pedagogical approach. This intervention supports the broader educational principle that STEM learning is most effective when students can bridge the theory practice gap through direct, guided experience with authentic tools and materials.

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Changing My Teaching Practice Using Structured Lesson Break Activities to Improve Students' Communication Skills

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Abstract

This study emerged from reflective evaluation of my teaching practice for the Foundations of Management module (N=16, first-year, first-semester). Previously, lectures were delivered in a continuous format with a strong focus on completing theoretical material, while student interaction was limited to occasional tutorial activities. This approach restricted opportunities for students to communicate their learning during lectures and contributed to passive learning behaviour, low confidence in speaking, and limited language fluency during classroom discussions. After exposure to reflective teaching practices through the Making Teaching Effective (MaTE) training course, I introduced structured lesson-break activities to improve students' participation, engagement, and oral communication in a theory-based course. Structured lesson breaks lasting 15-20 minutes were introduced during lecture sessions. During these activities, students created mini visual presentations based on theoretical concepts discussed in class using tablets or laptops. Students then communicated their visual explanations orally for 2-3 minutes and received peer and lecturer feedback. The effectiveness of the intervention was evaluated using a 10-item five-point Likert-scale questionnaire, one open-ended reflection question, and lecturer observations of student participation, fluency and engagement. Student feedback and observations indicated positive changes. Fourteen out of sixteen students (87.5%) reported improved confidence in speaking, while thirteen students (81%) reported higher engagement with lesson content. Observations also showed greater participation during discussions and presentations. Smartphone dependency during activity sessions was eliminated, with all students (100%) participating without using mobile phones. Findings demonstrate that introducing structured lesson-break activities created opportunities for students to actively communicate and interact with theoretical concepts. The intervention supported the development of communication as a key competency within the 21st-century 4Cs framework (communication, collaboration, critical thinking and creativity). The study highlights how reflective changes in teaching practice can enhance student participation and foster communication skills among learners in higher education. Future research should examine this across different academic disciplines.

Purpose/Background

Communication skills are widely recognized as an essential graduate attribute within higher education. Business graduates are expected to demonstrate confidence in presentations, teamwork, classroom discussions, and professional interactions. However, many first-year undergraduate students experience anxiety and lack confidence when communicating ideas in academic settings. Within the Foundations of Management module, students initially demonstrated passive learning behaviour and depended heavily on smartphones and written notes during presentations. This limited spontaneity, confidence, and classroom engagement. Reflective participation in the Making Teaching Effective (MaTE) programme encouraged reconsideration of existing teaching practices and highlighted the importance of introducing more interactive and student-centered learning opportunities. As a result, structured lesson-break activities were introduced to improve participation, communication confidence, and engagement.

Recent research further supports the importance of active learning and communication-focused pedagogies within higher education. Leslie and Johnson-Leslie (2023) found that active discussion-based learning methods increase student engagement and improve communication confidence among undergraduate students. Similarly, Barnett-Itzhaki et al. (2023) emphasized that interactive learning activities significantly improve learning effectiveness and student participation within higher education classrooms.

Constructivist learning theory suggests that students learn more effectively when they actively participate in knowledge construction rather than passively receiving information. Biggs and Tang (2011) explain that active learning environments encourage deeper understanding, stronger participation, and improved student engagement. Interactive teaching strategies therefore play a significant role in enhancing the quality of higher education learning experiences. Gibbs and Habeshaw (1989) further argue that classroom interaction and immediate feedback contribute positively to confidence development and student motivation. Activities involving presentations, peer interaction, and collaborative learning create supportive learning environments where students become more willing to express ideas independently.

Recent studies also demonstrate the growing importance of communication skill development in higher education. Cîrtiță-Buzoianu et al. (2022) identified communication skills as critical components of employability and academic success within both online and offline learning environments. Similarly, Vaghela and Kaushal (2024) highlighted that structured pedagogical approaches significantly improve communication competencies among undergraduate students.

Furthermore, research by Balakrishna (2023) demonstrated that interactive classroom activities improve student engagement during the transition into higher education. Active learning strategies have also been shown to produce stronger academic achievement compared to traditional lecturing methods (Theobald et al., 2023). These findings support the integration of structured lesson-break activities within theory-oriented modules to improve communication and participation.

Methodology

The study adopted a reflective teaching approach and was conducted among sixteen first-year undergraduate students enrolled in the International Business Management degree programme at APIIT Lanka, Kandy Campus. The intervention was implemented during regular Foundations of Management lecture sessions.

Structured lesson-break activities lasting approximately 15–20 minutes were introduced within theory lectures. Students worked individually or in small groups to create visual explanations of theoretical concepts using laptops or tablets. Students were instructed not to rely on smartphones or written scripts during presentations. Instead, they used diagrams, flowcharts, images, and key terms to explain concepts orally in their own words. The intervention was introduced through two stages. First, I informed the students about the objectives of the activities and the importance of communication skills for academic and professional success. Second, students were guided through a structured process involving concept visualization, peer interaction, oral explanation, and immediate feedback.

Data collection involved multiple methods to improve validity and depth of understanding. A 10-item five-point Likert-scale questionnaire was distributed to identify student perceptions regarding communication confidence, participation, and engagement. Students also responded to an open-ended reflection question describing their experiences during the intervention. Additional data were gathered through lecturer observations and peer feedback focusing on classroom participation, fluency, confidence, and interaction.

Results

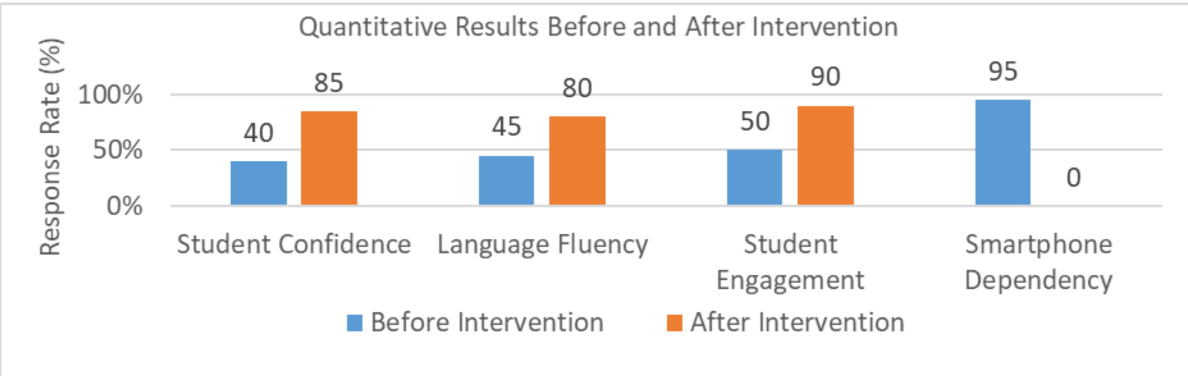

Figure 1: Quantitative Results before and after intervention

The findings demonstrated several positive outcomes relating to communication skills, participation, and student engagement. Fourteen out of sixteen students (87.5%) reported improved confidence in speaking during classroom discussions and presentations following the intervention. Students stated that using visuals instead of written notes reduced anxiety and enabled them to explain concepts more naturally.

Thirteen students (81%) also reported increased engagement with lesson content. Students appeared more attentive and actively participated during lesson-break activities compared to traditional lecture sessions. Lecturer observations confirmed that students demonstrated greater willingness to volunteer answers, ask questions, and interact with peers during discussions.

Another significant finding was the elimination of smartphone dependency during presentations. Prior to the intervention, students consistently relied on smartphones when presenting theoretical concepts. Following the implementation of visual-only presentations, students communicated more independently and demonstrated stronger fluency during discussions. Peer feedback sessions also contributed positively to student participation. Students encouraged each other during activities and developed a more supportive classroom environment. Similar findings were identified by Kalu et al. (2023), who found that active learning strategies improved student confidence, participation, and communication effectiveness within higher education classrooms.

Discussion and Conclusion

The findings suggest that structured lesson-break activities can effectively improve communication skills and student engagement within theory-oriented higher education modules. The intervention transformed students from passive listeners into active participants by encouraging independent speaking, peer interaction, and visual explanation of concepts. The results strongly support constructivist learning theory, which emphasizes active participation as a key component of meaningful learning. Students demonstrated improved understanding because they were required to explain concepts using their own words rather than memorizing lecture content. Immediate peer and lecturer feedback further contributed to confidence development and collaborative learning.

The intervention also contributed to the development of 21st-century graduate competencies, particularly communication, collaboration, and critical thinking. Students became more confident communicating ideas publicly and demonstrated improved classroom interaction. These findings align with recent higher education research highlighting the importance of active learning environments in improving student engagement and communication skills (Barnett-Itzhaki et al., 2023; Leslie & Johnson-Leslie, 2023). The removal of smartphones during presentations was another important outcome of the intervention. Students became less dependent on memorized content and more willing to communicate ideas spontaneously. This created a more interactive and student-centered classroom environment.

This study demonstrates that reflective changes in teaching practice can produce meaningful improvements in communication skills, participation, and student engagement within higher education classrooms. The introduction of structured lesson-break activities encouraged active learning, improved confidence, and reduced student anxiety during presentations and discussions.

The findings suggest that integrating short interactive activities into lecture sessions can create more engaging and student-centered learning environments. Such approaches may be particularly useful for first-year undergraduate students who often experience communication anxiety and passive learning behaviour during theory-oriented modules.

However, the study was limited to a small sample within a single academic discipline. Future research could examine similar interventions across larger student populations and different subject areas. Longitudinal studies may also be conducted to investigate the long-term impact of structured lesson-break activities on academic performance, employability skills, and communication development. Overall, the study highlights the importance of reflective teaching practices and active learning strategies in improving the quality of higher education learning experiences.

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Changing Ourselves as Educators: From Traditional Lecturing to Active Pedagogy in Computing Education

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Abstract

Reflections on low student engagement and assessment performance in the second-year Advanced Client-Side Development module at the Informatics Institute of Technology prompted us to reconsider our reliance on traditional lecture-based teaching. Participation in teaching and learning professional development activities encouraged us to critically reflect on our teacher-centered approach and recognise the need to change our own pedagogical practices. This study explores how transforming our teaching approach from passive lecturing to active pedagogy can improve student engagement and academic performance in computing education. A quasi-experimental reflective approach was conducted with 237 undergraduate computing students. An initial ICT assessment established a baseline performance level under traditional lecture-based teaching. Following our pedagogical shift, the module was redesigned using Kolb's experiential learning cycle, incorporating microlearning segments, Think-Pair-Share discussions, and practical coding exercises to foster an interactive and feedback-driven learning environment. The effectiveness of the intervention was evaluated by comparing baseline and final assessment results aligned with core web development competencies, along with institutional student feedback data. The changes implemented in our teaching practice resulted in notable improvements in student outcomes. The average mark increased from 46.57% to 66.83%, representing an absolute improvement of 20.26 marks. Individual analysis showed that 24.5% of students demonstrated substantial improvement, while 46.4% achieved moderate improvement. Student feedback further indicated positive perceptions of module delivery, learning activities, and the teaching team's preparedness, suggesting increased engagement in the redesigned learning environment. The findings illustrate that meaningful improvements in student learning can emerge when educators reflect on and change their own teaching practices. By transforming our traditional lecture-based approach into a more interactive and student-centred learning environment, we observed clear improvements in engagement and academic performance. This study highlights the importance of educator self-change and reflective pedagogical evolution, with further research needed to examine applicability across other disciplines.

Background

Student engagement and practical skill development remain persistent challenges in computing education, particularly in programming-intensive modules. Despite the adoption of modern educational tools and learner-centred pedagogies, traditional lecture-based teaching is still widely used in many higher education contexts. In these settings, learning often remains passive, with students primarily receiving information through lectures and demonstrations, and having limited opportunities for interaction, collaboration, and hands-on practice. This can restrict the development of essential problem-solving and programming competencies required in modern computing education (Berssanette and De Francisco, 2021).

Research in computing education consistently shows that active learning strategies can enhance student engagement and improve academic performance (Martinez and Gomez, 2025; Berssanette and De Francisco, 2021). Approaches such as Kolb's experiential learning (Henríquez *et al*., 2025), collaborative activities, microlearning (Sathiyaseelan, Mathew, and Nair, 2024), and practical coding exercises have been shown to promote deeper conceptual understanding and skill acquisition. In particular, Experiential Learning Theory emphasises learning through a cyclical process of concrete experience, reflection, conceptualisation, and active experimentation, making it especially relevant for programming and web development education.

This need for pedagogical improvement was identified in the second-year Advanced Client-Side Development module at the Informatics Institute of Technology. The module was initially delivered using a traditional lecture-based approach supported by presentation slides and instructor-led demonstrations. However, an early in-semester assessment revealed weak student performance in both theoretical knowledge and practical coding tasks. This outcome prompted the teaching team to critically reflect on their own instructional approach and reconsider the effectiveness of passive lecturing in supporting student learning.

Although active learning is widely discussed in the literature, and studies have examined how active learning changes student learning, this study investigated the following research question: Can transforming teaching approaches from passive lecturing to active pedagogy improve student engagement and academic performance in a specific second-year computing module, the Advanced Client-Side Development module?

Methodology

We adopted a quasi-experimental reflective design to evaluate the impact of transitioning from traditional lecture-based instruction to an active pedagogy framework in the Advanced Client-Side Development module at the Informatics Institute of Technology. Our study involved 237 second-year undergraduate computing students and followed a structured pre-intervention, intervention, and post-intervention design.

In the pre-intervention phase, we delivered the module using a traditional lecture-based approach characterised by slide-based presentations and instructor-led demonstrations. During this stage, students primarily engaged as passive recipients of content, with limited opportunities for interaction, collaboration, or applied practice. To establish a baseline measure of student performance, we conducted an In-Class Test (ICT). This assessment evaluated both theoretical constructs and practical coding competencies, with particular emphasis on HTML5, CSS3, JavaScript, and Bootstrap. Following the baseline assessment, our teaching team conducted a reflective pedagogical evaluation. This reflection informed how we redesigned the module using Kolb's Experiential Learning Cycle (Henríquez *et al*., 2025), ensuring alignment between learning activities and experiential learning principles.

We structured the redesigned learning intervention into four iterative stages:

- Concrete Experience: Students engaged with interactive HTML-based learning materials and executed coding exercises in real-time environments, allowing direct exposure to programming tasks.
- Reflective Observation: We encouraged students to identify errors and reflect on their problem-solving approaches, supporting them with Think-Pair-Share discussions (Syafruddin et al., 2024). We then provided immediate feedback on coding outputs.
- Abstract Conceptualisation: We introduced key theoretical concepts through 10-minute microlearning segments that combined short instructional inputs with guided explanations to enhance conceptual clarity.
- Active Experimentation: Students applied learned concepts by modifying and improving existing coding solutions and attempting new practical programming tasks.
- This cyclical process ensured continuous engagement, reflection, and application throughout the learning experience.

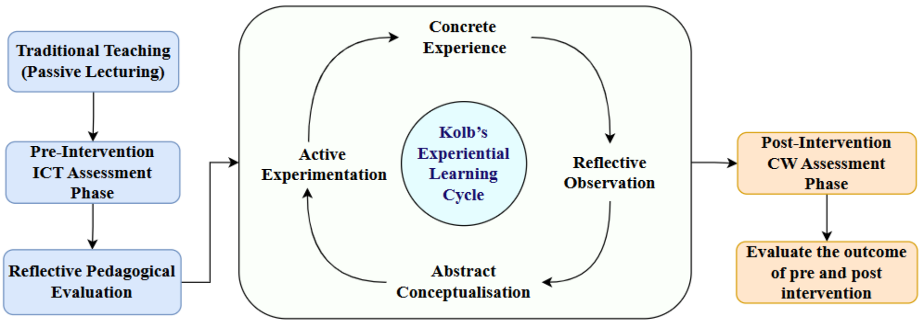

Figure 1. Proposed Experiential Learning Framework for Active Pedagogy in Computing Education

Following the intervention, we conducted a Coursework (CW) assessment based on ReactJS development to evaluate student performance within the active learning environment. While the baseline In-Class Test (ICT) focused on foundational web development concepts using HTML5, CSS3, and JavaScript, the CW assessment assessed students' ability to apply these skills in a more advanced, interactive development context using ReactJS. Although the technologies differed, both assessments aligned with the module's core learning outcomes in front-end web development, problem-solving, and practical coding competency, enabling an overall comparison of student progression before and after the intervention.

We collected data from direct classroom observations, pre- and post-intervention assessment scores and institutional student feedback. Finally, we analysed this data using descriptive statistics to compare changes in student performance and engagement.

Results

The results indicated a notable improvement in student academic performance following the implementation of the active pedagogical intervention. A comparison between the initial in-class test (ICT), conducted during the traditional lecture-based phase, and the final coursework (CW), completed after the intervention, showed an increase in the average mark from 46.57% to 66.83%, representing an absolute improvement of 20.26 marks. Individual student performance analysis further demonstrated positive learning gains across the cohort of 237 students. Among the students, 24.5% (n=58) achieved substantial improvement exceeding 30 marks, while 46.4% (n=110) demonstrated moderate improvement between 10 and 30 marks. Additionally, 18.6% (n=44) showed minor improvement, scoring 0-10. A smaller proportion of students (10.5%, n=25) reported a decrease in performance.

Student feedback further indicated positive perceptions of the module's intellectual stimulation, the teaching team's preparedness and enthusiasm, the effectiveness of learning activities, and the quality of the teaching environment, suggesting increased engagement in the redesigned learning experience. This feedback matched our direct classroom observations that students became more engaged.

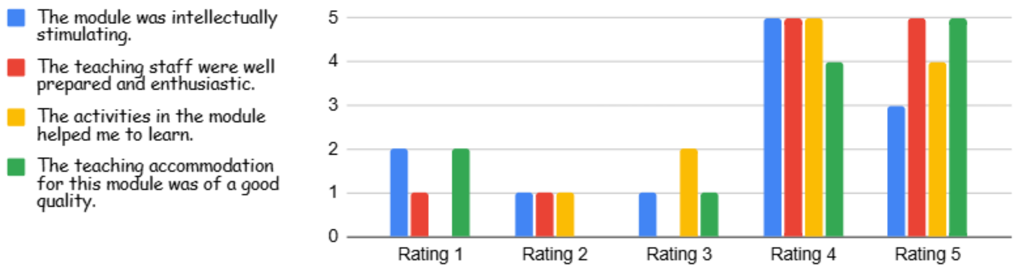

Figure 2. Summary of student feedback

Discussion and Conclusion

The study demonstrated that transforming a traditional lecture-based computing module into an interactive and student-centred learning environment can enhance both student engagement and academic performance. The shift from passive instruction to active pedagogy enabled students to engage more meaningfully with course content through iterative cycles of practice, reflection, and application. The intervention integrated interactive HTML-based learning materials, microlearning strategies, practical coding exercises, and Think-Pair-Share activities grounded in Kolb's experiential learning principles. These approaches supported cognitive load management by breaking complex programming concepts into manageable segments, while also promoting collaborative learning and peer-supported knowledge construction. Immediate feedback through coding activities further reinforced skill acquisition through active experimentation. The findings indicated a notable improvement in academic performance, with average marks increasing from 46.57% to 66.83%. In addition, student feedback reflected a more positive learning experience, highlighting increased engagement, understanding, and motivation.

However, several limitations should be acknowledged. First, the baseline assessment focused on foundational technologies, including HTML, CSS, and JavaScript, whereas the post-intervention coursework evaluated ReactJS development. Although these technologies align with broader front-end development competencies, differences in technical complexity and assessment formats may have introduced additional sources of variation. Second, the quasi-experimental design lacked a parallel control group, limiting the ability to fully isolate the intervention's effects from external influences, such as students' natural progression and increased familiarity over the semester. Nevertheless, the proposed pedagogical framework demonstrates strong potential for broader applicability within computing education. The integration of Kolb's experiential learning cycle with microlearning activities and peer-supported feedback provides an adaptable approach for enhancing engagement, continuous practice, and skill development in practical programming modules, particularly those involving iterative development and hands-on implementation.

Importantly, the study underscores the role of educator self-reflection and intentional pedagogical transformation as key drivers of improved learning outcomes. The shift in teaching practice itself acted as a catalyst for change, reinforcing the value of reflective teaching in computing education. This change highlights that improving student outcomes requires not only introducing new learning activities but also critically examining and transforming educators' own teaching practices. In conclusion, the results suggest that experiential and interactive learning strategies can improve the effectiveness of programming education. However, further research is required to explore the scalability and applicability of this approach across other modules, disciplines, and educational contexts.

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Adapting the PREP Framework to Structure Teaching and Improve Impromptu Speaking among EAP Students

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Abstract

While Impromptu speaking is a crucial academic skill in English for Academic Purposes (EAP) classrooms, yet many foundation-level students struggled to organise ideas clearly under pressure. In my EAP class of eight students, their struggles showed up in my initial observations as fragmented responses, unclear openings, loosely connected ideas, vague examples, and abrupt endings. As this lowered confidence and hindered effective communication, and based on the importance of sequentially structuring teaching learnt in a teaching development course, I explored how a pedagogical practice using a structured framework can improve students' organisation and confidence during impromptu speaking tasks. The teaching structuring method introduced was the Point–Reason–Example–Point (PREP) framework as a simple structure for organising spontaneous speech. The intervention included teacher modelling, think–pair–share practice, timed impromptu speeches, and immediate feedback, enabling students to apply the structure in increasingly independent speaking tasks. The effectiveness of the intervention was evaluated using direct observations and a rubric-based speaking assessment measuring coherence, organisation, use of examples, and confidence. Students completed a one-minute impromptu speaking task before and after the intervention. Pre-intervention scores ranged from 7–14 out of 20, while post-intervention scores improved to 14–17, indicating development of clearer organisation, more relevant examples, and greater confidence. Classroom observations revealed additional improvements: students paused strategically to plan, maintained steadier eye contact, connected ideas more logically, and concluded with clear reinforcement of their main point. Several students (6 out of 8) reported feeling "less anxious" and "more in control" during spontaneous speaking tasks. The findings suggest that reflective adaptation of pedagogical structuring strategies can improve students' impromptu speaking performance. Introducing a simple structural framework such as PREP can reduce cognitive load and speaking anxiety while supporting clearer communication.

Background

Speaking extemporaneously is one of the most critical skills for academic and professional purposes. At educational institutions, there are usually cases where learners need to speak spontaneously within various presentations, group discussions, lectures, and interviews. Nevertheless, there is a number of learners who face problems in organizing thoughts and speaking spontaneously. According to Beebe and Beebe (2017), effective public speaking largely relies on the capability to organize thoughts logically and present them confidently. The lack of logical structure results in confusion and makes it hard for audience to understand what is said.

Research indicates that structured speaking models help reduce cognitive load and improve fluency during spontaneous speech production. According to Cognitive Load Theory, learners face difficulties when they have to simultaneously process the production of content, organization of ideas, and language (Sweller,1988). Such structures make things easier because they provide consistent patterns that facilitate working memory.

For instance, the Point–Reason–Example–Point (PREP) model is one of the structures used. The PREP model requires speakers to begin with stating a point, then provide reasons, give examples, and restating the point. Recent research works by Del Rosario et al. (2023) show that the PREP model allows learners to achieve high levels of coherence, fluency, and confidence during spontaneous speech production activities.

I implemented this intervention in a Foundation level EAP class where students were accustomed to engaging in impromptu speaking exercises to develop their communication skills. Although students possessed adequate ideas and information about the topics, many had trouble giving coherent responses during such tasks. Through observation, I noticed that that students' speech was disorganized, filled with ideas that were barely related to each other, and ended without concluding properly. Moreover, students were often heard stopping to think of ideas or using random and unrelated examples when giving speeches. From these findings, it could be inferred that students did not have problems forming ideas and thoughts but rather organizing them coherently during limited time periods. As impromptu speaking is essential in both academic and professional communication contexts, finding ways to overcome the mentioned obstacles was necessary and thus became the purpose of this research.

Methodology

Eight participants from the Northern Consortium of UK Universities (NCUK) Foundation EAP module were involved in this class-based research. All participants belonged to different proficiency levels and differed in their confidence while performing the English-speaking tasks. Most of the participants had not previously engaged in impromptu speaking activities in a structured way.

The preliminary observations I made within the class and the speaking assessments conducted outside the class revealed some difficulties faced by the students during the process of impromptu responding. Participants often began speaking without preparation, resulting in poorly structured responses, weak idea generation, and incomplete or insufficient examples. They also showed poor conclusions, frequently stopping abruptly, along with noticeable nervousness, anxiety, and hesitation indicating low confidence in spontaneous speaking tasks.

The study employed an action research methodology, and it was carried out within an instructional cycle in class. The lesson was intended to provide guidance on how to organize their impromptu speeches through explicit instructions and guided activities based on the PREP formula as recommended by Del Rosario et al. (2023).

The students participated in a speaking assignment before and after the intervention, graded using the same criteria as given in Table 1 which included coherence, organization, examples, and confidence. Each criterion had a rating of five points, making the total score twenty points.

Table 1. Rubric used for speaking task

Criteria	5 – Excellent	4 – Good	3 – Satisfactory	2 – Developing	1 – Limited
Coherence (C1)	Clear, logical flow throughout.	Mostly clear with minor lapses.	generally understandable but unevenly connected.	Frequent breaks in clarity and flow.	lack logical connection, difficult to follow.
Organization (C2)	Structure with intro, body, conclusion.	Organized with minor structural issues.	Basic structure is present but inconsistent.	Limited organization, weak organisation	No clear organization or structure.
Use of Examples (C3)	Relevant, specific, and strongly supportive	Examples support ideas adequately.	Some examples are provided but limited details.	Few examples with limited support.	No relevant examples.
Confidence (C4)	Fluent, confident delivery, no hesitation.	Generally confident, occasional hesitation.	Moderate confidence with noticeable pauses.	Limited confidence, frequent hesitation.	Very hesitant, lacks confidence.

Instruction began with an explicit introduction to the PREP formula, followed by guided practice, timed impromptu speaking, feedback, and repeated task performance.

Results

The intervention was implemented through two classroom sessions, and the findings showed a marked improvement in the impromptu speaking skills of the participants. A pre-test speaking task was conducted in Week 1 of the study, prior to the introduction of the PREP framework, to establish baseline performance levels. In the first session, the PREP structure was introduced and students were engaged in several practice sessions such as think-pair-share and brief impromptu speaking. It was observed initially that the majority of students found it hard to arrange their thoughts. The responses were disjointed, lacked coherence and clear conclusions, included frequent pauses, used vague or irrelevant examples, and showed hesitation and low confidence in spontaneous speaking situations. During the first session, participants began to comprehend and apply the PREP structure more effectively, with pair discussions helping to build confidence in a supportive environment, and most students were able to present a main point, provide at least one reason, and conclude their responses.

The second session involved reinforcement and application of the framework independently, involving timed impromptu speeches based on prompts of greater difficulty. Following the intervention, a post-test speaking task was conducted in Week 2 of the study, after the completion of the two intervention sessions. Table 2 shows the scores test scores before and after the intervention.

Table 2. Pre and Post - Test Scores

Student	C1	C2	C3	C4	Pre-Test Score	C1	C2	C3	C4	Post-Test Score
1	2	3	1	3	**9**	4	3	3	4	**15**
2	3	3	2	4	**12**	4	4	4	4	**16**
3	2	2	2	2	**8**	4	4	3	3	**14**
4	4	3	3	4	**14**	4	4	4	5	**17**
5	2	2	1	2	**7**	3	4	3	4	**14**
6	2	3	2	2	**9**	4	4	3	4	**15**
7	2	3	1	2	**8**	4	5	3	4	**16**
8	2	3	3	5	**13**	4	4	4	5	**17**

Results of the post-tests indicated progress on the part of all learners. Whereas scores in the pre-tests fell in the range of 7-14, those in the post-tests rose to the range of 14-17. Speeches of the learners were seen to be more organized and logically structured, featuring smooth flow of ideas. Progress was also noted in the area of confidence, with learners being more relaxed and fewer in their hesitations during delivery. Progress was particularly marked in the area of organization, with learners having no problem in delivering an introductory statement, followed by supporting arguments, examples, and a conclusion.

Discussion and Conclusion

The model utilized in this research can also be understood from the perspective of sociocultural theory by Vygotsky (1978) which emphasizes scaffolded and socially mediated instruction as the key factors in facilitating higher order thinking among learners. Additionally, the principles underlying speech instruction as described by Paul Nation and Jeremy Harmer provide additional rationale for the instructional practices used in the present study. Cite the reference.

From the results of the two sessions of interventions, the use of explicit instructions of PREP framework was helpful in improving students' impromptu speaking. Before the intervention session, students were struggling to organize their thoughts under pressure; this had an impact on the level of coherence, confidence, and fluency. From the results of the study, it is clear that this challenge was associated with inadequate structure than lack of ideas. It seems like the PREP framework was used to relieve cognitive pressure by helping students create their arguments using a consistent pattern. With more exposure to the PREP framework, it was easier for students to organize their thoughts. This observation supports the claim of Sweller (1988) that structured instructions can be used to reduce cognitive pressure and hence facilitate performance. These observations are also in line with the theory by Beebe and Beebe (2017) regarding structure of speech.

The positive impact on the students' confidence level is another significant effect of the intervention. Students seemed to feel more relaxed and ready to speak on their own in the second session. 7 out of 8 students claimed that using the PREP technique made them more confident since they had a clear idea about how they should start talking and where they were going. Moreover, think-pair-share technique contributed to students' performance positively in that way that it helped create a less stressful atmosphere when students rehearsed what they were going to say.

Practice was another factor which facilitated better performance of students in this situation. Due to repeated use of the strategy over two sessions, most students managed to use it spontaneously without making plans in writing first. Even though the number of the subjects was small, the two sessions were sufficient enough to reveal the effects of using the structure. Based on the results of this study, it can be stated that structured speaking frameworks such as PREP can be considered valuable aids in teaching impromptu speaking skills in EAP classes. Further research will include not only a greater number of participants but also longer intervention period and more complex assessment procedure. These findings show that well-structured speaking lessons can improve impromptu speaking ability for Foundation EAP students. The students were noticeably better in terms of coherence, organization, confidence, and providing relevant supporting examples to answer impromptu questions compared to the beginning of the lesson. The PREP method worked as a helpful cognitive tool for structuring information and organizing thoughts within a limited time frame.

Thus, this research has proven the value of teaching students how to structure their speaking in EAP classes instead of expecting them to do it automatically. With the help of modeling, guiding practice, repetitions, and feedback, students were able to demonstrate better command of their responses and improved self-confidence. Even though this research was conducted on a limited scale, the findings prove that the PREP method can be used for improving impromptu speaking skills in EAP settings.

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Teaching Changes from Deductive to Inductive Small-Group Activities to Improve Theory Application in Managerial Economics

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Abstract

I identified a noticeable gap between theoretical knowledge and practical application in a first-year, second-semester Managerial Economics module with 30 students where I had used the traditional deductive pedagogical teaching approach. While this approach developed student ability to accurately define concepts (e.g. "opportunity cost"), along with limited engagement, students struggled to apply these in real-world practical contexts. Experiencing improvements in my own ability to apply theories while engaging in inductive Small-Group Discussions (SGD) in the Making Teaching Effective (MaTE) training course I followed, I explored whether a similar SGD change in my teaching could improve students' ability to confidently apply economics theoretical concepts. In my change to the inductive SGD teaching approach, I first gave students a real-life managerial scenario involving limited capital allocation and only thereafter, taught formal theory definitions. In their SGD's, students worked in six groups of five members, to discuss potential trade-offs and justified their decisions using reasoning, rather than textbook definitions. I evaluated the success of this inductive approach using direct observations and a feedback questionnaire that included questions on their perceptions of engagement, confidence and theory application. Observations showed class participation to have increased from 50% to near 80%, and student numbers confidently attempting application-based questions increased from approximately 40% to 67%. In the feedback, 82% of students agreed that group discussions helped them apply concepts, and 82% preferred starting with real examples over definitions. Furthermore, 78.5% reported increased confidence in explaining opportunity cost. The shift to an inductive, student-centered approach successfully addressed the “theory-practice” or “Knowing- Doing” gap, as exemplified by the "opportunity cost" concept evolving from a memorized definition into a practical decision-making tool. By prioritizing experiential learning over mere content delivery, structured small-group activities enabled students to relate their experiences to apply theory to practice.

Purpose/Background

Managerial Economics is a core subject in business education because it provides students with analytical tools required for managerial decision-making. Students are expected not only to understand economic theories but also to apply them effectively in practical business situations involving scarcity, trade-offs, resource allocation, and strategic decision-making.
In my first-year, second-semester Managerial Economics classroom consisting of 30 undergraduate students, I observed that students were generally capable of recalling definitions and explaining theoretical concepts accurately. However, when presented with

application-based or scenario-based questions, many students struggled to apply theoretical concepts analytically. Their responses often remained descriptive rather than evaluative or analytical. During previous lecture sessions, only around 35-40% of students confidently attempted application-based questions.

To address this theory-practice gap, I selected an inductive Small-Group Discussion (SGD) approach. This method was chosen because collaborative active learning encourages students to discuss, justify and apply concepts through peer interaction rather than relying solely on lecturer explanations (Prince, 2019). Furthermore, studies in economics education suggest that active learning promotes higher-order thinking skills and improves the practical application of theoretical concepts (Sekwena, 2023). Therefore, SGDs were considered an appropriate strategy to improve students' confidence, participation and theory application.
The earlier teaching approach mainly followed a deductive method where I introduced definitions and theories before discussing examples. Although this supported lower-order cognitive skills such as remembering and recalling, it appeared insufficient for developing higher-order thinking skills such as application, evaluation, and critical reasoning.

Educational literature strongly supports the use of active learning approaches to improve conceptual understanding and engagement in higher education. Freeman et al. (2014) identified that active learning significantly improves student performance compared to traditional lectures. Prince (2019) similarly highlighted that collaborative learning encourages students to articulate reasoning and apply concepts through peer interaction. More recent studies further support these findings. Sekwena (2023) emphasized that active learning pedagogies improve higher-order thinking skills in economics education, while Lewohl (2023) noted that technology-enhanced active learning environments increase student engagement and participation.

Constructive alignment theory proposed by Biggs and Tang (2011) also suggests that teaching activities should directly align with intended learning outcomes. Since one key learning outcome of the Managerial Economics module was the practical application of economic concepts, redesigning the lesson structure became necessary. Gibbs (2001) additionally argues that deep learning occurs when students actively engage with discussion and problem-solving activities rather than passively listening to lectures. Based on these observations and theoretical foundations, I redesigned the lesson using an inductive small-group discussion approach to improve students' confidence, participation, and ability to apply opportunity cost in managerial decision-making situations.

Methodology

I implemented the pedagogical intervention during a two-hour lecture on the topic "Opportunity Cost" in a first-year undergraduate Managerial Economics module consisting of 30 students. The lesson was redesigned from a traditional deductive lecture approach into an inductive, student-centered learning activity supported through structured small-group discussions. At the beginning of the session, I informed students that the lesson structure would differ from the usual lecture-based format. Instead of beginning with formal definitions, students were first introduced to a realistic managerial scenario involving a manufacturing company with limited capital resources. The company could invest in only one of the two options: Machinery investment or employee training.

I instructed students not to use textbook definitions initially. Instead, they were encouraged to analyze the managerial problem using practical reasoning and discussion. The class was divided into six groups consisting of five students each. Students were given approximately 20 minutes for group discussion. Each group selected a spokesperson to present their responses to the class. Groups were allocated approximately three minutes each to present their conclusions, followed by brief questions and comments from peers and the lecturer. Groups discussed the key managerial decision, opportunity cost involved in each option, and the importance of identifying opportunity cost for managers. During the activity, I used direct classroom observations to evaluate participation levels, interaction patterns, confidence, and analytical reasoning. Particular attention was paid to whether students actively justified decisions and applied economic reasoning. After group discussions, a whole-class discussion session was conducted where groups shared their responses. Different groups identified different opportunity costs depending on their managerial priorities. Following the discussion phase, the formal definition of opportunity cost was introduced and linked directly to students' responses. I evaluated the effectiveness of the intervention using classroom observations and a structured student feedback questionnaire. The questionnaire measured comprehension of the concept, confidence in applying theory, participation, and preference for inductive learning activities. Both quantitative and qualitative responses were analyzed to identify patterns related to engagement and conceptual understanding.

Results

Results are presented using two sources of evidence: direct classroom observations and quantitative and qualitative data collected through the student feedback questionnaire. The implementation of inductive small-group discussions produced noticeable improvements in student participation, engagement, and application of theory. During group discussions, 90% students actively contributed to discussion activities. Compared to previous lecture-based sessions where approximately 50% of students verbally participated in whole-class questioning, participation increased to nearly 80% during this intervention.

Students demonstrated stronger analytical reasoning during the activity. All six groups identified that selecting one option required sacrificing another alternative. Four groups extended their discussion by analyzing long-term productivity implications, while two groups initially confused opportunity cost with direct financial cost. This misunderstanding created valuable opportunities for clarification and deeper learning. The whole-class discussion demonstrated varying managerial perspectives. Four groups selected machinery investment because of efficiency gains, while two groups preferred employee training because of long-term human capital development. These differing perspectives enriched the discussion and reflected deeper economic reasoning. Student feedback responses were also positive. As illustrated in Figure 1, student perceptions regarding the inductive small-group discussion activity were positive. Around 78.5% of students agreed that the real-life scenario improved their knowledge regarding opportunity cost, while 82% stated that group discussions helped them apply the concept in managerial situations. Additionally, 78.5% reported increased confidence in explaining the concept, and 82% preferred beginning the lesson with practical examples rather than textbook definitions. The activity also improved classroom engagement, with 80% of students reporting increased participation and comfort in sharing ideas.

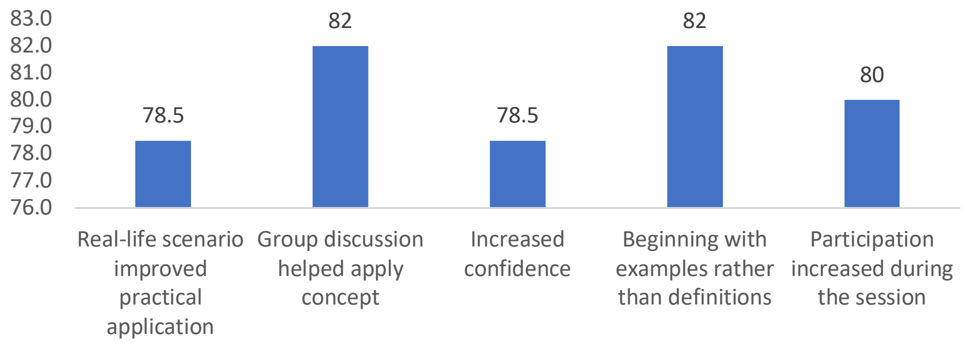

Figure 1: Student feedback responses

Qualitative feedback further highlighted that peer discussions and practical examples were the most helpful aspects of the session. Additionally, around 67% of students confidently attempted a follow-up application-based question at the end of the session compared to only 35-40% during previous lecture sessions. Moreover, qualitative feedback revealed that students valued peer discussion, practical examples, and comparing alternatives. Some students suggested incorporating numerical examples and allowing more discussion time in future sessions.

Discussion and Conclusion

The findings suggest that shifting from a deductive lecture-based approach to an inductive small-group discussion approach successfully improved students' ability to apply economic theory in managerial contexts. Students became more engaged when practical managerial situations were introduced before formal theoretical explanations. Instead of memorizing opportunity cost as an isolated definition, students experienced it as a practical decision-making tool relevant to real-world business situations.

The increased participation and willingness to answer application-based questions indicate that the inductive approach promoted higher-order cognitive engagement. These findings are consistent with Freeman et *al*. (2014) and Sekwena (2023), both of whom emphasized the effectiveness of active learning strategies in promoting critical thinking and deeper understanding. The collaborative nature of the activity also improved student confidence and created a psychologically safer learning environment. Students who were initially reluctant to participate in whole-class questioning appeared more comfortable discussing ideas within smaller peer groups. This supports Prince's (2019) argument that collaborative learning enhances conceptual understanding through discussion and peer interaction. The intervention also reflected constructive alignment principles proposed by Biggs and Tang (2011). The learning activities directly supported the intended learning outcome of applying economic concepts in managerial decision-making situations.

Several important teaching insights emerged from this intervention. First, application-oriented learning must be intentionally designed rather than assumed to occur automatically after theoretical explanation. Second, beginning with realistic scenarios can increase student engagement and relevance. Third, structured discussion activities can improve both conceptual understanding and communication skills. However, some challenges were observed. Effective facilitation required careful time management, and some students relied heavily on stronger group members during discussions. Future implementation could include structured worksheets, numerical examples, and comparative assessment analysis before and after intervention. Although the intervention was conducted within a single class and focused on one economic concept, the findings suggest that inductive SGD activities may be applicable to other topics within Managerial Economics and related business disciplines. Future implementations could include larger student cohorts and comparative assessment data collected before and after the intervention to provide stronger evidence of learning gains. Overall, this pedagogical intervention successfully addressed the identified theory-practice gap in the Managerial Economics classroom. The findings demonstrate that inductive and student-centered learning approaches can significantly improve confidence, engagement, and practical application of economic theory in higher education contexts.

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Changing Ourselves as Effective Teachers
by Shifting from Technical Perfection to Audience Clarity

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Abstract

For years, educator identities were rooted in "technical perfection". We too believed rigorous academic jargon was the hallmark of excellence. Having followed a teaching development course and then seeing high-quality student projects disqualified at the National ICT Awards (NBQSA) due to inaccessible pitching, we were forced to critically self-reflect and recognized that our focus on technical jargon was preventing students from learning how to communicate effectively. These motivated us to adopt a "simple-to-technical" scaffolding strategy. This self-change, along with selected Teaching-Learning Activities (TLA), enabled us to help Software Development Group Project (SDGP) students (41 students/7 Groups) bridge the gap between technical complexity and audience clarity. We first allowed SDGP groups to deliver original pitches to establish a baseline, assessed by two independent evaluators. We then implemented a four-week self-change intervention. First, we practiced pre-session modelling by preparing simplified analogies for complex theories. We introduced AI tools like NotebookLM, allowing students to "chunk down" complex theories before adding technical layers. Finally, we enforced Continuous Reinforcement through home practice and Peer-to-Peer Feedback Loops. To evaluate the impact, a final assessment required students to apply these steps, with the same evaluators measuring the overall improvement. We observed a notable increase in marks after we changed our modelling approach. Rubric-based performance data showed marks from the non-technical evaluator improved by more than 50% for every group, while technical evaluator marks increased by over 20%. Two teams were selected to pitch to a U.S. Delegation. Qualitative feedback confirmed that the personal shift we made was what helped them succeed. We have realized that an educator's self-change is the primary encouragement for student improvement. By shifting our focus from technical rigidity to audience clarity through structured preparation and AI tools, we hope to help students become well-rounded engineers. We have realized that being effective teachers means prioritizing clarity over perfection.

Purpose/Background

The traditional landscape of higher education in software and computing disciplines has long prioritized technical accuracy, often based on the assumption that professional competence is defined by the mastery of complex and specialized terminology. However, experiences within software engineering instruction revealed a critical gap where students with exceptionally high-quality technical projects frequently struggled to communicate their innovations to broader audiences. This issue became highly visible when otherwise excellent student projects faced disqualification during competitive selection auditions at the National ICT Awards (NBQSA) due to pitching at high level with heavy technical jargons. Reflecting on these outcomes, it became clear that an instructional focus on rigid technical jargon was unintentionally preventing students from developing essential communication skills. Following participation in a professional teaching development course, a conscious pedagogical shift was introduced to address this educational barrier.

To bridge the gap between technical complexity and audience clarity, a "simple-to-technical" scaffolding strategy was introduced. This change in instructional delivery, supported by structured Teaching-Learning Activities (TLA), was designed to guide forty-one Software Development Group Project (SDGP) students across seven groups. The main research question guiding this study was how a structured, educator-led transition from simplified analogies to technical complexity affects the ability of undergraduate software engineering teams to deliver pitches that satisfy both technical and non-technical evaluators. The primary expected outcome was a measurable improvement in student presentation performance, especially among evaluators without a technical background, without reducing the academic and technical quality of the projects.

Existing studies in software and computing education highlight the importance of student-centered and professionally relevant teaching approaches. Educational scaffolding provides an effective structure for helping students gradually understand complex concepts (Van de Pol et al., 2010). By breaking down theories into smaller and more manageable conceptual blocks, often referred to as “chunking,” educators can reduce the cognitive load placed on learners (Sweller et al., 2019). In addition, digital learning tools and peer-to-peer feedback support collaborative learning environments and encourage active student engagement (Panadero et al., 2018). This study demonstrates that when educators actively adapt their instructional methods, it can create a meaningful and positive improvement in student learning outcomes and professional readiness.

Methodology

To address the communication gap systematically, we designed and conducted a structured four-week pedagogical intervention. We began by establishing a clear baseline of the students’ initial communication abilities. We asked the forty-one Software Development Group Project (SDGP) students, organized into seven groups, to deliver their original project pitches without any prior intervention or coaching. Two independent evaluators, one with a technical background and the other with a non-technical background, assessed these baseline presentations using a standardized analytical rubric. This initial assessment provided objective data on the students’ starting points and highlighted the areas where technical jargon reduced the clarity of their software projects.

Following the baseline evaluation, we integrated a three-step process into the weekly project supervision sessions over a four-week period.

- Step one focused on pre-session modelling. Before the weekly supervision sessions, we prepared simplified analogies for complex software engineering theories. During the sessions, we temporarily set aside technical definitions and introduced abstract concepts through simple analogies to demonstrate how highly technical ideas could be explained clearly without losing their original meaning.

- Step two focused on AI-assisted theory chunking. We introduced students to digital tools, particularly NotebookLM, to support conceptual decomposition. Project groups used these tools to upload their technical documentation and break down complex and jargon-heavy theories into simplified core explanations. Once students clearly understood the basic concept and could explain it simply, they gradually added the necessary technical details back into their explanations.
- Step three focused on continuous reinforcement. To strengthen this communication shift, we asked students to continue practicing how they explained their project concepts outside the supervision sessions. In addition, we carried out structured Peer-to-Peer Feedback Loops during lab sessions. Teams presented their updated concepts to one another, while peers identified instances of unnecessary jargon or unclear explanations to support continuous improvement.
- At the end of the four-week intervention, we conducted a final evaluation to measure the overall impact of the strategy. The seven student groups delivered their final project pitches, and the same independent technical and non-technical evaluators assessed them using the same communication rubric applied during the baseline stage. This consistent evaluation structure ensured that the resulting data directly reflected the progress achieved throughout the intervention.

Results

A comparison of the evaluation scores before and after the four-week pedagogical intervention showed a clear and consistent improvement in student presentation performance across all participating groups. The quantitative data obtained from the rubric-based assessments of both independent evaluators demonstrated that the "simple-to-technical" scaffolding strategy successfully addressed the communication challenges faced by the students. The performance changes recorded for the seven student groups, consisting of forty-one students, are illustrated in Figure 1 & 2.

As shown in Figure 2, the most significant improvement was observed in the evaluations conducted by the non-technical assessor, where marks increased substantially across all groups. Baseline marks ranging from 35% to 60% increased considerably after the intervention, reaching scores between 56% and 95%, with Group 6 recording the highest performance. Several groups showed improvements of more than 50% compared to their baseline scores. At the same time, the evaluations conducted by the technical assessor also showed a steady increase in technical marks, representing an improvement of more than 20% across the cohort. These findings indicate that the use of simplified analogies and conceptual chunking did not reduce the technical depth or overall quality of the software projects.

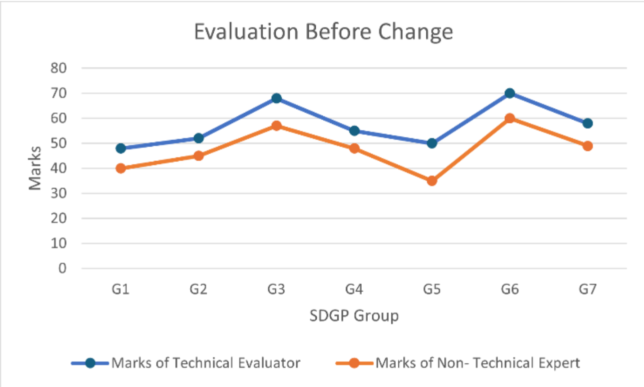


Figure 1: Evaluation marks before the intervention

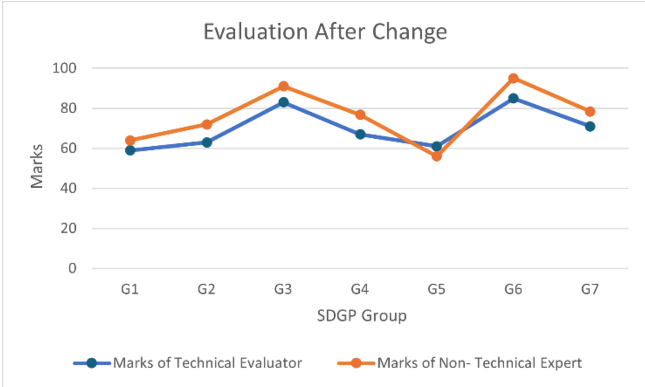
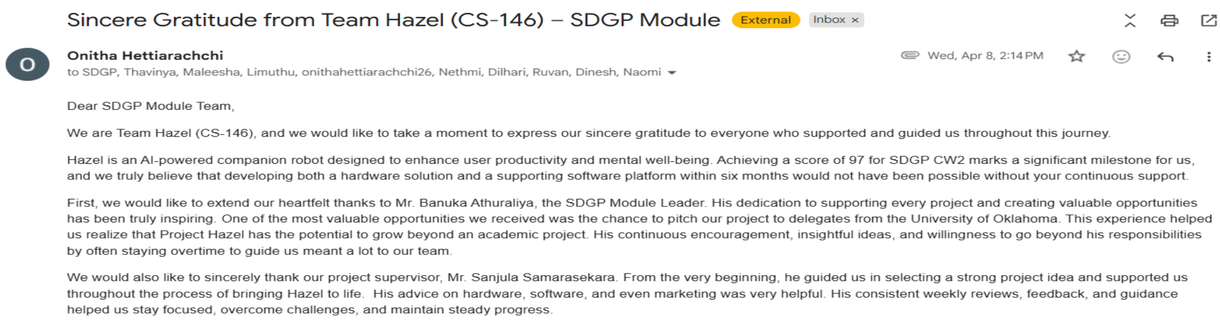


Figure 2: Evaluation marks after the intervention



Sincere Gratitude from Team Hazel (CS-146) – SDGP Module External Inbox ×

Onitha Hettiarachchi
to SDGP, Thavinya, Maleesha, Limuthu, onithahettiarachchi26, Nethmi, Dilhari, Ruvan, Dinesh, Naomi

Wed, Apr 8, 2:14 PM

Dear SDGP Module Team,

We are Team Hazel (CS-146), and we would like to take a moment to express our sincere gratitude to everyone who supported and guided us throughout this journey.

Hazel is an AI-powered companion robot designed to enhance user productivity and mental well-being. Achieving a score of 97 for SDGP CW2 marks a significant milestone for us, and we truly believe that developing both a hardware solution and a supporting software platform within six months would not have been possible without your continuous support.

First, we would like to extend our heartfelt thanks to Mr. Banuka Athuraliya, the SDGP Module Leader. His dedication to supporting every project and creating valuable opportunities has been truly inspiring. One of the most valuable opportunities we received was the chance to pitch our project to delegates from the University of Oklahoma. This experience helped us realize that Project Hazel has the potential to grow beyond an academic project. His continuous encouragement, insightful ideas, and willingness to go beyond his responsibilities by often staying overtime to guide us meant a lot to our team.

We would also like to sincerely thank our project supervisor, Mr. Sanjula Samarasekara. From the very beginning, he guided us in selecting a strong project idea and supported us throughout the process of bringing Hazel to life. His advice on hardware, software, and even marketing was very helpful. His consistent weekly reviews, feedback, and guidance helped us stay focused, overcome challenges, and maintain steady progress.

Figure 3: Feedback from the highest-scoring team in SDGP history supervised by Mr. Sanjula Samarasekara.

The practical impact of this communication shift was further reflected through external recognition, where the two highest-performing teams, Group 3 and Group 6, were selected to present their software project pitches to a delegation from the United States. In addition, qualitative feedback collected from students confirmed that the shift from technical rigidity towards conceptual clarity played a major role in helping them communicate more confidently and perform successfully during these high-stakes presentations.

Discussion and Conclusion

The results of this study demonstrate that prioritizing conceptual clarity over technical rigidity is highly effective in improving student communication outcomes. Traditional teaching approaches in technical disciplines often associate academic rigor with the heavy use of specialized terminology, which can isolate non-technical stakeholders and reduce the accessibility of student projects. By shifting the pedagogical focus towards a "simple-to-technical" scaffolding approach, educators can guide students in bridging this communication gap more effectively.

The findings of this study are aligned with scaffolding and cognitive learning approaches, which suggest that breaking down complex concepts into smaller and more understandable parts can improve learning and retention. Using simple analogies during the early stages of instruction helps reduce the initial cognitive difficulty faced by students. Once the core concepts are clearly understood, technical terminology can gradually be reintroduced while maintaining academic and professional accuracy. The improvement shown in the evaluations conducted by both the technical and non-technical assessors reflects this outcome.

This pedagogical approach can also be adopted by educators in other technical and computing-related disciplines where communication and pitching skills are important. To apply a similar approach, instructors can introduce structured supervision sessions that focus on conceptual modelling, the use of supportive digital tools such as NotebookLM for simplifying theories, and peer-to-peer feedback activities integrated into the learning process. Future development of this work will focus on integrating these communication activities permanently into the Software Development Group Project (SDGP) module. Continuing this work is important because developing industry-ready software professionals requires communication skills to be treated as a core competency rather than a secondary skill. To make these findings more generalizable, future studies can expand this approach to larger student groups and other software and computing-related modules to evaluate its long-term impact and wider applicability. Overall, this study confirms that an educator's willingness to reflect on and adapt teaching practices can play a major role in improving student outcomes. Prioritizing clarity over technical perfection is important in supporting the learning and professional development needs of Gen-Z learners.

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From Lecturer to Learning Facilitator: Student Perceptions of a Small-Group Approach to Supporting HOTS in Foundation Mathematics

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Abstract

For years, I delivered Foundation Mathematics using a lecturer-centred approach, influenced by training that rewarded content-driven delivery and the belief that explanation alone ensured learning. After following a teaching development course that made me reflect on classroom patterns, it revealed a problem: students followed explanations yet struggled to apply reasoning independently. Combined with mathematics anxiety and Gen-Z passive tendencies, this prompted re-evaluation of my own practice. I recognised my previous teaching philosophy was limiting higher-order thinking skills (HOTS), leading to a self-change from content transmitter to learning facilitator, enabling me to identify a gap in students' cognitive engagement. The study asked: can structured small-group activities support a shift from LOTS toward HOTS? My 24 Level 4 students were primarily operating at lower-order thinking levels. Using formative assessment scores (0–100% performance range; 75% high, 8% mid, 17% low; 16 male, 8 female), students were placed into six mixed-ability, mixed-gender groups of four. Activities were redesigned using constructive alignment: diagnostic starters, scaffolded modelling, and tiered tasks. Students adopted roles of reader, writer, calculator, and explainer to analyse real-world scenarios. Peer presentations and questioning encouraged justification and critique. Impact was explored through a perception survey and In-Class-Test results. Perception data from 19 students suggested increased engagement: 100% reported explanations supported understanding, 95% valued group work, and 84% felt supported. Additionally, 63% perceived improved recall, 42% stronger problem-solving, and 37% greater independence in applying methods. However, 74% indicated topics required further scaffolding and 32% had limited role engagement. In-Class-Test results (n=22) showed an average of 61.2% (range 30–94%), with 86% passing. Notably, the lowest-performing student improved by 23 percentage points, suggesting mixed-ability grouping supported weaker learners. Student perceptions suggest small-group activities may support movement toward HOTS, though findings should be interpreted cautiously. Future cycles will refine role rotation, strengthen scaffolding, introduce a peer-feedback rubric, and incorporate pre- and post-assessment to measure cognitive development robustly.

Keywords: *self-change, reflective practice, constructive alignment, action research, small-group learning, higher-order thinking, HOTS, LOTS, foundation mathematics, mathematics anxiety, student perceptions*

Purpose/Background

For several years, I delivered Foundation Mathematics at IIT Sri Lanka standing at the board, working through examples, believing that if I explained clearly enough, students would learn. But patterns troubled me. Students could follow my worked examples during lessons yet consistently struggled when problems required real-world reasoning or demanded justification rather than replication. In Biggs and Tang's (2011) terms, I saw that I was producing surface learners engaging with isolated steps rather than learning why those steps worked. This was especially visible in Financial Mathematics: students could copy the procedure but not adapt it when context changed.

The issue was not student ability. It was teaching design. A teaching development programme gave me the framework to name a design model I had been missing. Drawing on Biggs and Tang's (2011) model of constructive alignment that learning activities must be explicitly designed to develop intended cognitive outcomes.' I realised that while I expected students to analyse, apply, and justify, my lessons almost never created structured opportunities for this. Mathematics anxiety compounded this. Ashcraft (2002) established that anxiety restricts working memory and undermines mathematical performance; Haidt (2024) notes younger learners show heightened tendencies toward passive withdrawal when anxious. In my classroom, quieter students disengaged while confident students progressed and dominated. The wide ability range typical of foundation cohorts, which Gibbs and Habeshaw (1992) describe as a defining characteristic, made these dynamics especially entrenched. This led me to make a deliberate change: from lecturer to manager of learning (Gibbs and Habeshaw, 1992). The research question was: can structured small-group activities support a shift from LOTS toward HOTS in Foundation Mathematics at Level 4?

Methodology

I am simultaneously the teacher and the researcher in this study, and I acknowledge that this dual position shapes how I design, implement, and interpret evidence a defining feature of practitioner action research, in which the purpose is to improve one's own practice from the inside (Biggs and Tang, 2011). This paper reports my initial attempt; findings are exploratory. I describe the methodology as three stages: Planning, Acting and Observing.

Planning: My 24 Level 4 students (16 male, 8 female) displayed a wide ability range (formative mean 77.9%, SD 25.8%, range 0–100%), consistent with Gibbs and Habeshaw's (1992) characterisation of foundation cohorts. I categorised students as high-performing (76%, ≥75%), mid-level (10%, 50–74%), and low-performing (14%, <50%). I used these scores to construct six mixed-ability, mixed-gender groups of four, ensuring each included students from more than one performance band. Ability spread varied substantially: Group 3 spanned 88 percentage points (0–88%) while Group 4 was narrow (90–95%). My rationale was that peer explanation requiring a student to articulate why a step works demands deeper cognitive engagement than copying, consistent with Biggs and Tang's (2011) discussion of peer tutoring.

Acting: I redesigned delivery as a six-phase lesson structure, each phase aligned to a cognitive level from Anderson and Krathwohl's (2001) revised taxonomy through constructive alignment (Biggs and Tang, 2011): Phase 1 — Motivational Opening (normalise learning speeds, reduce anxiety; Haidt, 2024); Phase 2 — Diagnostic Starter (ungraded individual task to surface prior knowledge); Phase 3 — Scaffolded Teacher Modelling (step-by-step board work with guided questions: 'Why do we start here?' and 'What does this step achieve?'; targeting 'Remember' and 'Understand'); Phase 4 — Tiered Small-Group Activity (basic: 'Apply'; standard: 'Analyse'; challenge: 'Evaluate'); Phase 5 — Group Presentations and Peer Questioning (peers evaluate alternative approaches, raising demand to 'Evaluate' level for the whole class; Gibbs and Habeshaw, 1992); Phase 6 — Paired Reflection and Closure. Within each group, I assigned roles: reader, writer, calculator, and explainer. I circulated throughout, posing probing questions 'What was the first step your group chose?' and offering hints rather than answers to preserve cognitive demand (Gibbs and Habeshaw, 1992).

Observing: I gathered evidence through a student perception survey (19 of 24 students; 26 January 2026) using five structured yes/no/not-sure items and two open-ended questions, and an In-Class Test (ICT; n=22). Both instruments are used together to triangulate findings from this initial attempt.

Results

Table 1. Student perception survey results, Q1–Q5 (n=19; 26 January 2026)

Survey Question	YES	NOT SURE	NO
Q1: Teacher explained step by step	19 (100%)	—	—
Q2: Understood what to do in the activity	15 (79%)	3 (16%)	1 (5%)
Q3: Felt supported when unsure	16 (84%)	2 (11%)	1 (5%)
Q4: Working in a group helped me learn	18 (95%)	1 (5%)	—
Q5: I had a role and took part in the group	13 (68%)	1 (5%)	5 (26%)

Table 2. Perceived cognitive impact of the activity, Q6 (multiple responses permitted; n=19)

Q6: This activity helped me…	Count	%
Recall what I already knew	12	63%
Follow the steps clearly	8	42%
Apply the method by myself	7	37%

Q1 through Q4 reflect consistent positive responses to the intervention's structure and collaborative design. Q2 reveals that while 15 students (79%) fully identified what to do in the activity, three (16%) partially identified, likely reflecting the wide ability spread across groups (Group 3: range 0–88%; Group 6: range 33–100%). Q5 is the most critical finding: five students (26%) reported no active role, indicating that my role-assignment monitoring was insufficient during this initial attempt. Table 2 shows a stepped cognitive pattern: activities were most accessible at the recall level (63%) and progressively less so toward independent application (37%), consistent with Bloom's hierarchy and the single-attempt nature of the intervention.

Open-ended qualitative data revealed clear topical patterns. Motion was the most frequently cited easy topic (8 students, 42%), followed by Fractions (5 students, 26%) and Graphs (4 students, 21%). Financial Mathematics and Percentages/Interest Calculations were identified as most difficult by 14 of 19 respondents (74%), with comments including 'The percentage and interest question the long question' and 'Financial mathematics is really hard for me.' Three students (16%) cited Motion as difficult; two (11%) reported no difficulty. The concentration of difficulty in Financial Mathematics even after the group-based intervention is the most actionable finding for future attempts.

ICT results (n=22) produced a cohort average of 61.2% (range 30–94%), with 19 students (86%) achieving a passing grade. The student who recorded 0% on the formative quiz improved by 23 percentage points in the ICT the most notable individual gain. Despite the overall pass rate, the gap between the lowest (30%) and highest (94%) ICT scores confirms that performance inequality persisted at the bottom of the cohort even after the intervention.

Discussion and Conclusion

What this initial attempt taught me most clearly is that redesigning classroom structure and changing how students think are not the same and closing that gap requires sustained effort across multiple attempts.

The 100% agreement on explanation quality (Q1) confirms that Phase 3 scaffolded teacher modelling succeeded in its primary purpose: giving students cognitive access before group tasks began, the prerequisite of constructive alignment (Biggs and Tang, 2011, p. 54). However, the stepped pattern in Table 2 63% recalled, 42% followed steps, 37% applied independently shows that the intervention reached the lower cognitive levels without yet consistently activating the upper ones. Anderson and Krathwohl (2001) are clear that apply and Analyse level engagement develops through repeated exposure; one attempt creates the foundation, not the outcome. The Q2 data 21% of students partially or fully uncertain about the activity likely reflects the diversity of ability spread across groups and signals a need to improve how I introduce tiered tasks verbally, particularly for groups containing the lowest-performing students.

The Q5 data that 26% reported no active role is the finding that concerns me most as a practitioner. Confident students naturally occupied the explainer and calculator roles while quieter students defaulted to writer or observation; I did not enforce rotation rigorously enough. Gibbs and Habeshaw (1992) are explicit: moving from lecturer to manager of learning requires deliberately structuring and enforcing accountability it cannot be assumed. The 74% who cited Financial Mathematics as their hardest topic demands targeted action beyond general design improvement. Student comments point to multi-step procedural overload rather than conceptual gaps, consistent with Ashcraft's (2002) findings on how anxiety degrades complex arithmetic performance. In my next attempt, I will introduce a role rotation card changing every task and a dedicated Financial Mathematics diagnostic and scaffold sequence before any group task on this topic.

The 23-percentage-point improvement of the lowest-attaining student (formative: 0%) is this teaching activity's most encouraging individual signal. In whole-class sessions this student was disengaged; in a mixed-ability group they accessed peer explanations calibrated closer to their level, the zone of proximal development mechanism that Biggs and Tang (2011) identify as the core benefit of peer tutoring. One data point is not evidence of causal impact, but it is consistent with the design's intent and warrants the pre/post tracking I will embed in next attempts with this teaching activity.

Regarding applicability: the six-phase design motivational opening, diagnostic starter, scaffolded modelling, tiered group task, peer presentations, paired reflection — requires deliberate planning but no specialist resources. Any practitioner in a mixed-ability numeracy context could trial this framework. Regarding generalisability: this is a single cohort at one institution in one attempt; these findings belong to my classroom for now. For my next attempt, I commit to: (i) role rotation cards; (ii) a Financial Mathematics scaffold sequence; (iii) a structured peer-feedback rubric for the presentation phase; and (iv) a matched pre/post-assessment. My goal remains unchanged: a classroom where every student, regardless of starting point, has a genuine and structured opportunity to think at a higher level. This initial attempt demonstrates the design works in principle. Subsequent attempts will tell me whether it works consistently in practice.

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Changing tutorial activity alignment towards assessment tasks to improve Attendance, Engagement and Perceived Performance Readiness

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Abstract

When tutorial sessions were primarily based on multiple-choice question (MCQ) discussions, students experienced difficulties in applying theoretical knowledge to practical tasks, even though this was a coursework requirement. This teaching approach also led to reduced engagement and lower tutorial attendance (55%) in a second-year module with 127 undergraduates, where group coursework accounted for 60% of the final grade and the coursework required students to develop design-level system diagrams. Having learnt of Constructive Alignment in a teaching development course and identifying that this was a result of misalignment between tutorial activities and coursework expectations, this study explored whether redesigning tutorials to include interactive, coursework-aligned activities could improve student engagement, attendance, and perceived preparedness for coursework. A four-week instructional intervention was implemented by redesigning tutorial sessions to incorporate interactive and applied learning activities. The revised tutorials included step-by-step diagram construction, small-group collaborative tasks, whiteboard-based visualisation, and class-wide discussions to simulate coursework requirements. The effectiveness of the intervention was evaluated through attendance monitoring and student perception data collected through mid-intervention feedback and post-course reflections. The findings indicated increased student engagement by 13% and improved perceived preparedness for coursework by 22%. Student feedback highlighted that guided diagram-building exercises, peer collaboration, and immediate formative feedback were the most beneficial elements. The majority of students (78%) reported stronger alignment between tutorials and coursework and expressed confidence in applying theoretical concepts to practical design tasks. The study demonstrates that redesigning tutorials to incorporate interactive, coursework-aligned activities can enhance student engagement, attendance, and perceived learning outcomes in applied computing education.

Purpose/Background

Tutorials play an important role in supporting student learning by providing opportunities to apply lecture content and clarify complex concepts through practice. However, when tutorial activities are not aligned with coursework or assessment requirements, students may perceive them as less useful, leading to disengagement and reduced attendance (Biggs & Tang, 2011).

This issue became apparent in the BIS Design and Architecture module, where tutorials primarily consisted of multiple-choice question (MCQ) discussions, while the coursework required students to develop design-level system diagrams and apply theoretical concepts in practical contexts. Students experienced difficulties transferring theoretical knowledge to practical coursework tasks, and tutorial attendance remained low at approximately 55%. Having learnt about Constructive Alignment through a teaching development programme, I identified this as a consequence of misalignment between tutorial activities and coursework expectations.

Research suggests that when learning activities reflect assessment requirements, students become more motivated and better prepared to succeed (Wang et al., 2023). In addition, collaborative and small-group learning approaches have been shown to improve student engagement, participation, and higher-order thinking skills (Robillard et al., 2011; Saleh et al., 2015; Shivananda et al., 2021).

Although previous studies have highlighted the benefits of collaborative and aligned learning activities, limited research has explored how coursework-aligned tutorial redesigns influence student engagement, attendance, and perceived preparedness within applied computing and BIS design-oriented modules. Therefore, this study aimed to investigate whether redesigning tutorial sessions to include interactive and coursework-aligned activities could improve student engagement, attendance, and perceived preparedness in a BIS Design and Architecture module. The study explored whether stronger alignment between tutorial activities and coursework requirements could create a more effective and engaging learning environment for students. It was expected that the redesigned tutorial approach would improve participation, understanding of concepts, and confidence in completing coursework tasks.

Methodology

This study was conducted with 127 second-year undergraduate students enrolled in the BIS Design and Architecture module, which includes a group coursework component weighted at 60% of the final grade. The coursework required students to develop design-level system diagrams by applying theoretical concepts to practical scenarios.

I implemented the intervention during Weeks 02 to 05 of the semester to address low tutorial engagement, reduced attendance, and misalignment between tutorial activities and coursework requirements. Prior to the intervention, tutorial sessions mainly consisted of passive content review and multiple-choice question (MCQ) discussions, which provided limited opportunities for students to practice coursework-related skills.

To address this issue**,** I redesigned the tutorials to include interactive and coursework-aligned learning activities. Students worked in small groups and completed step-by-step tasks designed to guide them toward developing complete design diagrams based on case studies. Students collaboratively discussed solutions, presented their diagrams on the whiteboard, and participated in my lecturer-led feedback discussions to compare approaches and clarify misunderstandings.

The redesigned tutorial approach aimed to improve student engagement, attendance, participation, and perceived preparedness by aligning tutorial activities directly with coursework expectations. To evaluate the effectiveness of the intervention, I collected attendance records weekly throughout the intervention period. I gathered mid-intervention feedback and final tutorial reflections using Google Forms to capture students' perceptions regarding engagement, collaborative learning, tutorial alignment, and preparedness for coursework tasks. I also analysed qualitative feedback from open-ended responses to identify common themes related to the effectiveness of the redesigned tutorial activities.

Results

Mid-Intervention Feedback Analysis

A mid-intervention feedback survey was conducted among 127 students enrolled in the BIS Design and Architecture module, and 88 responses were received. The findings indicated high levels of student engagement and positive perceptions toward the redesigned tutorial approach. As given in Table 1, a total of 95.4% of students reported high or very high levels of engagement during tutorial sessions. Similarly, 87.5% of students reported that group activities were highly effective in supporting concept application, while 92.0% found the step-by-step diagram-building activities highly useful for completing coursework-related tasks. In addition, 96.6% of students reported feeling comfortable participating in tutorial discussions. These findings suggest that the inclusion of interactive and collaborative learning activities improved student participation, application of concepts, and confidence in applying theoretical knowledge to practical coursework tasks.

Table 1. Mid-intervention survey results

Measure	Positive Response (%)
Student Engagement	95.4
Usefulness of Group Activities	87.5
Usefulness of Step-by-Step Activities	92.0
Comfort in Discussions	96.6

Qualitative feedback further supported the quantitative findings, with students highlighting that lecturer explanations, group discussions, and practical activities helped clarify doubts and strengthen their ability to apply coursework-related concepts. Some students also suggested including additional practical exercises and more challenging theory-based questions to further enhance the tutorial sessions.

Final Tutorial Reflection Analysis

Following the intervention period and coursework completion, students were invited to provide final reflections regarding the effectiveness of the redesigned tutorial approach. Although the study involved 127 students, 94 responses were received for the final reflection survey. The findings indicated strong positive perceptions regarding the alignment between tutorial activities and coursework requirements, with 71.3% of students reporting that the tutorial activities aligned very well with coursework requirements and 28.7% reporting moderate alignment. In addition, 81.9% of students reported that the redesigned tutorials

significantly improved their preparedness for completing coursework tasks, while 18.1% reported that the tutorials improved their preparedness to some extent.
Students identified step-by-step diagram-building activities, collaborative group discussions, and lecturer feedback as the most beneficial elements of the redesigned tutorial approach. Step-by-step diagram-building activities were identified by 75 students, followed by group discussions (62 students), class-wide discussions and feedback (33 students), and whiteboard-based activities (25 students). Qualitative reflections further revealed that students valued opportunities to apply theoretical concepts, learn from peers, clarify coursework-related doubts, and improve teamwork and communication skills through interactive tutorial activities.

Attendance Analysis
Attendance records as given in Table 2 indicated a gradual improvement in student participation throughout the intervention period. Attendance increased from a pre-intervention level of approximately 55% to 91.33% by Week 05 of the intervention period, indicating that students perceived the redesigned tutorials as more useful and relevant to coursework requirements. Attendance also increased progressively from 77.17% in Week 02 to 91.33% in Week 05, demonstrating sustained student participation throughout the intervention.

Table 2. Weekly Tutorial Attendance During the Intervention Period

Week	Percentage (%)
Week 02	77.17
Week 03	81.88
Week 04	81.88
Week 05	91.33

Overall, the findings from attendance records, survey responses, and qualitative reflections consistently indicate that the redesigned tutorial approach positively influenced student engagement, participation, attendance, collaborative learning, and perceived preparedness for coursework tasks.

Discussion and Conclusion

The findings of this study indicate that redesigning tutorial activities to align more closely with coursework requirements positively influenced student engagement, attendance, participation, and perceived preparedness for assessment tasks. Replacing passive multiple-choice question (MCQ)-based discussions with interactive and applied learning activities appeared to improve students' motivation, confidence, and involvement during tutorial sessions. Attendance records and student feedback consistently indicated positive perceptions regarding engagement, collaborative learning, and readiness for coursework tasks. The findings are consistent with the principles of constructive alignment proposed by John Biggs and Catherine Tang, which emphasize aligning learning activities with assessment requirements. The results also support previous studies highlighting the benefits of collaborative and active learning approaches in improving participation, confidence, and problem-solving skills (Robillard et al., 2011; Saleh et al., 2015; Shivananda et al., 2021; Bond et al., 2020; Theobald et al., 2020).

Students particularly valued step-by-step diagram-building activities, peer discussions, and lecturer feedback, suggesting that interactive learning experiences are more effective than passive content review for developing applied skills in design-oriented modules. These findings may be useful for lecturers teaching computing, information systems, engineering, and other project-based modules, as similar coursework-aligned tutorial activities could be adopted to improve student engagement, participation, and preparedness for assessment tasks.

Although the findings are encouraging, the study was limited to a single module and relied mainly on student perceptions and attendance data. Therefore, the findings may not be fully generalisable to other higher education contexts. Future research involving multiple modules, institutions, and academic performance data would help further evaluate the effectiveness of coursework-aligned tutorial redesigns. In addition, future studies could examine the long-term impact of aligned tutorial activities on academic performance and student retention across different disciplines.

Overall, the study demonstrates that interactive and coursework-aligned tutorial strategies can create a more engaging, supportive, and student-centered learning environment that improves students' attendance, participation, and perceived preparedness for coursework tasks. The findings highlight the importance of aligning tutorial activities with assessment requirements to create meaningful and effective learning experiences in higher education.

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Changing myself from evaluator to facilitator to improve evaluative judgement among undergraduates through peer evaluations

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Abstract

Becoming an effective teacher required me to shift my long-held role as an evaluator of students to a facilitator for improving their evaluative judgement. I realized that providing feedback only after the final assessment limited students' opportunities to identify and correct misconceptions. Therefore, I conducted a formative assessment with 73 first-year undergraduates in the Database Systems module, aiming to raise awareness of the rubric and lecturer's grading perspective. Students' answers were randomly evaluated by peers, who were required to assign grades supported by marking evidence and constructive feedback aligned with the rubric. However, analysis revealed that 88% of peer feedback was vague, mostly consisting of arbitrary grades without comments or evidence, indicating a significant deficit in students' evaluative judgement. To address this, I implemented an in-class intervention using a scaffolded evaluation process to improve the quality of peer feedback. Initially, I conducted a discussion critiquing a flawed example using a checklist aligned with the rubric, guiding students to identify strengths, weaknesses, and areas for improvement. Students then re-evaluated peers' work using the checklist, providing grades with supporting evidence and constructive comments. They subsequently revised their own formative assessments based on peer feedback and conducted self-evaluation using the same checklist. Effectiveness was measured through student perceptions via a five-point Likert-scale questionnaire and analysis of peer feedback using a three-level rubric. After the intervention, vague feedback decreased to 49%. Student perceptions (n = 66) indicated that 82% gained awareness of the lecturer's grading perspective, and 71% reported that peer feedback helped them improve their work. Evaluative judgement improved by 24% and rubric awareness by 29%. Overall, the intervention successfully enhanced students' evaluative judgement, rubric awareness, and early correction of mistakes, while providing insight into the lecturer's grading perspective. Future implementations could incorporate peer discussions to enhance clarity of feedback.

Purpose/Background

Evaluative judgement is an essential higher-order thinking skill (HOTS) that enables graduates to objectively appraise the quality of their own work and that of others against established performance standards (Tai et al., 2018). It empowers them to navigate complex professional environments with greater confidence and expertise. However, students in higher education often depend heavily on teachers' assessment of their work and struggle to clearly identify the criteria and expectations used to evaluate their performance. Furthermore, the evaluation process is frequently embedded within assessment practices and insufficiently transparent to students (Cowan, 2010). Formative assessment through repeated evaluative practice, supported by self- and peer-feedback, rubrics, and exemplars, can reduce excessive teacher influence on student learning (Cowan, 2010; Tai et al., 2018). Furthermore, when teachers shift from passive evaluation to actively engaging students in transparent and systematic assessment processes, students develop stronger evaluative judgement, gain a better understanding of academic standards, and become less dependent on teachers' grades (Ibarra-Sáiz et al., 2025).

Providing undergraduates with opportunities to engage in scaffolded peer evaluation can significantly enhance evaluative judgement. Through iterative peer-evaluation processes, students learn to assess work against established criteria, identify strengths and weaknesses, and provide evidence-based, constructive, and objective feedback, thereby improving the quality of peer feedback (Cano García et al., 2024). Furthermore, repeated exposure to standards and exemplars, together with structured and guided peer-evaluation cycles, can strengthen evaluative judgement by promoting dialogic feedback and collaborative learning, enabling students to more effectively communicate, interpret, apply, and act upon feedback for continuous improvement (Ardill, 2025). Therefore, teachers must adopt effective and transparent strategies aligned with learning outcomes and professional expectations to systematically develop students' evaluative judgement.

In the first-year Database Systems module of the BSc in Artificial Intelligence and Data Science programme, student performance is assessed solely through a single individual coursework. Students receive constructive feedback only after this final summative evaluation, with no formative feedback provided at earlier stages. This approach limits opportunities to identify and address weaknesses early in the learning process. Therefore, I initially conducted a formative in-class assessment (pre-intervention) with the current student cohort (n = 73) to enhance students' awareness of the evaluation rubric and provide early insights to improve their work for better module grades (A, or B). Student answers were randomly and anonymously assigned to peers across the two tutorial groups for evaluation using the rubric. They were instructed to provide grades, clear marking evidence, and constructive feedback on strengths, weaknesses, and areas for improvement. However, analysis revealed that 88% of the peer feedback consisted mainly of subjective grades with limited alignment to the rubric and minimal comments or marking evidence. This highlighted insufficient evaluative judgement and limited engagement with peer evaluation as a meaningful learning opportunity.

To address this gap, I implemented an in-class intervention to investigate whether a structured teacher-guided evaluative scaffolding process, compared with conventional peer-evaluation practices, could enhance first-year undergraduates' evaluative judgement and peer feedback quality (Research Question). It was expected that the intervention would strengthen students' rubric awareness, support the early identification and correction of weaknesses, provide greater insight into teachers' grading perspectives and assessment practices, and ultimately enhance students' evaluative judgement and the quality of their feedback.

Methodology

The study implemented a structured teacher-guided evaluative scaffolding intervention through several sequential stages. Initially, I presented students with a flawed model answer that I had intentionally created from the previous formative assessment by including incorporating common mistakes frequently observed in student coursework submissions. This was followed by a guided class discussion in which students identified mistakes, justified their observations, and critically examined the quality of the work. Subsequently, I introduced a task-specific checklist developed from the summative assessment evaluation rubric. Using this checklist, I guided students in evaluating the flawed example, assigning an appropriate grade, and providing constructive feedback by clearly identifying strengths, weaknesses, and suggested improvements. Subsequently, I presented a correct model answer of the same task, and the same guided discussion, checklist-based evaluation, and feedback process were repeated. In the next stage, I redistributed the student answers that had already been evaluated during the pre-intervention phase across the two tutorial groups. Students were then instructed to re-evaluate their peer work using the same checklist by clearly providing marking evidence (e.g., ticks, crosses, and other indicators), assigning an appropriate grade, and offering constructive feedback on strengths, weaknesses, and areas for improvement. The evaluated scripts and corresponding feedback sheets were then returned to the original authors. Students were instructed to carefully review the peer feedback to identify the highlighted strengths, weaknesses, and required improvements in their work. Subsequently, I asked them to revise and redo the formative assessment based on peer feedback, together with the awareness gained through the initial teacher-guided discussions. Finally, students conducted self-evaluation of their revised work using the same checklist, assigned a grade, and produced structured self-feedback by independently identifying strengths, weaknesses, and potential improvements. The effectiveness of the intervention was measured through student perceptions gathered using a five-point Likert-scale questionnaire (1 = Strongly disagree, 5 = Strongly agree). In addition, the quality of peer feedback was categorized using a three-level rubric (no/vague, limited, good), and feedback quality before and after the intervention was compared.

Results

Figure 1 presents the analysis of peer feedback quality for the formative assessment (n = 73) before and after the intervention. Following the intervention, "no or vague" feedback decreased to 49%, while good-quality feedback increased by 65%, indicating a substantial improvement in the quality and constructiveness of peer evaluations. The percentage distribution of student perceptions (n=66) from the Likert-scale questionnaire is presented in Table 1. The results showed that over 70% of responses across all criteria fell within the "Agree" or "Strongly Agree" categories. Notably,

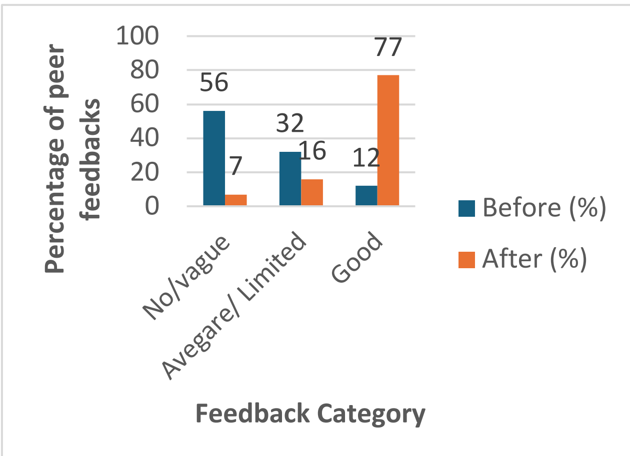

Figure 1. Peer Feedback Quality of Formative

81.8% of students reported gaining greater awareness of the lecturer's grading perspective (C8), while an equal percentage recognized the evaluation checklist (C2) as an effective learning aid. Additionally, 80.3% positively appraised the discussion with model answers (C1). Furthermore, 77.3% indicated that evaluating peers' work (C4), and 71.2% indicated that the peer feedback they received (C3), supported the early identification and correction of their own weaknesses. Table 2 presents the total percentage of student perceptions (n = 66) within the "Agree" and "Strongly Agree" categories before and after the intervention, together with the percentage improvements observed. The findings highlighted that students' confidence in accurately completing the summative assessment (C10) increased by 23%, while motivation to achieve higher module grades (C12) increased by 27%. Most importantly, evaluative judgement (C14) improved by 24%, and rubric awareness (C11) increased by 29% following the intervention.

Table 1. Summary of Student Perception (%)

Evaluation Criteria (C)	**Scale wise Student Perceptions (%)**				
	1	**2**	**3**	**4**	**5**
The discussions with model answers helped me understand what to look for when evaluating my peer's work (C1).	3.0	7.6	9.1	34.8	45.5
The evaluation checklist simplified the marking rubric and was an effective tool for assessing my peer's work (C2).	1.5	6.1	10.6	37.9	43.9
The peer feedback I received was instrumental in identifying specific strengths, mistakes, and areas for improvement in my conceptual design (C3).	1.5	7.6	19.7	39.4	31.8
Evaluating my peers' work made me more critical and aware of mistakes in my own design (C4).	3.0	6.1	13.6	40.9	36.4
I was able to develop an advanced design than earlier (C5).	3.0	4.5	16.7	37.9	37.9
I feel capable of pre-grading and moderating my own coursework using rubric to improve my grade (C6).	4.5	3.0	18.2	40.9	33.3
This collaborative "moderation" approach is more effective than traditional one-way feedback from a lecturer (C7).	4.5	6.1	7.6	39.4	42.4
This activity helped me understand the "Lecturer's perspective" on grading my coursework (C8).	3.0	4.5	10.6	39.4	42.4
The activity reduced my anxiety about the final coursework (C9).	3.0	10.6	12.1	40.9	33.3

Table 2. Summary of Student Perception (%)

Criteria - Coursework Conceptual Design (CCD)	**Agree + Strongly Agree (%)**		**Improve-ment (%)**
	Before	**After**	
I am confident in accurately creating the CCD (C10).	54	77	23
I am familiar with the CCD rubric (C11) - Rubric Awareness.	53	82	29
I was confident of getting a higher grade (A or B) for my CCD (C12).	50	77	27
I could grade accurately aligned with the marking rubric (C13).	55	76	21
I was able to provide constructive feedback, identifying strengths, mistakes, and areas for improvement (C14) - Evaluative Judgment.	59	83	24

Discussion and Conclusion

The findings of this study indicate that a structured teacher-guided evaluative scaffolding process can significantly enhance undergraduates' evaluative judgement, rubric awareness, and peer feedback quality. The study supports existing literature emphasizing the effectiveness of self-assessment and peer feedback (Cowan, 2010), while further demonstrating the value of rubrics, exemplars (Tai et al., 2018), and transparent evaluative frameworks in developing evaluative judgement (Ibarra-Sáiz et al., 2025). By integrating flawed and correct model answers, checklists rubrics-based evaluation, peer feedback, and self-assessment within a formative framework, the intervention effectively bridge the gap and improved transparency in the evaluation process.

This study also highlights the importance of teachers shifting from the traditional role of evaluator to that of a facilitator of evaluative judgement. Through this transformation, educators can create more transparent, systematic, and student-centered assessment environments that better support students' learning needs. Future implementations could be strengthened by incorporating peer discussion phases to further improve the clarity, depth, and reasoning behind peer feedback, as collaborative dialogue may deepen evaluative understanding. However, time limitations were a major constraint during the intervention, indicating that extensive planning and careful task design are essential for effective time management. As the findings are currently limited to a single student cohort, further research is needed across different cohorts, disciplines, and academic levels to determine the broader applicability and long-term impact of this approach. Future studies could also compare the effectiveness of formative peer- and self-evaluation with traditional summative teacher evaluation. Overall, this study suggests that structured teacher-guided evaluative scaffolding offers a promising pedagogical strategy for systematically developing evaluative judgement and improving feedback quality in higher education.

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Changing Teaching to Transform Passive Mathematics Learning through Collaborative Case-Based Teaching and Formative Assessment

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Abstract

Student engagement when teaching a technical subject was a challenge in a Business Mathematics class of 30 foundation level students where traditional lecture-based teaching resulted in passive note-taking and limited peer interaction. Though many students were able to perform calculations but struggled to explain reasoning or employ mathematical concepts to real-world contexts. Motivated by curriculum design principles learnt from a teaching development course, this situation led me to explore whether a change to collaborative case-based learning combined with formative assessment strategies could improve student engagement and performance in mathematics and my findings are reported here. Three sequential pedagogical changes were implemented. First, collaborative group problem-solving activities were introduced to encourage peer discussion and explanation of solutions. Second, real-world case-based statistics tasks were integrated where students tested datasets such as sales records and customer counts, calculating mean, median, and standard deviation and interpreting results for business decisions. Third, assessment was redesigned using self-assessment and peer feedback with a structured rubric focusing on clarity of reasoning, correct rule application, and presentation. Effectiveness was appraised using student observation checklists, student feedback, and comparative analysis of examination performance before and after the intervention. Observation data indicated that 70% to 75% of the students actively participated in group discussions and demonstrated peer-to-peer support during problem-solving activities. Quantitative analysis of examination performance showed improvement in class achievement. The mean score increased from 43.7% in the first mock examination to 45.7% in the second, with 12 of 23 students improving their marks, including one student, increasing from 16% to 59%. These results suggest improved engagement and conceptual interpretation. The findings indicate that combining collaborative learning, real-world case contexts, and formative assessment strategies can transform passive mathematics classrooms into active learning environments. The approach encourages students to explain reasoning, employ concepts to practical situations, and take responsibility for their learning. Such pedagogical redesign supports the learning needs of digital-age learners and provides a practical framework for improving engagement and performance in technical subjects.

Background

Business Mathematics is often perceived as a subject focused mainly on formulas, procedures, and repetitive calculations. In my teaching context, many students relied heavily on lecturer explanations and worked examples, while only a few actively engaged in discussions or demonstrated deeper conceptual interpretation. Although students could perform calculations, they often struggled to employ mathematical concepts in unfamiliar or real-world situations, highlighting a gap between procedural fluency and conceptual identification.

These challenges encouraged me to rethink my teaching practices in line with learner-centered and Outcome-Based Education (OBE) principles (Keo et al., 2025). Similarly, Gibbs and Habeshaw (1989) highlight that collaborative and discussion-based learning improves active participation, while Ramsden (1992) argues that learning becomes more meaningful when students connect theory with practical situations. Bell Hooks (1994) emphasizes that meaningful teaching should create conditions for deep and engaged learning, while Biggs and Tang (2011) explain that constructive alignment requires learning activities and assessments to support intended learning outcomes directly. Formative assessment strategies such as self-assessment and peer feedback also encourage reflection and self-regulated learning (Biggs & Tang, 2011). More recently, Lim and Park (2023) found that allowing students to engage in self-study before discussion resulted in better immediate and long-term retention, as well as improved transfer of learning, compared to traditional lecture-first approaches. Their findings suggest that students benefit more when they actively construct knowledge and then discuss their understanding with peers. This further reinforces the value of student-centered strategies that promote independent learning, collaboration, and the application of knowledge in different contexts. Therefore, this study examines the implementation of three connected teaching interventions in Business Mathematics: collaborative group problem-solving, case-based collaborative statistics activities, and formative assessment through self-assessment, and student performance data. The study evaluates how these strategies contributed to transforming passive learning into a more active, collaborative, and reflective learning experience.

Methodology

I conducted this study for 30 students following Business Mathematics at Asia Pacific Institute of Information Technology (APIIT), I progressively implemented three interconnected Change Agreements, each designed to address specific challenges related to passive learning, limited conceptual interpretation, and low levels of student engagement in the classroom. I adopted a classroom-based reflective intervention approach to evaluate the effectiveness of active learning, case-based learning, and formative assessment strategies in enhancing student participation and improving students' ability to interpret and apply mathematical concepts.

For the first intervention, I focused on reducing passive learning by introducing collaborative group problem-solving activities. I divided the students into six groups of five members each and assigned mathematical problems to solve collaboratively. I encouraged students to discuss different methods, explain their reasoning to peers, and present their solutions to the class. Throughout the activity, I adopted the role of a facilitator by guiding discussions, clarifying misconceptions, and promoting peer interaction. For the second intervention, I introduced case-based collaborative statistics activities using authentic business-related datasets. I organized students into groups of 5 and provided them with customer records, and sales data to calculate statistical measures such as the mean, median, standard deviation, frequency tables, and frequency polygons. I then encouraged students to interpret their findings within practical business contexts and present their conclusions as "mini business analysts." Throughout the activity, I facilitated classroom discussions by linking statistical outcomes to real-world decision-making situations, enabling students to recognize the relevance and application of mathematics in business settings. For the third intervention, I redesigned assessment practices by integrating formative assessment strategies into a differentiation lesson. I asked students to complete differentiation tasks followed by self-assessment, peer feedback, reflective writing, and rubric-based evaluation (Figure 1). I encouraged students to exchange their work with peers, provide constructive feedback, and reflect on their strengths and areas for improvement. In addition, I provided timely feedback that focused not only on procedural accuracy but also on students' conceptual reasoning and their ability to explain the methods they used. I adopted different evaluation methods for each intervention, while classroom observations, student feedback, reflective comments, and comparisons of student performance before and after implementation were common across all three interventions. For the first and second interventions, I used a Student Engagement Observation Checklist, classroom observations, and student comments. For the third intervention, I used self-assessments, peer feedback, reflective writing, and rubric-based evaluation (Figure 1). Overall, the interventions contributed to a 2.04 percentage point increase in the mean score, with 12 out of 23 students demonstrating improvement, alongside enhanced participation, collaboration, and reflective learning practices.

Criteria	Excellent (3)	Good (2)	Needs Improvement (1)
Application of Rules	Correct Differentiation Rules (Power rule, chain rule applied appropriately)	Mostly correct with minor rule errors	Wrong or inconsistent rules applied
Clarity of Steps	All steps shown Clearly, logical flow easy to follow	Most steps shown but some gaps	Few/no steps shown, unclear reasoning
Accuracy of Solution	Final derivative is correct and simplified properly	Minor errors in simplification or arithmetic	Major errors, incorrect final result
Explanation / Justification	Clear explanation of why a rule was used, reasoning well stated	Some explanation provided but limited detail	No explanation, only final answer given
Presentation and Effort	Neatly presented, well organized, easy to read	Some effort in presentation	Poorly organized, messy or careless

Figure 1: Rubric used for self-assessment and peer feedback in the differentiation task.

Results

To evaluate the effectiveness of the interventions, students' performance in the 1st mock examination (before implementation) was compared with the 2nd mock examination (after all implementations). A total of 23 students were included in the analysis. The findings indicate a positive overall improvement in student performance with an increment of the mean score by 2.04 following the implementation of collaborative learning, case-based activities, and formative assessment strategies (Table 1). Out of the 23 students, 12 students demonstrated improvement in their marks after the interventions (Figure 2). Several students showed substantial progress, including one student whose marks increased from 16% to 87%. Although the overall mean score increased by 2.04 percentage points, a few students (e.g., Students 1, 2, 6, 9, and 18) showed a reduction in marks after the interventions. This may be attributed to differences in learning pace, varying levels of participation in group activities, inconsistent attendance, and difficulties in adapting to student-centered learning approaches that required greater independence and collaboration. These findings suggest that active learning strategies may not benefit all students equally without continuous guidance and structured support. Qualitative evidence collected through classroom observations, student reflections, peer feedback, and the Student Engagement Observation Checklist demonstrated increased student participation and engagement. Based on the checklist, approximately 83% (25 out of 30) of students actively participated in discussions and showed positive engagement throughout the activities. Most students collaborated effectively, used appropriate mathematical language, and demonstrated evidence of peer-to-peer support. Students also displayed improved confidence in presenting solutions, although a few remained hesitant when presenting outside their comfort groups. Sustained engagement was observed among many students, with only a small number losing focus when grouped with close friends. However, uneven participation remained evident, as some weaker students contributed less and relied on stronger peers during discussions.

Table 1: Comparison of Student Performance Before and After the Implementation of the Three Teaching Interventions

Assessment	Mean Score
1st Mock (Pre-intervention)	43.65
2nd Mock (Post-intervention)	45.70

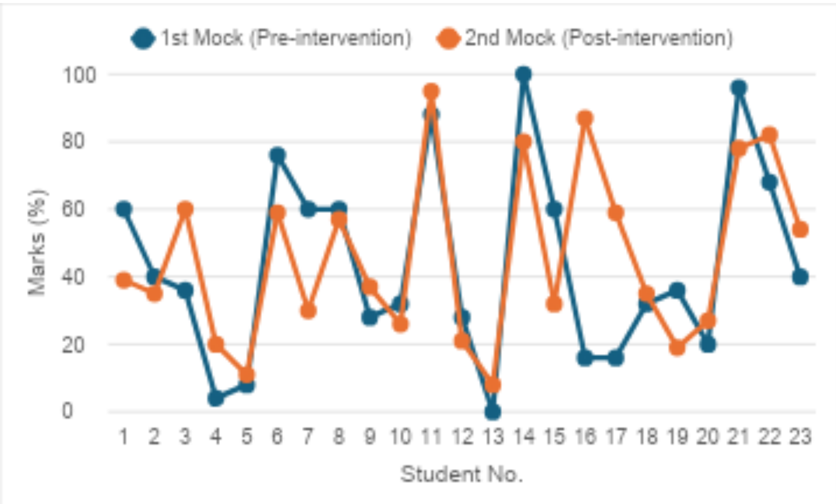

Figure 2: Comparison of Students Marks (Before and after implementation)

Discussion and Conclusion

The findings suggest that collaborative, contextual, and reflective teaching strategies positively improved student engagement and performance in Business Mathematics. The increase in the overall mean score of 2.04, together with the improvement shown by 12 out of 23 students, indicates the positive impact of collaborative learning, case-based activities, and formative assessment strategies. Several students demonstrated substantial progress, including one student whose marks increased from 16% to 87% after the interventions. Qualitative findings further supported these results. Students became more comfortable discussing mathematical ideas within collaborative groups and were more actively involved in group discussions, peer questioning, collaborative problem-solving, and explaining mathematical reasoning to classmates. The use of authentic business scenarios also helped students interpret mathematics as a practical decision-making tool rather than a purely theoretical subject. In addition, the radar chart feedback demonstrated improvements in classroom discussion, encouragement of student opinions, practical application of concepts, clarity of teaching, organization, and stimulation of critical thinking. These outcomes align with the constructive alignment principles proposed by Biggs and Tang (2011). These findings are also consistent with recent research: Lim and Park (2023) reported that learning approaches that encourage independent learning followed by discussion lead to better retention and transfer of knowledge than traditional lecture-based approaches. Similarly, the improvements observed in this study suggest that student-centered learning environments that promote collaboration, application, and reflection can enhance both academic performance and higher-order thinking skills. However, the study also highlighted that active learning requires continuous facilitation and structured classroom management. Challenges related to uneven participation, group dynamics, and confidence in presentations suggest the need for strategies such as structured group roles, mixed-ability grouping, reflective journals, and stronger peer feedback mechanisms in future implementations. Further research is needed to explore the applicability of these findings on a broader scale. Future studies could implement similar interventions across larger student cohorts, different mathematics modules, and other disciplines to determine their long-term effectiveness and generalizability. In addition, longitudinal studies could examine whether improvements in engagement, critical thinking, and application of knowledge are sustained over time. The process also transformed my own teaching practice by shifting my role from primarily delivering content to facilitating discussion, interpretation, and application of mathematical concepts. Although challenges related to participation and group dynamics remain, the findings suggest that student-centered and reflective teaching approaches have strong potential to improve engagement and deeper learning within mathematics education.

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Reflective Teaching to Reorient Student Motivation in a Theory-Intensive Database Module: A Perception Study

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Abstract

This study was conducted in a second-year undergraduate Database (DB) module delivered to Software Engineering, Computer Science and Business Computing undergraduate students, with approximately 120 students in each of ten groups. Lecturers had frequently observed that the module, traditionally delivered through theory-intensive lectures, resulted in reduced engagement and limited demonstration of knowledge during tutorials. Students appeared lethargic during lectures, with body language indicating low energy and minimal attentiveness. Many were dependent on direct explanations and focused primarily on passing assessments rather than engaging deeply with concepts. Reflecting on this context, a deliberate shift in teaching practice was undertaken to reorient student motivation towards more active participation and meaningful engagement during lectures. The research question posed was: Can embedding structured low-stakes active-learning mechanisms within lectures improve student motivation and enhance conceptual learning in a theory-intensive module. Low-stakes Kahoot quizzes were embedded mid-lecture and at the end of lectures as formative checkpoints. Each quiz, limited to ten questions, was based on theories delivered within the same session and required application rather than simple recall. Students attempted the quizzes via mobile phones, aligning with their digital preferences, and displayed curiosity about top scores and enthusiasm for the activity. Post-quiz discussions addressed misconceptions through explicitly referring back to the theories taught. Success was evaluated using student perception data, lecturer observations, and comparison of clarification queries with previous cohorts. Student feedback indicated increased engagement (78%), enjoyment, and reduced anxiety. 74% of students reported that the quizzes helped them evaluate their own comprehension during lectures. 80% of them recommended adopting similar approaches in other modules during structured mid-semester meetings. Lecturer observations confirmed sustained participation, while attendance showed a noticeable increase (Approximately 17%) during quiz-integrated sessions. Additionally, a 28% reduction in clarification queries was observed compared to previous iterations. Findings suggest that embedding structured, low-stakes motivational mechanisms can positively influence engagement and conceptual learning in theory-intensive modules.

Background

Maintaining student motivation, attention, and meaningful engagement in theory-intensive higher education modules has become increasingly challenging, particularly among contemporary Generation Z learners. Although these students are highly familiar with digital technologies, they often prefer immediate feedback, exhibit shorter attention spans, and rely heavily on structured guidance. Recent studies suggest that Generation Z students expect interactive and technology-enhanced learning environments that support active participation and continuous feedback (Alruthaya et al., 2021; Al-Adwan et al., 2024). These challenges were evident in a second-year undergraduate Database module. Topics such as entity relationship modelling, database design principles such as conceptual and logical mapping require abstract reasoning and conceptual comprehension. Through module team discussions and observations in classes over several academic years, I observed that students frequently struggled to sustain attention during concept-heavy lectures and tent to adopt passive learning behaviors. In large lecture settings, opportunities for interaction were limited, resulting in reduced engagement during theory delivery. Students often required repeated explanations of theoretical concepts during subsequent tutorial sessions, suggesting a gap between lecture delivery and conceptual knowledge. Consequently, additional teaching time was required to revisit concepts that had already been covered in lectures. These observations highlighted the need to reconsider existing teaching practices and identify approaches that could better support student motivation and engagement.

Educational research consistently demonstrates that students learn more effectively when actively involved in the learning process. Active learning approaches have been associated with improved understanding and academic performance (Prince, 2004). Similarly, Student Response Systems (SRS) have been shown to enhance classroom interaction and positively influence learning experiences in large classes (Caldwell, 2007). More recently, gamification has emerged as an effective strategy for promoting motivation and engagement in higher education. Kahoot!, a widely used gamified Student Response System, is grounded in principles of intrinsic motivation and flow theory (Malone, 1981; Sweetser & Wyeth, 2005). Recent studies have shown that Kahoot-based learning positively influences academic performance, motivation, engagement, and attitudes towards learning while also supporting formative assessment in higher education settings (Wang & Tahir, 2020; Martín-Sómer et al., 2021; Özdemir, 2024). With growing evidence supporting gamification, this study explored whether embedding low-stakes Kahoot-based activities within lectures could enhance student motivation, engagement, and conceptual learning in a second-year undergraduate Database module.

Methodology

The intervention was implemented across six selected lecture sessions, involving approximately 120 students in each of ten groups. In each session, low-stakes Kahoot quizzes were embedded at predefined pedagogical checkpoints: (i) between two major topic segments, (ii) mid-lecture following the introduction of a key concept, and/or (iii) at the end of the lecture for consolidation. The number and timing of quizzes varied across sessions based on lecturer observation and time constraints, with some sessions including a single quiz instead of two. Each quiz consisted of a maximum of ten questions aligned with content delivered in the same session. Question formats included multiple-choice, short answer, and ordering-based items to assess different levels of conceptual engagement. All quizzes were accessed via a QR code displayed on the lecture screen, enabling students to participate using mobile devices. Immediate feedback was provided after each quiz, followed by lecturer-led discussion addressing misconceptions with explicit reference to the taught theory. Class-level performance summaries for each question were also reviewed during discussion. To evaluate the impact of the implemented methodology, I collected data using three approaches. First, I administered questionnaire to collect student perceptions after the intervention which yielded a 70% response rate. Second, qualitative feedback was obtained from open-ended questionnaire responses. Third, I recorded lecturer observations discussed during module team meetings. In addition, comparative analysis of clarification queries was conducted by reviewing records from the current cohort against previous iterations of the module, as documented in internal communications. Figure 1 below illustrates the continuous reflective cycle where teaching practice was iteratively refined based on real-time classroom observations which were implemented.

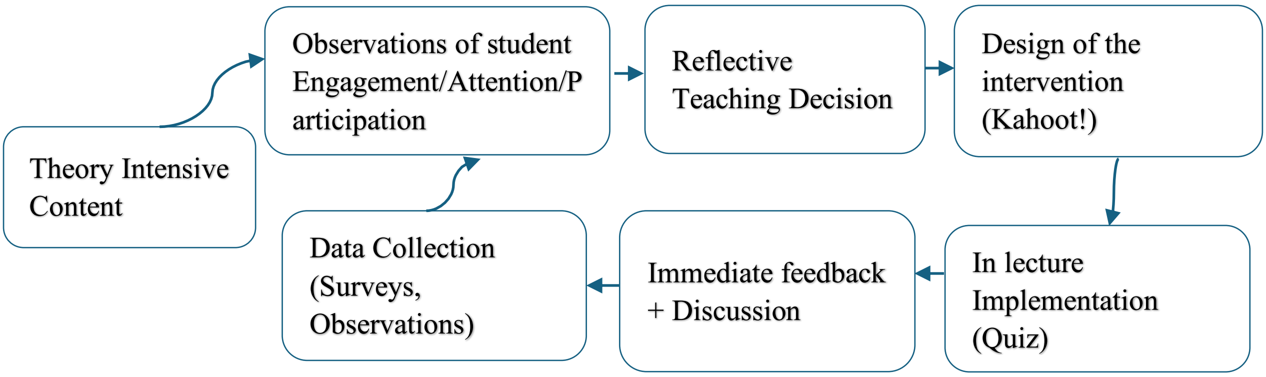

Figure 1. Reflective Teaching Cycle Model for reorienting student motivation in theory-intensive lectures

Results

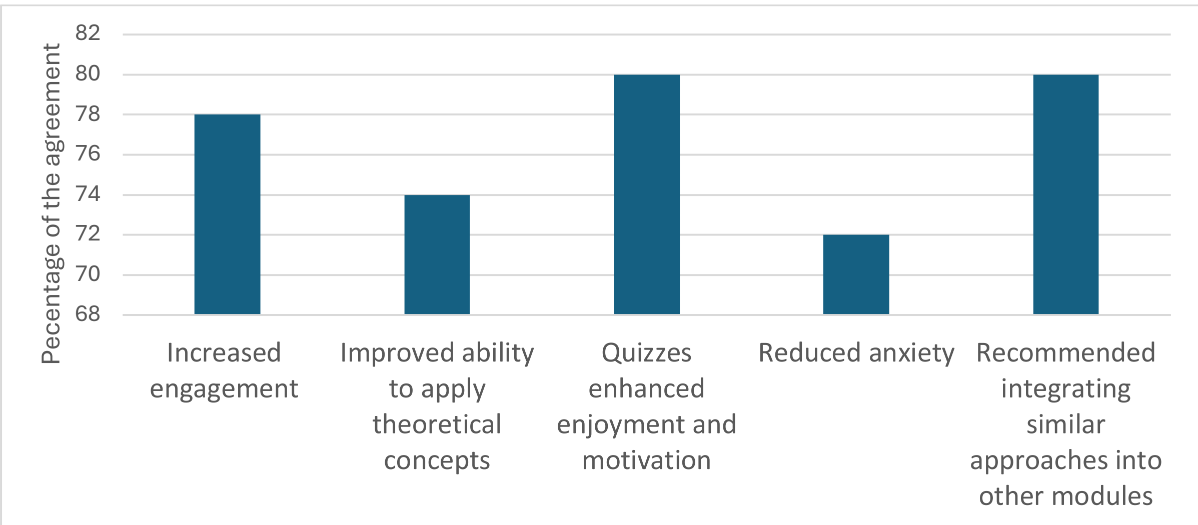

Figure 2. Student perceptions on overall experience

The results present triangulated evidence drawn from student perception data, qualitative feedback, lecturer observations, and comparative module-level analysis. This multi-source approach was used to enhance the validity of findings related to student motivation and engagement. (i) Quantitative Results: As illustrated in Figure 2, student perception data indicated strong agreement across all measured dimensions. 78% of the students reported increased engagement and 74% of the students reported improved ability to apply theoretical concepts. Additionally, 80% of students indicated that the quizzes enhanced enjoyment and motivation, while 72% reported reduced anxiety when engaging with complex database concepts. 80% of the students recommended integrating such approaches into other modules. (ii) Qualitative Insights: Open-ended responses further supported these findings. Students emphasized that the quizzes facilitated conceptual clarity by linking questions directly to lecture content and enabling application of theories rather than passive memorization. Several responses highlighted that the interactive nature of the quizzes was "better than just reading slides" and supported simplified comprehension of complex topics. Suggestions for improvement included increasing the number of questions, allowing more response time, and incorporating additional real-world examples. (iii) Observational and Comparative Data**:** Lecturer observations further confirmed sustained participation and a noticeable increase in attendance during quiz-integrated sessions. Additionally, a 28% reduction in clarification queries was observed compared to previous iterations, suggesting improved conceptual clarity and reduced reliance on repeated explanations. Overall, the observational evidence aligned with student perception data, indicating enhanced engagement and improved conceptual grasp when low-stakes formative mechanisms are integrated into theory-intensive lectures.

Discussion and Conclusion

The findings of this study indicated that embedding structured, low-stakes gamified interventions within theory-intensive lectures can significantly enhance student motivation, engagement, and conceptual comprehension particularly where student disengagement and cognitive overload are common. The reported increases in engagement (78%), motivation (80%), and reduced anxiety (72%) are consistent with prior research on game-based learning and SRS's, which highlighted the role of interactivity, immediate feedback, and enjoyment in improving learning experiences (Wu *et al.,* 2011; Zhao *et al.,* 2022). Importantly, the findings demonstrated that such interventions are particularly effective in theory-heavy contexts by supporting active engagement and bridging the gap between concept delivery and understanding. These strategies can be applied to similar theory-intensive modules, provided they are carefully aligned with learning outcomes and lecture design. The findings are subjected to limitations, including the context-specific nature of the module, cohort characteristics, and time constraints affecting intervention consistency. Therefore, further research across diverse modules, disciplines, and student cohorts is necessary to establish broader applicability. In the Future work, I will focus on extending the approach across different theory intensive computing modules, incorporating higher-order thinking tasks, and evaluating long-term learning impact such interventions on academic performance and knowledge retention beyond immediate lecture contexts. Overall, the study reinforces the need for adaptive teaching practices that both respond to and reshape student learning behaviors toward deeper engagement.

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Students' Perceptions of Structured Peer Feedback as a Teaching Change to Motivate Students and Improve Low Fidelity Prototype Design in Computing Education

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Abstract

Students in our design-oriented Human–Computer Interaction (HCI) and User Experience (UX) modules frequently faced difficulties when identifying clear system requirements in early stages of prototype development. Observations in previous coursework evaluations showed student unawareness of important requirements when selecting design topics and developing low-fidelity wireframe prototypes, often resulting in incomplete designs and reduced prototype quality. Many students also lacked confidence in evaluating self-work and were hesitant to seek feedback so that errors and omissions were often identified only at later coursework stages. Recognizing these challenges and based on methods learnt in a teaching development course, we introduced teaching changes to motivate students to actively engage in requirement analysis to improve their initial prototype design quality. We implemented a structured peer feedback activity in our second-year tutorial (n=40). Students, in–groups (of 5 students), first presented their system idea and identified key user requirements. Another group then evaluated the presented work using a structured peer feedback rubric that had guidance to provide constructive suggestions, motivational comments and identify missing requirements to encourage improvement. After receiving peer feedback, each group refined their requirements before proceeding to develop their final low-fidelity prototype. The intervention was evaluated by direct observations and student feedback. The activity demonstrated strong participation, with 100% active engagement. Student feedback collected indicated a positive response, with 95% of participants expressing satisfaction and 5% reporting a neutral response. Students noted that peer feedback helped them recognize overlooked requirements, refine their design ideas, and improve the clarity of their prototypes before finalizing the design. While the teaching change encouraged student motivation and engagement and developed collaboration, critical thinking, and constructive dialogue, it also supported lecturers in reflectively addressing learning challenges students faced during their early learning stages. This helped students develop more effective low fidelity prototypes in HCI and UX modules.

Introduction

In HCI and UX education, low-fidelity prototyping plays a critical role in enabling students to conceptualize and visualize system designs before implementation. Despite its importance, a recurring issue observed in coursework is that students often fail to identify and incorporate essential system requirements during the initial design phase. This results in incomplete prototypes and affects the overall quality of their work.

This issue is largely attributed to limited evaluative skills, lack of confidence in self-assessment, and minimal engagement in feedback-seeking practices. Students typically rely on instructor feedback provided at later stages, which reduces opportunities for early improvement. According to Nicol and Macfarlane-Dick (2006), effective feedback plays a central role in developing self-regulated learning and improving student performance.

To address this challenge, a structured peer feedback approach was introduced as a pedagogical intervention. Peer learning has been widely recognized as an effective strategy that promotes active engagement, collaborative learning, and deeper understanding (Topping, 1998; Karal & Sarıalioğlu, 2022). Additionally, involving students in peer assessment helps develop critical evaluation skills that are essential in design disciplines (Falchikov, 2005; Barney et al., 2023).

Methodology

We introduced this intervention during a tutorial session involving forty second year students enrolled in an HCI and UX modules. We divided the class into eight groups, with each group consisting of five members. We designed the intervention as a structured peer feedback activity aimed at improving requirement identification and design quality.

During the session, we asked each group to present their system idea along with an initial set of identified requirements. After each presentation, we assigned another group to review the presented work using a structured rubric. The rubric guided students to provide both motivational feedback, which acknowledged strengths, and actionable feedback, which identified missing or unclear requirements and suggested improvements. Structured rubrics have been used to improve the quality and consistency of peer feedback by providing clear evaluation criteria (Taylor et Al., 2024; Ardill, 2025).

After each group received feedback and we gave them time to refine their requirements before proceeding to the final prototype design. We evaluated the effectiveness of the intervention through direct observation, student participation levels, and feedback collected at the end of the session, consistent with classroom-based action research approaches in education.

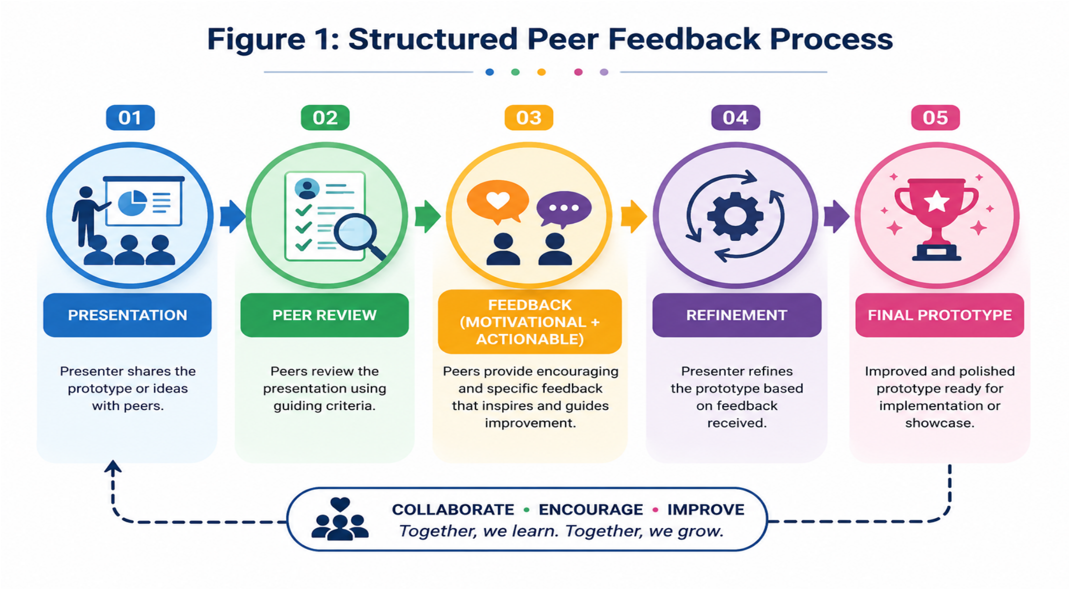

Figure 1: Structured Peer Feedback Process (Authors' own illustration based on the structured peer feedback activity conducted in the HCI and UX tutorial)

Results

The results of the intervention indicated a high level of student engagement and participation. All forty students actively participated in both presenting and reviewing activities, demonstrating strong involvement in the learning process. The structured nature of the activity ensured that every group contributed meaningfully.

Student satisfaction was assessed using a shared student questionnaire administered at the end of the session. The questionnaire captured students' perceptions of the structured peer feedback activity, including their level of satisfaction, engagement, and the usefulness of peer feedback in improving their requirements and prototype ideas. The feedback revealed a high level of satisfaction, with 38 students expressing positive responses and 2 students indicating a neutral response. This represents 95% positive responses and 5% neutral responses.

Students reported that the peer feedback process helped them identify overlooked requirements, refine their ideas, and gain a clearer understanding of design expectations. Additionally, many students noted that receiving feedback from peers felt more approachable and less intimidating compared to instructor feedback.

Lecturer satisfaction with the teaching and learning activity was assessed through our reflective observation of the session, including student participation, completion of the peer review task, quality of group discussion, and students' ability to apply the received feedback during refinement. Based on these observations, we estimated lecturer satisfaction with the activity to be above 80%, as the intervention supported active participation, meaningful peer discussion, and visible improvement in students' requirement refinement process.

The activity also contributed to perceived improvement in learning outcomes, as students demonstrated better clarity in requirement identification and increased confidence in evaluating both their own work and that of others.

Discussion and Conclusion

The findings demonstrate that structured peer feedback supported student engagement and participation in HCI and UX education. All groups contributed meaningfully during the activity, suggesting that the structured nature of the intervention encouraged students to take an active role in both presenting and reviewing work. This aligns with Topping's (1998) and Karal & Sarıalioğlu (2022) view that peer assessment can increase student participation and accountability by allowing students to become active contributors in the learning process.

The students' positive feedback also suggests that the intervention created a supportive learning environment. Students reported that feedback from peers felt more approachable and less intimidating than relying only on instructor feedback. This supports Falchikov's (2005) view that peer feedback can reduce anxiety and promote openness to critique. In this study, the combination of motivational and actionable feedback appeared to help students accept comments more positively and use them to refine their initial requirements and prototype ideas.

The use of a structured rubric played an important role in guiding the quality of peer feedback. It helped students identify strengths, recognize missing or unclear requirements, and provide suggestions for improvement. As a result, students demonstrated better clarity in requirement identification and increased confidence in evaluating both their own work and the work of others. These outcomes are consistent with Nicol and Macfarlane Dick's (2006) view that feedback supports the development of self regulated learners.

The study confirms that structured peer feedback can improve students' perceptions of requirement identification, prototype refinement, collaboration, critical thinking, and evaluative skills. However, the findings are based on one cohort of forty students and mainly reflect student feedback and lecturer observation. Therefore, further research with multiple cohorts, different institutions, and additional forms of evidence is needed to improve the generalisability of the findings. The approach can be applied by other educators in HCI, UX, and similar project-based modules by incorporating rubric based peer feedback activities into tutorial sessions. Future work will extend this intervention by introducing multiple rounds of peer feedback, evaluating the quality of feedback provided by students, and integrating the activity into formal assessment criteria. Overall, the study highlights the value of structured peer feedback as a practical teaching approach for supporting students during the early stages of low fidelity prototype development.

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Changing Teaching to Reduce Cognitive Overload Using a Scaffolded Reflective Writing Framework in English for Academic Purposes

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Abstract

In the second semester of the English for Academic Purposes (EAP) module at the Asia Pacific Institute of Innovative Technology (APIIT), foundation-level students were required to produce extended reflective writing with limited structured guidance. This existing situation necessitated change as students were expected to manage multiple cognitive demands simultaneously, including idea generation, organisation, linguistic accuracy, and critical reflection (concurrent cognitive demands).As a result, students experienced cognitive overload, which adversely affected both the writing process and classroom engagement. The absence of scaffolded instructional support led to fragmented writing, reduced coherence, and low participation levels, as working memory was overburdened (key issues—cognitive overload, reduced engagement, and weak textual organisation).The study is grounded in Sweller's Cognitive Load Theory and Vygotsky's Zone of Proximal Development. These frameworks inform the design of instructional scaffolding that optimises working memory capacity while supporting learners within their developmental range through structured guidance. The intervention restructured the writing process by sequencing reflective writing into five distinct phases: description, emotional articulation, evaluation, analysis, and action planning. Each phase incorporated a 'motivational' segment to establish purpose and an 'instructional' segment providing linguistic scaffolds. Thirteen second-semester foundation students were observed through classroom interaction, textual analysis of written outputs, and qualitative learner feedback. Findings indicate that calibrated instructional support led to increased student participation (from 46% to 77% active engagement) and visibly improved coherence in writing (9 out of 13 students demonstrated clear logical progression). Whilst some learners (4 out of 13) remained dependent on sentence frames, the majority showed increased confidence and greater control over structuring reflective responses. Strategic instructional scaffolding functions as an effective motivational mechanism to reduce cognitive strain among foundation-level students, fostering structured and confident reflective writing practices in preparation for higher education. This approach also mitigates learner resistance by clarifying task expectations. However, further longitudinal research is required to evaluate how such scaffolded support influences learner autonomy at degree-level study.
Keywords: Scaffolding; Cognitive Load Theory; Reflective Writing; EAP; Foundation Education; Instructional Design; Learner Confidence

Purpose/Background

Reflective writing is widely used in English for Academic Purposes (EAP) classrooms because it encourages learners to analyse experiences, evaluate learning, and develop academic communication skills. However, reflective writing is cognitively demanding, particularly for foundation-level learners who are still developing academic literacy in English. According to Moon (1999), reflective writing requires learners to manage multiple processes simultaneously, including idea generation, organisation, language accuracy, and critical evaluation. Sweller's (1994) Cognitive Load Theory explains that excessive cognitive demands can overwhelm working memory and negatively affect learning. In the observed second-semester EAP classroom, students frequently produced disconnected ideas, repetitive sentence structures, and weak organisation during reflective tasks. Many learners also lacked confidence and struggled to move beyond basic description. To address these challenges, a scaffolded reflective writing framework was introduced based on Vygotsky's (1978) concept of scaffolding.

Methodology

This study adopted a small-scale qualitative action research design to examine whether scaffolded reflective writing could reduce cognitive overload among foundation-level EAP students. I conducted the study in a second-semester EAP classroom at the Asia Pacific Institute of Information Technology with thirteen foundation-level students of mixed proficiency levels. I introduced a scaffolded reflective writing framework using five stages: description, emotional articulation, evaluation, analysis, and future planning. I collected data through classroom observation, textual analysis of student writing, and informal learner feedback.

I implemented the five stages sequentially during reflective-writing activities, recorded participation before and after the intervention, compared students' written responses for logical sequencing and coherence, and collected informal learner feedback. Table 1 outlines the scaffold stages and support provided.

Results

The findings showed noticeable improvement in learner participation, organisation, and confidence following the scaffolded intervention. Classroom participation increased from 46% before the intervention to 77% after scaffolded activities were introduced. Figure 1 presents the participation data, and Table 1 summarises the scaffolded framework used in the intervention.

Table 1. Stages in the scaffolded Reflective Writing Framework that was used

Stage	Support Provided
Description	Guided prompts
Emotional articulation	Vocabulary support
Evaluation	Reflective questions
Analysis	Analytical guidance
Future planning	Goal-setting prompts

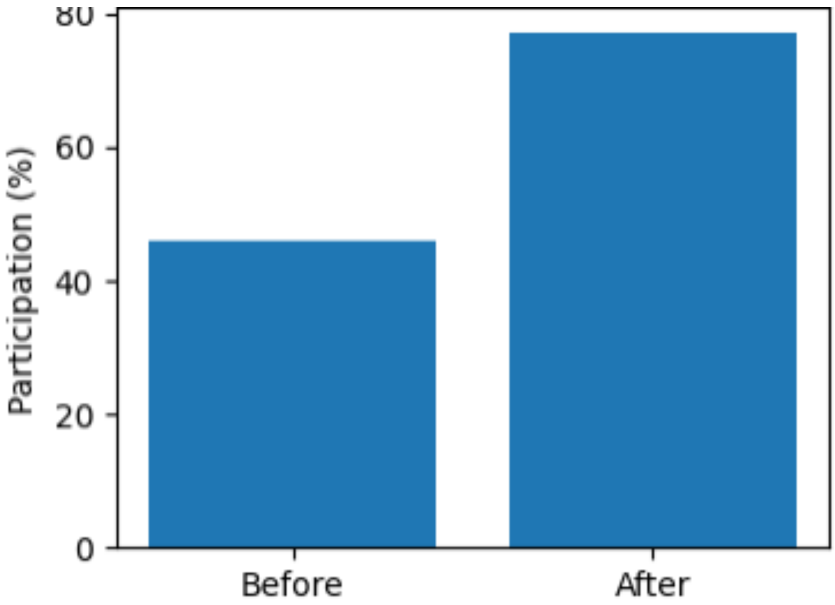

Figure 1. Classroom Participation

Textual analysis indicated that 9 out of 13 students demonstrated improvements in their reflective writing as evaluated by clearer logical sequencing and more coherent reflective responses after the intervention. Figure 2 presents this improvement in reflective writing.

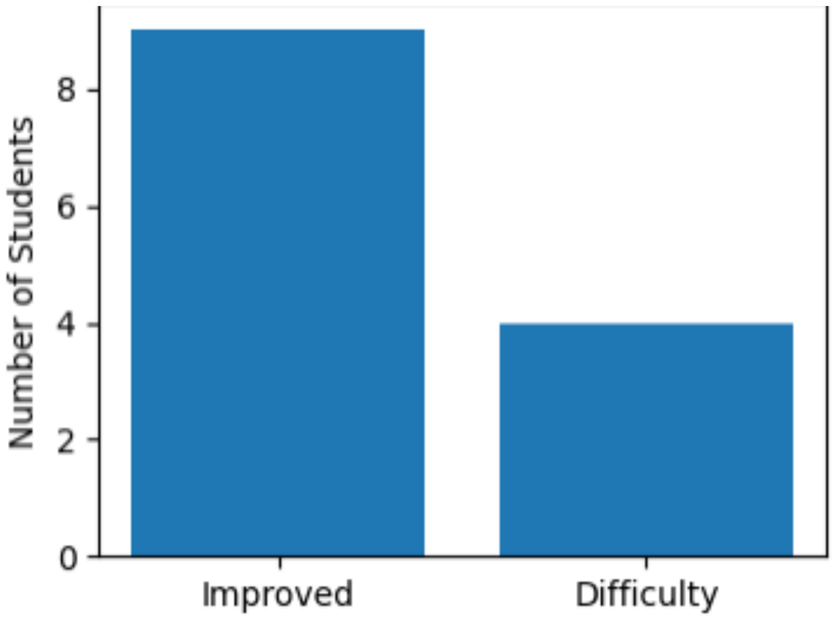

Figure 2. Improvement in Reflective Writing

Discussion and Conclusion

The findings suggest that scaffolded reflective writing can effectively reduce cognitive overload and improve learner engagement in foundation-level EAP classrooms. Dividing reflective writing into structured and manageable stages enabled students to focus on one cognitive process at a time, which appeared to improve organization, participation, and confidence during reflective tasks. These findings support Sweller's (1994) Cognitive Load Theory, which emphasizes that structured instructional design can reduce excessive cognitive demands and improve learning performance.

The results also align with Vygotsky's (1978) concept of scaffolding and the Zone of Proximal Development, where guided support enables learners to complete tasks beyond their immediate independent capability. Sentence starters, guided prompts, and teacher modelling functioned as temporary support mechanisms that helped learners organize ideas and engage more critically with reflective writing. As students became more familiar with the scaffolded structure, several demonstrated increased confidence and greater independence in producing reflective responses.

However, although the majority of students demonstrated improvement, several learners remained dependent on sentence starters and guided structures. This indicates that while scaffolding is effective during the initial stages of learning, support mechanisms should be gradually withdrawn to encourage learner autonomy and independent reflective writing skills. These findings are based on a small classroom sample and should be interpreted cautiously; further research with larger cohorts and longitudinal follow-up is needed to assess transfer to degree-level study.

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Changing myself to Reorient Passive Gen-Z Learners towards Active Accountability through Structured Cooperative Learning

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Abstract

I observed participation inequality when teaching a Mobile App Development course (Year-2; n=35) where about 40% (14 students) remained passive in group discussions. Except for a few confident students who could control the coding process, students could not grasp some fundamental concepts, leading to failure to answer questionnaires. Using methods learnt from a teaching development course (MaTE 2026), I therefore explored whether cooperative learning could be used to shift learner orientation from passivity and dependency to responsibility. In the four-step cooperative learning approach I used, mixed-ability groups of 4-5 were first formed, incorporating students with diverse skills to avoid skill clustering. Second, a Profile Card Activity was designed where the UI development activity was divided into sections so that the given problems could be solved only through group collaboration. Third, my teacher role changed from a passive to an active facilitator, moving among groups to directly help less-active participants. Lastly, mandatory group presentations were undertaken to foster accountability. Intervention effectiveness was evaluated by comparing pre and post direct behavioral observations and student perceptions from a four-part, 5-point Likert Scale feedback form. Post-intervention feedback analysis (n=23) showed ratings of 4.17 (out of 5) for 'Active Participation' and 4.30 rating for 'Group-work Making-contribution-easier'. Compared with the initial 40% passive student participation, it almost doubled to 78% post-intervention, with a 4.35 rating for 'Contributed-ideas-to-my-group'. As far as technical success was concerned, it was rated very highly at 4.44 out of 5. The intervention was successful in modifying the teaching method to suit the new needs of these Generation Z learners. The imposition of interdependence led me to focus on moving students from being mere spectators into active participants with high engagement levels. This change led to better technical self-efficacy and lower student hesitation. Future interventions will include the designation of roles such as coder and note-taker within groups.

Purpose/Background

The focus of the current research is solving problems of participation inequality and passive learning associated with high-complexity technical subjects, such as Mobile Application Development and Object-Oriented Programming (OOP). For example, when working with a group of 35 Year 2 students studying the Flutter UI course, initial observations showed that there were many "spectator" learners, with about 14 students (or 40%) being passive during discussion among small groups. Their lack of engagement made it hard for these students to grasp essential concepts like Stateless Widgets and UI tree, thus preventing them from answering the corresponding concept check questions.

This finding fits into the general trends discussed in literature related to Generation Z (Gen-Z) Learners. As stated by Seemiller and Grace (2017), despite their digital literacy, Gen-Z individuals tend to seek more structure in instructions and feel anxious about having to solve tasks independently in the public forum. Particularly, in terms of technical subjects, this preference often translates into fear of asking questions in front of the class and making mistakes publicly because of fear of being judged in an environment where only a minority of expert or confident students takes control of the coding. Furthermore, the "Expert Blind Spot" (i.e., the instructor's failure to recognize the difficulty faced by students) is likely to play a role in the observed lack of engagement.

To improve this process, this action research studies the reorganization of classroom dynamics through the use of Cooperative Learning as advocated by Johnson et al. (2014). Specifically, it promotes desirable interdependence and accountability in learning, thus allowing for a deviation from lecture-based delivery methods which do not consider different levels of pre-existing knowledge. Therefore, the main research question (RQ) under consideration is the following one: *Can a structured Cooperative Learning intervention, emphasizing individual accountability and positive interdependence, reorient passive Gen-Z learners toward active participation and technical self-efficacy?* It was expected that collaboration would help students shift from passive attendance to Higher Order Thinking Skills (HOTS).

Methodology

This study employed a problem-solving intervention based on the Cooperative learning theory to solve issues of participation inequity and cognitive dependency. The methodology followed an Identify-Plan-Undertake-Reflect (I-P-U-R) framework (Ekaratne, 2026). In particular, the method began with the identification of passive behaviors, followed by a structured technical exercise, which was intended to force participation.
The above intervention was operationalized using a four-stage pedagogical approach, which included the following activities:

1. Strategic Group Formation: Students were divided into smaller groups of about four to five students. This step involved conscious diversification of abilities to prevent skill clustering, where high-performing students form their own group. Such an arrangement would guarantee that all groups had prior knowledge so that peer-to-peer teaching can occur.
2. Interdependent Activity (The Profile Card Activity): The main intervention was the development of a Flutter UI “Profile Card”. To promote Positive Interdependence, the technical work was subdivided into three components (Row/Column layout, reusable widgets, and asset management). In such a way, for the entire activity to be compiled and presented, every member must do their part to achieve collective success.
3. Active Scaffolding and Facilitation: Here, the teacher's function was transformed from passive instructor to active facilitator.
4. This role involved moving around the classroom, providing scaffolding (providing temporary help so that students accomplish a task that is beyond their capability alone), and posing follow-up questions to ensure that students engaged in a

discussion. This strategy ensured that communication barriers were addressed since some students felt intimidated in the conventional learning atmosphere.

5. Accountability and Group Processing: The last stage of the pedagogical model was the presentation, which allowed for Individual Accountability. Each group was expected to present their work in class and share what they contributed and why.
6. Measures of Evaluation: To measure whether the intervention achieved its goals, student perception before the intervention and after the intervention was compared. Data were gathered using a questionnaire with four sections and seven questions each. These questions had a rating scale from 1 (strongly disagree) to 5 (strongly agree). Open-ended questions were also included to measure student perception regarding participation, ability to contribute ideas and understanding of Stateless widgets.

Results

The findings are analyzed on the basis of the results of numerical perceptions and behavioral observations conducted before and after the intervention. Initially, it was observed that 14 people (40%) exhibited spectator behavior in group activities. Post-intervention evaluation was conducted by 23 people (n=23).

Table 1. Student Perceptions of Cooperative Learning Intervention Effectiveness

Criterion	**Count**	**Mean (out of 5)**	**Std. Dev.**
Actively Participated	23	4.17	0.887
Group Work Made Contribution Easier	23	4.30	0.765
Comfortable Sharing Ideas	23	4.35	0.885
Understood Stateless Widgets	23	4.44	0.788
Improved Understanding of Combining Widgets	23	4.17	1.029
Overall Enjoyment	23	4.44	0.662

As shown in the quantitative results in Table 1., there was a great transformation of student needs. In comparison with the initial figure of 40% of passive spectators, after implementing the structured cooperative learning technique, the number increased to 78%. The mean for "Comfortable Sharing Ideas" equal to 4.35/5 is considered an indicator of the decline in the level of anxiety among Gen-Z learners.

The qualitative feedback confirmed that students not only felt more comfortable but also achieved some technical and social success in the process. Specifically, according to the student evaluations, the techniques "nesting in columns and rows" and "making a card with many widgets" proved to be the most helpful during the work in groups. A lot of students appreciated the possibility of contributing as individuals since this approach lowered their fear of not being involved in the teamwork. The result for "Confident Designing UI Screen" was 3.87/5, whereas at the pre-intervention stage, students failed to answer simple concept checks correctly.

Discussion and Conclusion

Overall, the results of this research prove that structuring CL is highly efficient in switching Gen-Z participants from a stage of passive dependency to one of active participation. Based on qualitative data, structuring CL allowed participants to successfully nest widgets and refactor the code due to student statements shown in Appendix A. As a result of the experiment, I have succeeded in closing communication gaps commonly found between lecturers and students during the course of highly difficult subjects because I was able to change myself and establish a CL structure in a class, creating a positive interdependence in my students' minds. As seen from the quantitative analysis, the overall increase in participation in class rose from initial 40% of students to impressive 78%, which is an evidence to a hypothesis that Gen-Z students benefit from breaking up technical tasks into interdependent parts that make them individually engaged. In this way, the needs of learners for cooperation and applying Higher Order Thinking Skills (HOTS), namely refactoring code and analyzing widget trees in this case, have been significantly improved.

These results correspond to the theory developed by Johnson et al. (2014), according to which, students who attend classes built upon proven cooperative learning structures achieve higher levels of technical self-efficacy and experience less public performance anxiety in terms of their performance. Educators teaching computing subjects may adopt these findings in practice by segmenting the software development processes into interdependent tasks and ensuring equal participation from all students.

I find it vital to continue this work since, despite the progress achieved by the intervention, learners' technical skills in UI development were still a bit inferior compared to those in active participation, meaning that they still needed time to learn to master end-to-end design and required a lot of "scaffolding." In future, interventions will aim at introducing official and regularly changing group roles such as "Coder," "Note-taker," and "Presenter."

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Appendix A

Most Helpful Aspect	Challenges Faced	Suggestions
The peer helper walked around and explained concepts step by step, which made it much easier for me to follow along and not feel left behind. I felt more confident to ask questions this way.		
I really liked how both the lecturer and the peer helper supported us together. The peer helper explained things in Sinhala sometimes which helped me connect better with what sir was teaching.	I felt shy to ask questions from sir	Give more practical coding examples
The group activity along with the peer's encouragement really pushed me to participate more. I normally stay quiet, but this session helped me talk and learn actively.		Provide lecture notes before class
The peer support made the session much more engaging. When I came late, the peer helped me catch up and also gave simple analogies that I could easily understand.		More Q and A time at the end
Peer helper explained the topic in simple way		Use Sinhala to explain hard words sometimes
Examples given by sir made it clear		
Peer support helped me when I was lost		
I could ask doubts from peer without fear		
The lecture examples were connected to real life	It was difficult to ask in English	
Peer was very supportive walking around		
Group activity made me understand better		
Lecture flow and peer help together was good		
Peer explained in Sinhala when needed		
Class discussion helped to clear confusion		
I liked that peer corrected mistakes quickly		
The whiteboard examples were useful		
Peer helper encouraged me to talk		
Combination of lecture and peer made it easier		
Peer answered when I was shy to ask lecturer		
Both lecture slides and peer guidance supported learning		
Peer helper explained the topic in simple way		
Examples given by sir made it clear		
Peer support helped me when I was lost		Check understanding with small quizzes
I could ask doubts from peer without fear	Peer busy with others so I had to wait	Summarize main points at the end
The lecture examples were connected to real life		

Student Perceptions on Changing Assessment from Multiple Written Assignments to a Mini Project-Based Format in a Digital Electronics Module

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Abstract

Previous written assignments in the Digital Electronics module did not effectively support students in applying theoretical knowledge to real-world circuit design scenarios. As this did not provide sufficient opportunities for students to apply circuit design knowledge, increased examination fatigue (from multiple written examinations) and module failure rate, were observed over time. Therefore, I explored whether implementation of a mini-project based assessment would positively influence student perceived learning, application skills, engagement, and confidence in a Digital Electronics module, followed by first-year, second-semester students in the National Diploma in Technology in Information Technology, involving two cohorts (NDT 2022/2023 and 2023/2024) each with 100 students participating in this new assessment. Students were assigned a Continuous Assessment to design a digital circuit as a solution to a real-life problem. Working in groups of 5-6, they developed a prototype, presented their solution, and attended an individual viva. This activity was conducted with two batches, and a 16-item questionnaire was administered to measure students' perceptions of the mini project-based assessment. The responses were analyzed using IBM Statistics 22 and thematic analysis. Fifty-Two (52) students from NDT2022/2023 batch (52%) and 50 students from NDT2023/2024 batch (50%) responded to the questionnaire. Results indicated generally positive student perception toward mini project-based assessment. Majority of the students reported that they had basic level knowledge on Boolean algebra and logic circuit designing before the project. But after the project, they reported higher level of confidence (mean= 3.3-3.5) in digital circuit designing. Qualitative type feedback highlighted that students enjoyed designing circuits and collaborative learning most. The most challenging part for them was using suitable sensors and circuit components in their circuit design to achieve their output. These findings suggest that incorporating mini project-based assessments can enhance student confidence, engagement, and practical learning in the digital electronics module.

Purpose/Background

For past 2-3 years the pass rate of the continuous assessment in Digital Electronics module was getting low. Students were notified that both continuous assessments were written examinations which created some examination fatigue and lowered motivation among students. The study aimed to identify "What is the students' perception when mini-project based assignment is replaced with one written examination?". Based on the students' perception, it is planned to restructure one of the continuous assessments of IT1203 Digital Electronics module as a mini project. I designed the mini project based on Project-Based Learning (PBL) concept which is renowned for creating positive attitudes among students (Prince 2004) . There is evidence that PBL fosters deeper approach for learning and help students retain knowledge longer than traditional instructions (Prince 2004). Further, it has been proved that students retain concepts for longer time when they involve in "doing" tasks (Rao et al. 2018). By considering these aspects, I redesigned the assessment to find a solution for a real-life problem using the knowledge on digital circuit designing. PBL supports three main learning principles in three approaches; cognitive learning, collaborative learning and content (Lehmann et al. 2008). Cognitive learning means learning is organized in problems and carried out as projects while collaborative learning strengthens teamwork which indicates the collective ownership of the learning process. Content approach supports to create a link between theory and practice, demonstrating learning process involves an analytical approach (Lehmann et al. 2008). While studying the students' perceptions on mini-project based assignments, I will also look at whether this strengthens the PBL's main learning principles. The following sections present the methodology adopted for the study, followed by the results obtained, discussion of the findings and the concluding remarks.

Methodology

I restructured continuous assessment 02 of IT1203 Digital Electronics module to a mini project where students complete a digital circuit as a solution to a real-life problem. It was a group project where 5-6 students worked together. I gave them one-month period to complete the project with a report. At the end, they presented their prototype in a mini exhibition. I evaluated the report and the solution using a structured rubric and individual VIVA. After completing the evaluation, students provided their perception about implementing a mini project as a continuous assessment via a questionnaire with 16 questions. This questionnaire included multiple choice questions, Likert type questions and short answer questions. I analyzed the responses using IBM SPSS Statistics 22 and thematic analysis. The next section describes the results obtained.

Results

Question 1 and 2 of the questionnaires study the familiarity of Boolean algebra and logic gates. Cross tabulation results of Question 1 and Question 2 indicated similar baseline familiarity levels across the two cohorts, suggesting comparability in prior knowledge (Table 1 and Table 2). In both batches, majority had basic knowledge in digital circuits while having intermediate knowledge in Boolean algebra

Table 1. Year * Q1 Crosstabulation

			Prior knowledge about Digital circuits				Total
			None	Basic	Intermediate	Advanced	
Year	1	Count	5	26	17	4	52
		% within Year	9.6%	50.0%	32.7%	7.7%	100.0%
	2	Count	5	31	12	2	50
		% within Year	10.0%	62.0%	24.0%	4.0%	100.0%
Total		Count	10	57	29	6	102
		% within Year	9.8%	55.9%	28.4%	5.9%	100.0%

Table 2. Year * Q2 Crosstabulation

			Prior knowledge about Boolean algebra				Total
			None	Basic	Intermediate	Advanced	
Year	1	Count	1	15	31	5	52
		% within Year	1.9%	28.8%	59.6%	9.6%	100.0%
	2	Count	0	24	19	7	50
		% within Year	0.0%	48.0%	38.0%	14.0%	100.0%
Total		Count	1	39	50	12	102
		% within Year	1.0%	38.2%	49.0%	11.8%	100.0%

Question 3 to question 8 were Likert type based (Strongly Disagree – Strongly Agree) on the learning experience. For these questions, Cronbach's Alpha was calculated to confirm the reliability of these 6 questions. Cronbach's alpha was 0.927, indicating a high reliability of questions Q3-Q8. Table 3 presents that most of the students agreed that their understanding of digital circuits was improved, their ability to apply Boolean algebra in real world problems and problem-solving skills were enhanced, confidence in designing digital circuits was strengthened and the project helped them learn practical applications of digital circuit designing.

Table 3. Comparison of Students' Perceptions across Two Years (Q3-Q8)

Item	**Year 1 Mean**	**Year 2 Mean**	**% Positive (Year 1)**	**% Positive (Year 2)**
Improved understanding	4.4	4.5	96.2	96
Ability to apply Boolean algebra	4.3	4.3	92.3	88
Gained confidence	4.3	4.3	94.3	92
Knowledge of Practical applications	4.3	4.5	98	100
Improved problem-solving skills	4.3	4.2	94.3	90

Post-project confidence	3.5	3.4	92.3	86

Question 8 surveyed about the confidence of digital circuit designing after the project. An independent samples t-test was conducted to compare the confidence levels in designing digital circuits between two students' groups. Levene's test indicated that assumption of homogeneity of variances was met (F= 1.733, p=0.191). The results showed that there was no statistically significant difference in confidence levels between groups ($t(100) = 0.722$, $p = 0.472$). The mean confidence score for Year 1 students (M = 3.46, SD = 0.64) was slightly higher than that of Year 2 students (M = 3.36, SD = 0.78); however, this difference was not statistically significant. The 95% confidence interval for the mean difference (−0.178, 0.381) includes zero, further confirming the absence of a significant difference. Results revealed that more than 85% of students from both years confirmed that they are confident in digital circuit designing.

Question 9 surveyed the most valuable aspect they learned from the mini project. Majority of Year 1 students responded that practical application was the most important aspect they learned while year two responded as designing the circuit. Table 4 presents the cross tabulation of the answers for question 9.

Table 4. Year * Q9 Crosstabulation

			The most valuable aspect they learn				Total
			Identifying the problem	Designing the Circuit	Simplifying the Boolean expression	Practical Applications	
Year	1	Count	5	16	4	27	52
		% within Year	9.6%	30.8%	7.7%	51.9%	100.0%
	2	Count	6	24	4	16	50
		% within Year	12.0%	48.0%	8.0%	32.0%	100.0%
Total		Count	11	40	8	43	102
		% within Year	10.8%	39.2%	7.8%	42.2%	100.0%

From both batches 68% agreed that project is very engaging. Regarding the challenges they faced, 65% mentioned that designing the circuit was challenging while 58% reported that understanding a real-world problem. Students mentioned that they enjoyed circuit designing and collaborative learning most. When they were asked what remedies, they followed to overcome the challenges they faced, answers revealed that referring to internet and YouTube videos, asking from peers and brainstorming with teammates were the popular methods. Nearly 85% of the students have confirmed that this assignment should be continued for future batches too. As for the improvements, they have suggested holding an exhibition or competition and allocating more time for completing the project. In additional comments, they appreciated the opportunity they gained for project-based learning.

Discussion and Conclusion

This assignment was based on solving a real-life problem using students' analytical thinking where it confirmed cognitive learning. As it was a group project and students have mentioned they have enjoyed most with collaborative learning. Regarding the remedies for overcoming the challenges they faced, most of them have mentioned peer learning as a solution. These results strengthened the concept of collaborative learning in PBL. The students must reach the solution while applying the theory they learned under Combinational Circuits. They had to use the knowledge of Boolean algebra and digital circuit designing, selecting suitable sensors and other equipment which are affordable as well as reliable for the solution. In these areas, content approach of PBL must be used. Hence, it assures that this assignment satisfied the three main principles of PBL (Lehmann et al. 2008). Students' positive perception (more than 80%) towards the mini-project based assignment confirms that students are more motivated for these types of assignments rather than written papers in Digital Electronics module. Hence, teachers are encouraged to introduce more problem-oriented tasks as assignments for practical oriented subjects. Similar type of study should be conducted for more modules to identify which modules this strategy would suit and which modules it would not suit. Overall, findings suggest that integrating mini project-based assessment into Digital Electronics module can promote active, collaborative and application-oriented learning experience among students and it can be continued for future batches too.

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Changing Clinical Teaching through Role-Play to improve student perceptions on engagement and confidence

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Abstract

Though developing clinical competence is necessary as part of student training in Siddha Medicine clinical subjects, it was not facilitated in conventional teaching where students observed lecturers presenting patients at bedside without active participation. As this passive learning led to low confidence in handling patients, in teaching a clinical subject for third-year students (n=19) in Siddha Medicine, I shifted to Role-Play to simulate real-life clinical scenarios, develop communication skills and empathy, engage students in active learning, cater to diverse learning styles and build confidence in handling patients. The Role-Play intervention used a structured, student-centered approach, involving simulated patient scenarios, peer feedback and facilitator guidance. Pre- and post-intervention surveys (Student feedback) evaluated confidence, anxiety and clinical competence (self-rated perceptions). Post-intervention data revealed improvements, 100% of students reported increased confidence, 83.3% reported improved clinical competence in simulated scenarios, 94.5% found it effective for improving communication skills, 94.4% rated the activity effective for improving clinical skills, 61.1% of students reported role-play is engaging more than lectures, indicating an increase in proactive approach of learning. These findings indicate that Role-Play is an effective strategy for enhancing clinical engagement, reducing anxiety and promoting self-directed learning among Gen Z learners. Transforming teaching with Role-Play effectively fosters clinical competence and self- directed learning among Gen Z learners, addressing their unique needs and improving engagement. This approach has implications for clinical educators seeking innovative strategies to enhance student learning outcomes. The study highlights the potential of Role-Play in bridging the gap between theoretical knowledge and practical application, preparing students for real-world clinical challenges.

Purpose/Background

Clinical competence in Siddha Medicine requires the integration of theoretical knowledge with practical communication and decision-making skills. Conventional bedside teaching often limits students to passive observation of the lecturer managing patients. This restricts opportunities for active participation and can reduce confidence when students transition to independent clinical practice. Pre-intervention feedback indicated that 50% of students were moderately engaged during conventional teaching sessions and 66.7% found the format effective for developing clinical decision-making skills. Active learning has been demonstrated to improve application of concepts in health professions education (Prince, 2004). Simulation based methods including role play are established approaches to develop communication and clinical reasoning skills (Motola et al., 2013). For Gen Z learners, differentiated instructional strategies are important to address diverse learning needs (Shorey and Ng, 2021).

The Purpose of this Study was to evaluate the effectiveness of a structured role-play intervention in improving clinical engagement, grasp of patient interactions and perceived clinical competence among third-year Siddha Medicine students. To do so, the Research Question was posed as: does the integration of structured role-play into clinical teaching lead to higher student engagement, better grasp of patient interactions and increased confidence in applying clinical knowledge compared to conventional bedside observation?

Methodology

The study was conducted with third-year students in the *Noinaadal Chikitsai* department. Nineteen students were recruited. One student was absent during the intervention survey, hence final analysis included n=18. Students were divided into small groups of 4-5 members and assigned roles of clinician, patient and observer. Clinical scenarios relevant to the syllabus were prepared by the lecturer and enacted by each group in class to simulate clinical encounters and apply theoretical knowledge. After each role-play, a structured debriefing session was held, involving student case presentation, peer feedback and lecturer guided reflection on clinical reasoning and communication. Following the intervention, a post-intervention feedback survey was administered to assess the knowledge, skill development, engagement, preparedness and applicability and peer evaluation was conducted using the institutional standardized form. Responses were analyzed using descriptive statistics. Participation was voluntary and approval obtained prior to data collection. Pre and post intervention surveys using Likert scale assessed self -confidence, anxiety, clinical competence and self- directed learning.

Results

Post-implementation feedback showed strong positive responses to the role-play activity across all domains (Table 1). 83.3% of students reported that role-play enhanced their grasp of clinical scenarios and 94.5% found it effective for improving communication skills. All students indicated that the activity helped them grasp patient interactions better and 100% reported increased confidence in patient interactions, with 50% noting an increase. Peer feedback was rated useful or very useful by 100% of respondents. Regarding application and relevance, 88.9% of students felt the role-play was relevant to real-life clinical situations and 88.9% stated they were likely or extremely likely to apply the learning in future clinical work. Preparation and comfort were also high, with 94.4% feeling adequately prepared and 94.4% comfortable participating. In terms of engagement, 61.1% found role-play more engaging than traditional lectures and 77.8% agreed it helped apply theoretical knowledge practically. Overall satisfaction was high. 66.7% rated the quality as good and 16.7% as excellent. 94.4% rated the activity effective for improving clinical skills and 100% agreed it met learning outcomes. For future adoption, 72.2% would recommend incorporating role-play, with 27.8% neutral.

Table 1. Pre vs Post Implementation Feedback on Role-Play (n = 18)

Item	Pre- Implementation (%)	Post-Implementation (%)	Change
Confidence and Competence			
Confident/Extremely confident in clinical scenarios	61.1	100.0	+38.9
Role-play helped grasp patient interactions	-	100.0	+
Role-play enhanced grasp of scenarios	-	83.3	+
Helped identify gaps in clinical knowledge	-	88.9	+
Communication and Skills			
Role-play effective for communication skills	-	94.5	+
Role play is effective for improving clinical skills		94.4	+
Engagement and Relevance			
Found role-play more engaging than lectures	-	61.1	+
Role-play relevant/very relevant to training	88.9	88.9	0.0
Helped apply theory to practice	-	88.9	+
Preparation and Feedback			
Felt prepared for role-play	94.4	94.4	0.0
Comfortable participating in role-play	94.4	94.4	0.0
Peer feedback useful/very useful	-	100.0	100.0
Feedback helped improve performance	-	100.0	100.0
Feedback important/very important	94.4	100.0	+5.6
Future Application			
Likely/Extremely likely to apply learning in future	-	88.9	+
Would recommend role-play for future lectures	-	72.2	+

Discussion and Conclusion

The results indicate that students perceived that role-play effectively addressed gaps in engagement and confidence associated with conventional bedside teaching. The high rates of improved ability to analyze scenarios, communication and confidence perceived by students suggest that experiential learning helps students connect theory to practice. Simulation-based training provides a safe, structured environment that allows learners to practice complex clinical skills without the fear of causing patient harm, which directly acts to mitigate anxiety and elevate overall student confidence (Motola et al., 2013). While previous high-fidelity simulation studies have established a clear correlation between structured scenarios and heightened nursing student self-confidence (Smith & Roehrs, 2009), our findings demonstrated a remarkably uniform impact, with 100% of the participating students reporting an increase in clinical confidence following the intervention. The structured debriefing aligns with Bandura's (1977) Social Learning Theory, where observation and feedback build self-efficacy. Active learning through role-play enhanced students' ability to apply theoretical knowledge to practice, consistent with Prince (2004) who demonstrated that active learning improves application of concepts. Communication skills training is essential for health professionals and improves patient interactions (Mata et al., 2021). Additionally, systematic approaches to clinical examination support skill development (Innes et al., 2018). For Gen Z learners, this type of differentiated, active instruction supports deep engagement across varied learning styles (Shorey & Ng, 2021). Our layout proves that implementation is entirely feasible within existing clinical sessions, provided that the interactive scenarios are realistic and the subsequent debriefing process is tightly structured (Motola et al., 2013). However, the observed 27.8% neutral response regarding student recommendation suggests that minor instructional adjustments are still required to better support and reassure the small cohort of participants who felt less clinically prepared. Limitations include the single-batch design, small sample size and reliance on self-reported perceptions without objective clinical assessment. To build upon these findings, future work must utilize objective measures to evaluate long-term skill retention and the definitive transfer of these simulation competencies into real patient encounters (Sackett et al., 2000). Based on these findings, Role-play is perceived by students as an effective and well-received strategy to enhance clinical skill development and confidence among third-year Siddha Medicine students. It should be retained and expanded in the curriculum with minor adjustments.

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Changing teaching with group work strategies to address diverse learning levels in Database Systems Education

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Abstract

I observed that undergraduates (n=36) began their second-year Database Systems module of the B.Eng. Software Engineering programme with different levels of prior knowledge. This challenged me in maintaining an effective pace during tutorial sessions. As this module is critical in developing students' insights into database management concepts and from knowledge gained from a teaching development course, I introduced an adaptive teaching change to address this varied knowledge challenge to improve student performance, as reported here. During initial tutorials, students' knowledge of database concepts was evaluated through structured tasks and conceptual questions. Based on performance, students were classified into four ability categories: Good, Above Average, Average, and Below Average. In the third week of the semester, to start the changed tutorial strategy, students were grouped into mixed-ability groups of three or four per group, maintaining balance across categories. In this change, the designated tutorial exercises that were previously undertaken as individual student activities now became collaborative group activities with peer-assisted learning that encouraged knowledge sharing and cooperative problem-solving. Targeted feedback support was given to the 'Below Average' category as additional support. Take-home practice tasks given at each tutorial end, reinforced learning outcomes achievement. The teaching change effectiveness was evaluated using two formal assessments: an In-Class Test and a Coursework assignment, each contributing 50% to final module grade. Performance results indicated a clear improvement, compared with semester beginning. At semester end, from among the 36 students, none remained in the 'Below Average' category and over 94% of students had achieved performance levels of 'Above Average' or 'Good' categories with the change to Group Work (5.5% as 'Average', 50% as 'Above Average', and 44.4% as 'Good'). Findings indicate that adaptive teaching strategies combined with peer-assisted learning and mixed-ability collaborative groups support diverse learning abilities towards enhanced achievement in Database Systems Education.

Purpose / Background

Database Systems Education plays an important role in computing and information technology programmes. However, students studying database-related modules often illustrate different levels of knowledge, technical competency, and learning abilities. Concepts such as SQL queries, entity-relationship modelling and relational database design are often considered difficult for many learners. Traditional lecture or tutorial - based teaching approaches may not work for all students especially students with different learning needs,

resulting in reduced engagement, low participation and unequal learning opportunities within the classroom.
The purpose of this research is to illustrate how group work strategies can be used to address different learning levels in Database Systems Education. This study targets to investigate whether learning activities along with group-based interactions can improve students' understanding and engagement and academic performances. This research particularly focuses on learners who has mixed learning abilities and explores how group activities can support weaker students while also strengthening the skills of top-performing students.

- How can group work strategies improve learning outcomes and engagement among students with different learning levels in Database Systems Education?

It is expected that a more inclusive and student-centred learning environment will be created through the realization of group work strategies. Students are expected to improve their communication, teamwork and problem-solving, and critical-thinking skills through team-based activities. Furthermore, peer learning will help weaker students gain confidence and improve their understanding of database concepts, while stronger students can develop their leadership and mentoring abilities.

Previous studies have highlighted the benefits of collaborative learning in computing and software engineering Education. Team Based Learning (TBL) improves student engagement, teamwork, communication and practical skill development in technical subjects (Garcia et al., 2023).

Research also shows that varied grouping, where students with different academic abilities work together, can improve learning outcomes and peer interaction among mixed-ability learners (Odo et al., 2019). More recent studies have introduced intelligent grouping techniques that adapt group composition according to students learning characteristics to elevate collaboration effectiveness (Wang et al., 2024). Overall, this existing research indicates that group work strategies can support diverse learners effectively in Database Systems Education through peer learning, collaboration, and active participation.

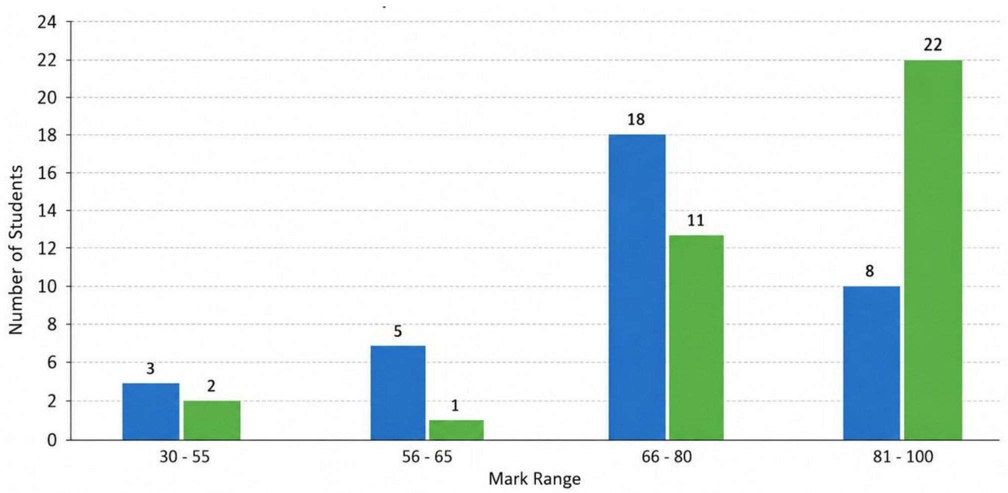
Methodology

To address differences in students' basic knowledge of database concepts, an adaptive teaching strategy was implemented during the tutorial sessions during the tutorial sessions during the tutorial sessions. Students were given several tasks then asked questions related to basic database topics, at the first two tutorial classes. Good, Above Average, Average, and Below Average were the categories which the students were grouped into based on their answers and performances. This categorizing was done according to their level of comprehension. Beginning in the third week of the semester, students were asked to sit according to the groups that had been formed. With their regular tutorial questions, peer learning and mixed-ability group activities were introduced to encourage teamwork and knowledge sharing among students. These activities allowed students with stronger understanding to assist fellow students who required additional support. At the end of each tutorial session, I provided additional practice tasks to reinforce the concepts covered in class. Special attention was given to students in the Below Average category. That was because the primary objective of the intervention was to support these students in improving their knowledge in database concepts. When reviewing the completed tasks, mainly focused on evaluating the progress of this group and providing targeted feedback to help them overcome learning difficulties. Students' performance during tutorial activities and task completion throughout the semester was continuously observed to measure the effectiveness of the teaching invention.

Results

The effectiveness of the adaptive teaching intervention was measured by students' performance on two formal assessments conducted during the semester: an In-Class Test and a coursework submission, each contributing 50% to the final grade. 36 students enrolled in the Database Systems module took part in this study. Figure 1 shows the coursework 1 and in class test marks analysis while figure 2 shows the overall final evaluation marks analysis.

The results of the Coursework assessment shows that 8.3% of students were categorized as Below Average and 16.6%as Average and 52.7% as Above Average and 22.2% as Good. In-Class Test results showed 5.5% of students in the Below Average category and 0% in the Average category, 30.5% in the Above Average category and 63.8%in the Good category. When looking at the overall performance, none of the students (0%) remained in the Below Average category while 5.5% were classified as Average, 50% as Above Average and 44.4% as Good. These results indicate that by the end of the evaluation period over 94% of the students have achieved performance levels categorized as either Above Average or Good.



Mark Range	30 - 55	56 - 65	66 - 80	81 - 100
Course Work 1 Marks	3	5	18	8
In-Class Test Marks	2	1	11	22

Mark Ranges: 30 - 55 (Below Average) | 56 - 65 (Average) | 66 - 80 (Above Average) | 81 - 100 (Good)

Figure 1. Coursework 1 and In Class Test Mark Analysis

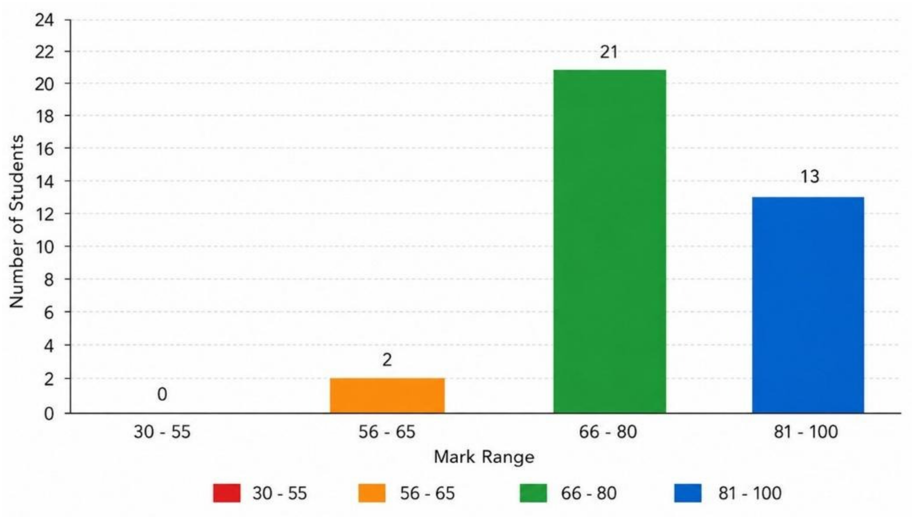


Figure 2. Final Evaluation

Discussion and Conclusion

The findings indicate that adaptive teaching methods and mixed-ability group work had a positive impact on the engagement, participation, and academic performance of students in database systems module. The absence of students in the below-average category and the fact that more than 94% of students achieved above-average or good performance levels indicate the effectiveness of collaborative learning strategies. The results indicated a clear improvement in students' overall performance. These results are consistent with previous studies that highlight the benefits of peer learning and heterogeneous group building, where students learn from each other through knowledge sharing and collaborative problem solving. Structured group work created opportunities for active participation and supported learners with different ability levels. Overall, the study suggests that collaborative learning can be an effective approach to creating a more inclusive and student-centred learning environment while supporting mixed-ability learners in Database Systems Education.

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Supporting Gen-Z learners through changing myself as a resilient teacher to improve student engagement

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Abstract

We changed ourselves, mainly to support Gen-Z learners, as observations from recent student cohorts indicated that students are less engaged when teaching and learning are not linked with technology, lecture materials are not connected to activities, and resources are bulky. Therefore, teachers must develop resilience in using technology and reflective practice to support evolving learner needs and enhance meaningful engagement. Thus, this study aims to evaluate the effectiveness of a structured teaching approach in improving engagement and learning outcomes among Generation Z learners while examining adaptive teaching practices. A pre-post intervention design was implemented using two methods: (1) micro-learning, where content was delivered using structured, chunked slides to enhance attention and retention of the concepts, measured through students' digital responses (task completion via Nearpod and cognitive reflection through MentiMeter word cloud); and (2) on-demand learning, providing flexible LMS access, tracked via views and user engagement. Data were collected from computing (Commercial Computing (CC), Emerging Technologies (ET)) and business cohorts (Foundations of HRM (FHRM) and International Business Strategy (IBS)). Structured, chunked slides increased students' focus and attention in both computing and business modules, with greater eye contact directed toward the lecturer and slides. "Nearpod collaboration board" responses showed task completion rates of ET-81%, CC-72%, FHRM-75%, and IBS-90% within 10 minutes. "Mentimeter word cloud" was used to capture learning points and doubtful areas using the 3-2-1 method. Silent responses decreased, compared to the traditional question-and-answer sessions across modules. LMS data showed higher engagement with activity-linked resources (ET-86%, CC-82%, FHRM-78%, IBS-88%). The study found that structured micro-learning and technology-supported teaching increased Generation Z students' engagement, participation, and LMS use, demonstrating that flexible, interactive, and technology-integrated approaches enhance learning and meaningful engagement across computing and business streams. Further research can investigate whether these approaches improve long-term outcomes such as knowledge retention and employability skills.

Purpose/Background

Recent observations of student cohorts revealed that Generation Z learners demonstrate lower engagement when teaching approaches are not integrated with technology, when lecture materials are disconnected from activities, and when learning resources are excessively bulky (Alruthaya et al., 2021; Hammad, 2025; Huss, 2023; Szymkowiak et al., 2021). As a result, educators are increasingly required to develop resilience in adopting educational technologies and reflective teaching practices to support evolving learner expectations and on-demand learning needs (Chan & Lee, 2023; Persada et al., 2019). Furthermore, students are often reluctant to access LMS reading materials unless these resources are directly linked to classroom activities or assessment-related tasks (Abou-Khalil et al., 2021; Holbrook & Cassell, 2024).

Based on these concerns, this study examined how technology-linked teaching approaches improve engagement and learning outcomes among Generation Z learners while also exploring adaptive teaching practices. Two research questions guided the study: (1) the impact of technology-supported microlearning delivered through structured and chunked slides on student attention and concept retention, and (2) the influence of on-demand LMS access on resource views and user engagement.

The literature consistently highlights that Generation Z learners prefer interactive and technology-supported learning experiences over passive lecture-based teaching methods (Dejacto et al., 2023; Hammad, 2025; Huss, 2023). As digital natives, they are naturally inclined toward interaction, collaboration, and practical engagement with learning activities (Chan & Lee, 2023). Studies indicate that these learners favor active learning approaches where they can build knowledge through “doing” and “creating” rather than through passive listening (Hammad, 2025; Huss, 2023).

Additionally, Generation Z learners’ value educational experiences that demonstrate real-world relevance and practical application, particularly in preparation for employment and professional environments (Alruthaya et al., 2021; Hammad, 2025). The integration of information and communication technologies (ICT) has therefore become essential in supporting experiential learning, problem-solving, and knowledge construction (Dejacto et al., 2023). Consequently, recent literature emphasizes the need for educators to shift from traditional knowledge transmission toward facilitative teaching approaches that encourage inquiry, collaboration, and practical application of concepts (Dejacto et al., 2023; Szymkowiak et al., 2021).

Methodology

To answer the two research questions, a pre-post intervention design was implemented over four weeks across four modules. Two instructional approaches were used: (1) micro-learning, where content was delivered in weekly sessions using structured, chunked slides to enhance attention and retention. Student engagement and understanding were measured through embedded Nearpod activities (collaborate board) and Mentimeter word clouds used at the end of each session to capture cognitive reflections; and (2) on-demand learning, where learning materials were made available through the LMS for asynchronous access, with engagement tracked through system-generated views and usage analytics. Data were collected from computing cohorts (Commercial Computing [CC] and Emerging Technologies [ET]) and business cohorts (Foundations of Human Resource Management [FHRM] and International Business Strategy [IBS]).

Results

The implementation of micro-learning approaches using structured and chunked instructional slides resulted in a significant transformation of the teaching materials used for both computing and business modules. Prior to the intervention, lecture slides primarily consisted of large blocks of content with limited integration of interactive activities or technology-supported engagement opportunities. Following the intervention, slides were redesigned into smaller, concept-focused segments accompanied by interactive activities aimed at improving students' attention, participation, and retention of concepts.

The redesigned instructional approach demonstrated noticeable improvements in classroom engagement. Figure 1 presents an example of a slide, including the chunked content and the activity embedded within the slide, which was used to facilitate increased student engagement and interaction during the post-intervention sessions. The QR code provided in Figure 1 can be scanned to access the student outputs generated for the activity which shows how students have shared their concept diagrams for the activity.

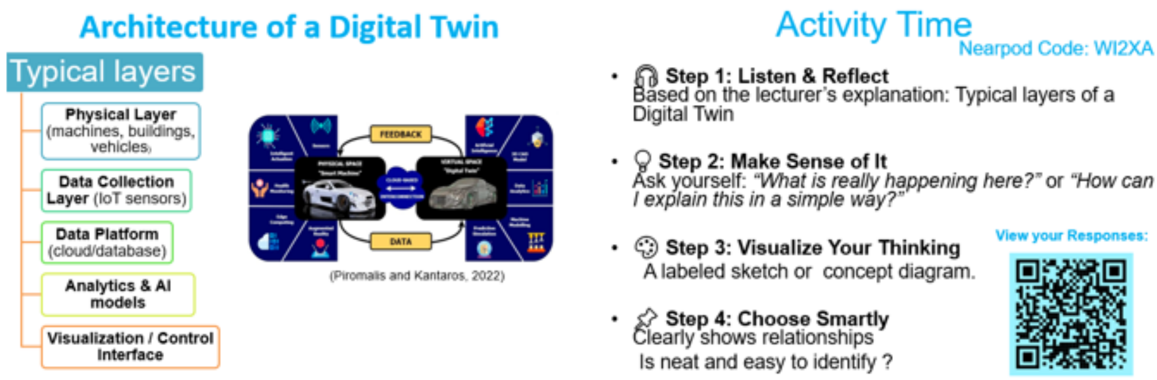

Figure 1: Chunked slides including an activity to enhance students' attention and retention

To evaluate reflective engagement, the 3-2-1 reflection method was implemented using Mentimeter word clouds. Compared to the pre-intervention classroom environment, where silent response rates during traditional question-and-answer sessions were relatively high, the post-intervention approach generated a substantially larger number of student reflections and responses. The findings indicated that digital reflective tools encouraged broader student participation and reduced passive classroom behaviour, which was reflected in Figure 2.

Figure 2 - Responses of the 3-2-1 method

The study also examined student engagement with on-demand learning resources through Learning Management System (LMS) analytics. Results revealed that activity-linked learning materials consistently achieved higher view rates than non-activity-linked resources across all modules. The analysis also revealed that activity-linked resources were viewed more frequently by students than non-activity-linked resources across all four modules considered in this study. Table 1 depicts these results.

Table 1 – Content views for modules

Module	Non-activity-linked resource view rate	Activity-linked resource view rate
ET	30%	86%
CC	25%	82%
FHRM	28%	78%
IBS	17%	88%

Discussion and Conclusion

The findings of this study demonstrate that technology-linked teaching approaches, particularly micro-learning and on-demand learning, positively influenced Generation Z students' engagement and participation across both computing and business modules. The results align with previous literature, which emphasizes that Generation Z learners prefer interactive, technology-supported, and practice-oriented learning experiences over passive lecture-based instruction (Dejacto et al., 2023; Hammad, 2025; Huss, 2023).

The findings related to LMS engagement also support existing literature on on-demand learning preferences among Generation Z students (Chan & Lee, 2023; Persada et al., 2019). Activity-linked materials recorded substantially higher view rates compared to non-activity-linked resources across all modules. This suggests that students are more likely to access learning resources when they are directly connected to classroom activities and assessments. The results reinforce the view that modern learners' value purposeful and immediately applicable learning content rather than large volumes of standalone reading materials.

Although the study focused primarily on short-term engagement and participation indicators, future research could further investigate the long-term impact of these approaches on academic performance, knowledge retention, critical thinking, and employability skills. In addition, future studies may explore how similar technology-linked strategies can be adapted across different disciplines and diverse student populations.

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My Transformed Self as Teacher Guide that Develop Students' Responsible AI Use by Socratic Role-play Activities

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Abstract

Initially, I responded with caution and concern to the growing use of artificial intelligence (AI) by students in academic work, primarily due to its impact on academic integrity, the promotion of passive learning and reduced engagement, all of which hindered the development of higher order thinking skills (HOTS). After a teaching development course enabled reflecting on my own teaching practice, it led to the realization that discouraging AI use alone will be insufficient in addressing these concerns. Thus, a change in my role as a lecturer was required from a critic of AI use to a guide who supports students in engaging with AI effectively and responsibly, which would facilitate a meaningful learning experience. Following this shift in perspective, this action research was conducted to investigate how AI-based Socratic role-play activities could support both student learning and my teaching practice. Students at Levels 5 and 6 (n=20) participated in the activities where ChatGPT was assigned specific roles through an assigned prompt, facilitating a structured dialog as opposed to direct answers. Students engaged with AI by responding to questions, reflecting on feedback and formulating follow-up questions. A mixed-methods approach was utilized combining quantitative and qualitative data for purposes pertaining to the research. Quantitative results reported that 69% of the students were highly engaged, 63% reported a significant change in how they used AI for learning, 100% agreed that the activity helped them to think carefully before responding. Qualitative reflections highlighted the value of feedback and the roleplay in fostering understanding and responsible use of AI. These findings suggest that Socratic AI role-play has the potential to enhance engagement, higher-order thinking skills (HOTS) and metacognitive awareness. More importantly, the study showcases that transforming the teacher's own approach towards developing technologies can enable more effective guidance for students, encouraging responsible AI, supported by further pedagogical improvements.

Background

Artificial Intelligence (AI) has rapidly emerged as a transformative force, challenging the status quo within the higher education sector, widely influencing and changing how students access information, complete assessments and engage with learning activities (Ruano-Borbalan, 2025). Tools such as ChatGPT have become quite common among university students due to factors such as accessibility, speed and ability to generate instance responses. Even though AI technologies provide considerable opportunities for personalized learning and student support, concerns pertaining to academic integrity, dependency on AI-generated responses and reduced critical thinking skills have also intensified (Schmidt et al., 2025). Higher order thinking skills (HOTS), including the ability to analyze, synthesize and evaluate are central to higher educational learning outcomes and are essential for developing independent learners capable of critical thinking and problem solving. However, concerns arise through unrestricted AI use, which may promote passive learning habits where students prioritize obtaining quick answers over reflective understanding (Hassen, 2025). Such practices may reduce student engagement and weaken opportunities for cognitive development.

Initially, I approached increasing use of AI by students with skepticism and caution due to the impact it may have on the educational experience of the students and joy of learning (Hasan, 2025). During lectures and assessments, I observed that some students relied excessively in AI-generated content without critically evaluating the quality, relevance, or accuracy of the information provided. This concern raised doubts pertaining to originality of work, effective engagement by students and academic integrity. However, by exploring new teaching techniques in the age of AI, I recognized that resisting or discouraging AI use entirely would be ineffective within a rapidly evolving digital learning environment (Dey, 2025). Instead, I realized that my role as an educator should be transformed from being merely a critic of AI use in education and become a facilitator who guides students to engage with AI responsibly and meaningfully. Thus, the purpose of this research was to evaluate the feasibility of AI-based Socratic role-play activities in supporting responsible use of AI use, student engagement and the developments of HOTS among learners.

Methodology

The Socratic method, which is based on reflective questioning and dialogue, engages students in justifying their reasoning, conducting analysis and developing a deeper understanding through an inquiry-based model of learning (Hagos, 2025). By integrating AI into structured role-play activities rather than allowing unrestricted answer generation, the current study sought to position AI as a learning partner that encourages critical engagement as opposed to replacing student thinking.

Accordingly, the current research adopted an action research approach involving students from Levels 5 and 6 of the LL.B. undergraduate programme at APIIT Kandy Campus. A total of 20 students participated in the intervention. The research utilized a mixed-methods design incorporating both quantitative and qualitative data collection methods to evaluate the effectiveness of the activities. The intervention was conducted through structured activities via the Learning Management System (LMS) where the students engaged with AI in the form of Socratic role-play interactions. Specific instructional roles through carefully designed prompts were assigned to ChatGPT, given its suitability for the intervention (Gregorcic et al., 2024). These prompts instructed the AI to behave as a Socratic guide by posing reflective and analytical questions as opposed to immediately providing solutions. Students actively engaged with the AI by responding to its questions, reflecting on the feedback generated and formulating further follow-up questions. Following the activities, students completed a feedback survey that measured engagement, changes in AI usage patterns, perceptions regarding critical thinking and qualitative reflections were analyzed through a thematic approach for the purpose of identifying recurring themes pertaining to use of AI, engagement and reflective learning experiences. Additionally, the research included a reflective evaluation of my own teaching practices as an educator. I therefore examined how my transformation into a facilitator of AI influenced classroom interactions, affected student participation, and shaped the overall learning environment. Figure 1 shows the Socratic AI Prompt Design Framework for Higher-Order Legal Reasoning which I developed and used in my intervention.

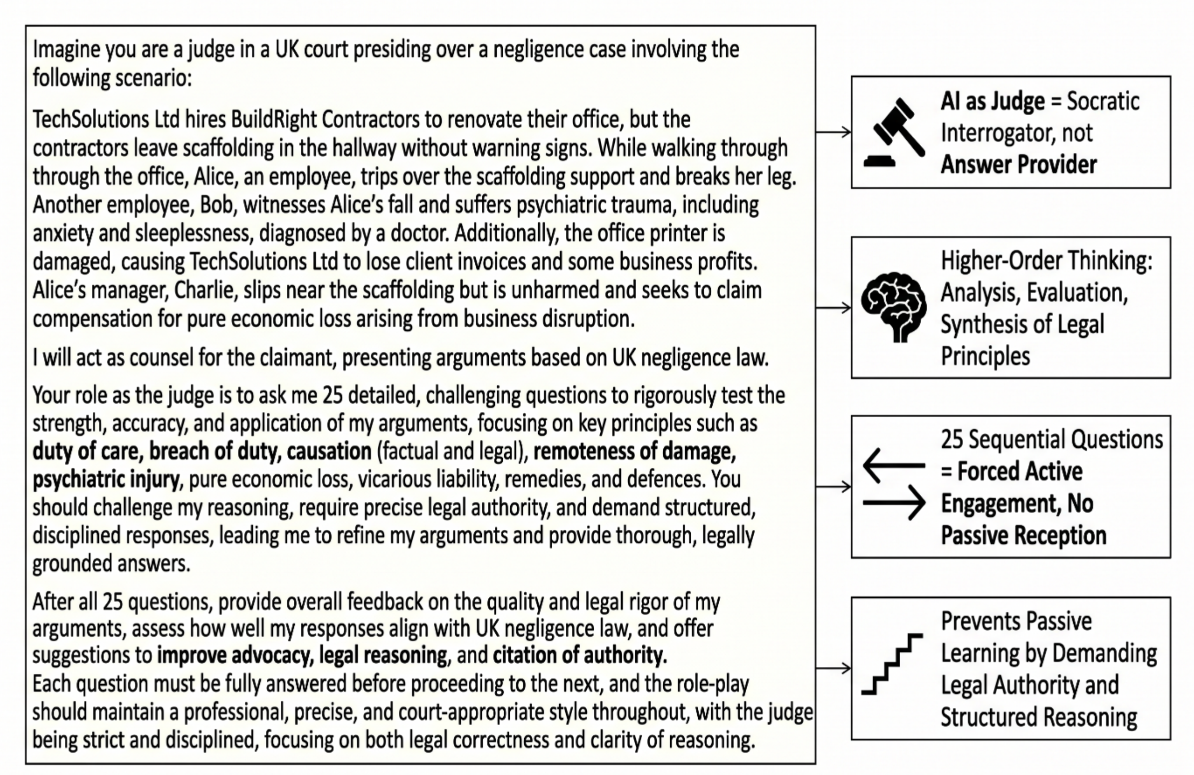

Figure 1. The Socratic AI Prompt Design Framework for Higher-Order Legal Reasoning

Results

The findings of the study portrayed positive outcomes relating to student engagement, responsible use of AI and use of reflective learning practices. Quantitative findings depicted that 69% of the students reported high levels of engagement throughout the AI-supported Socratic role-play activities. Students appeared to be more willing to participate actively during discussions and demonstrated greater involvement in the learning process compared to traditional AI usage methods that focused primarily on answer generation.

Furthermore, 63% of the students reported that the intervention significantly changed how they utilized AI for learning purposes many students opined that they began to view AI as a platform for questioning, clarifications and reflections as opposed to a mere tool for generating answers. Most significantly, 100% of the participants agreed that the activities encouraged them to think carefully before responding, implying enhanced reflective engagement and critical consideration during learning activities. 94% of the students reported that they felt more comfortable using AI for learning due to lecturer guidance and that the activity changed the way they used AI for learning. In the context of qualitative reflections, students highlighted that the questioning approach used by the AI encouraged deeper understanding and prevented them from depending solely on automated answers. Students reflected that the role-play activities helped them to recognize the importance of evaluating

AI-generated responses critically and appreciated receiving guided feedback through questioning. Classroom observation following the activities showcased a noticeable improvement in discussing ideas, asking questions and engaging in reflective dialogues on AI's position as a facilitator contrary to an answer-generating platform.

Discussion and Conclusion

The findings of the current research suggest that AI-supported Socratic role-play activities possess considerable potential in supporting Gen-Z learners within higher education environments. Rather than encouraging passive dependence on AI-generated responses, the structured questioning approach appears to have effectively promoted reflective engagement, metacognitive awareness and the development of HOTS. The Socratic method has been recognized as an effective pedagogical approach for the purpose of promoting inquiry reasoning and analytical thinking (Makhene, 2019). This, integrating AI within this framework appears to have enabled the students to engage in continuous reflective dialogue, while receiving immediate feedback and guidance. The results suggest that positioning AI as a questioning facilitator rather than an answer provider may reduce passive learning tendencies and encourage the students to take responsibility for their cognitive development and learning. It should also be highlighted that the intervention facilitated an opportunity for the students to learn according to their own convenience and pace due to the personalized experience (Zhu, 2024), which fostered a more comfortable learning atmosphere.

The study further depicts the significance of the educator's evolving role within AI-integrated educational environments. Initially, my own perspectives towards AI was predominantly shaped by concerns regarding academic integrity and reducing student engagement. However, in light of evolving teaching practices within a transformative technological environment, a shift in my role as an educator towards promoting responsible and ethical use of AI, rather than resisting technological developments, became a well-justified necessity. When the reflections obtained from the students are considered, it is visible that the responsible use of AI can be promoted when students are encouraged to critically evaluate information, justify their reasoning and engage actively in reflective learning processes. The said transformation appears to be catering to the broader educational objective of preparing students to utilize and navigate in digital environments responsibly while maintaining independent critical thinking skills and reason. The change in role as a facilitator also appears to have the capacity to prevent students from being negatively affected by the harmful use of AI in education (Morales et al., 2023).

However, the study is influenced by limitations. The sample size was relatively limited and the intervention was conducted within a specific educational context. Additionally, varying levels of digital literacy, motivation and prior experience on AI among students may have influenced the findings of the research. Further research, thus, should explore the long-term impact of AI-supported Socratic learning approached across larger and diverse student populations. In an overall manner, the current research effectively demonstrates that AI-based Socratic role-play activities can function as a productive strategy for supporting responsible AI use and engagement in a manner that enhanced HOTS and reflective learning among learners. The research also illustrated that transforming the educator's own approach towards emerging technological advances may be pivotal in guiding students to experience a meaningful development in technology-driven educational environments.

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Changing teaching to enhance teaching quality, student engagement and learning using the Minute Paper

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Abstract

The students' academic achievements and certifications represent the outcomes of an effective Teaching and Learning environment, where strong student engagement is essential to reach outcomes. While teaching 45 final-year students in the cybersecurity module (Gen-Z n=45), I was unaware how to determine student engagement and learning extent. The 'Making Teaching Effective' course changed my thinking skills as a new teacher, enabling me to recognize the self-improvement need and tools for use in Teaching and Learning Activities (TLAs) to evaluate student learning as the first self-improvement step. To address my cognitive conflict whether students had actively engaged in learning sessions, I selected the Minute Paper TLA and is discussed here. Having explained at the beginning that a Minute Paper was to be filled at the end of the session, it was shared in digital QR code form at concluding my tutorial and given time to complete. It contained questions on teaching clarity, including asking students to summarize the teaching session. Data from direct observations, and individual minute paper entries were used to evaluate student learning, engagement, and effectiveness of the Minute Paper as an evaluation tool to improve Learning and Teaching. Previously, it was observed that nearly 50% of the 45 students used mobile phones during tutorial time. With the use of pre-announced Minute Paper, 75.6% (n=34) completed it, showing increased engagement in the session. Among these students, 97.1% were able to provide a clear summary of the session content. These results demonstrate that students had utilized their cognitive skills to provide their feedback using the Minute Paper. When unclear points from students' Minute Papers were used as feedback, it also helped me improve future teaching. The Minute Paper activity effectively utilized students' cognitive knowledge. The Minute Paper can therefore be used as an effective TLA to increase student engagement.

Purpose/Background

In education, student achievement and professional certification are indicators of how well the teaching and learning environment is working (Biggs & Tang, 2011; Hattie, 2009). At Informatics Institute of Technology (IIT), in collaboration with the University of Westminster and Robert Gordon University, I taught the final-year cybersecurity module to 45 students. For these students, being engaged in class is crucial not only for their grades but also for developing the skills they need to work in the information security industry. These students are part of Generation Z, which is very comfortable with technology (Seemiller & Grace, 2016; Twenge, 2017). They like to learn in different ways and want to get things done quickly. While this can be good for teaching, it also makes it harder to use methods that just involve lecturing and tutoring. As a teacher, it's my duty to figure out if students are really learning (Fredricks, Blumenfeld & Paris, 2004).

When I first started teaching as a new teacher, I found it difficult to identify if the students were really engaged. I conducted the lab-based tutorials and gave them do activities in the lab. I found it challenging to determine the level of students' learning due to the lack of assessment. Since I didn't know what they were struggling with, I was not able to adjust my teaching to help them, which resulted in cognitive conflict about whether students had actively engaged in learning sessions (Black & Wiliam, 1998). Participation in the Making Teaching Effective (MaTE) professional development programme prompted a fundamental reorientation of my educational approach, promoting critical reflective capacity. In response to my cognitive conflict regarding the depth of student engagement in the cybersecurity module, I utilized the Minute Paper (Widia *et al.*, 2022). Provided at the close of the session, the teaching-learning activity invited students to identify the most significant concept learned and articulate any remaining points of confusion. This twofold method simultaneously activates the metacognitive reflection in the learner and produces diagnostic data for the teacher, making it particularly well-suited to Gen-Z students that responds favorably to feedback-oriented tasks (Flavell, 1979; Zimmerman, 2002). Additionally, a crucial finding from this experience was to generate real-time evidence of student engagement (Korhonen *et al.*, 2024).

This study's primary research question was: How can I improve myself as a teacher to identify the engagement level of the final year undergraduate Cybersecurity learners? The objective was to verify if the Minute Paper can help me identify what my students have learnt effectively and what have they found difficult to comprehend about cybersecurity. I also wanted to know if I could use this data to improve my teaching in the cybersecurity module.

Methodology

I conducted this study within a final-year undergraduate Cybersecurity module delivered to a cohort of 45 students (n=45), broadly representing the Generation Z demographic. At the beginning of the session I informed the students that a minute paper would be given at the end of the session to identify what you learnt best and what is still confusing to them. This ensured that they stayed focused on improving the comprehension during the lesson. I distributed the minute paper online through a QR code provided at the end of a tutorial, a method chosen for its compatibility with the tech-savvy tendencies of Gen-Z students and its ability to promote efficient, paperless data gathering. Three minutes were allocated for completion to ensure responses were meaningful. The Minute Paper contained structured prompts that evaluated teaching clarity and student comprehension, including questions asking students to summarize the key concept covered, identify their most significant point of learning, and write down any confusion or doubt. Data was collected through two primary sources: direct classroom observation conducted by the me during tutorial sessions, and individual minute paper responses submitted by each student via a structured Google Form. The form required students to provide short-answer responses to prompts addressing key learning takeaways and areas of confusion. A mixed-methods approach was employed to analyze the collected data. Qualitative analysis was applied to the short-answer, enabling thematic examination of the depth of student engagement (Creswell & Plano Clark, 2018). These data sources were subsequently evaluated to assess the extent to which the Minute

Paper generated actionable evidence of student learning and informed instructional adjustments.

Results

The implementation of the pre-announced minute paper produced a measurable improvement in student engagement, with 75.6% of the cohort (n=34) completing the Google Form, compared to a prior observation in which approximately 50% of students were engaged with mobile phones during tutorial time. Of those who responded, 97.1% were able to provide a coherent summary of the session content, demonstrating sufficient cognitive engagement to consolidate and articulate their learning. The figures 1,2 and 3 summarize the key findings identified regarding the utilization of the minute paper technique.

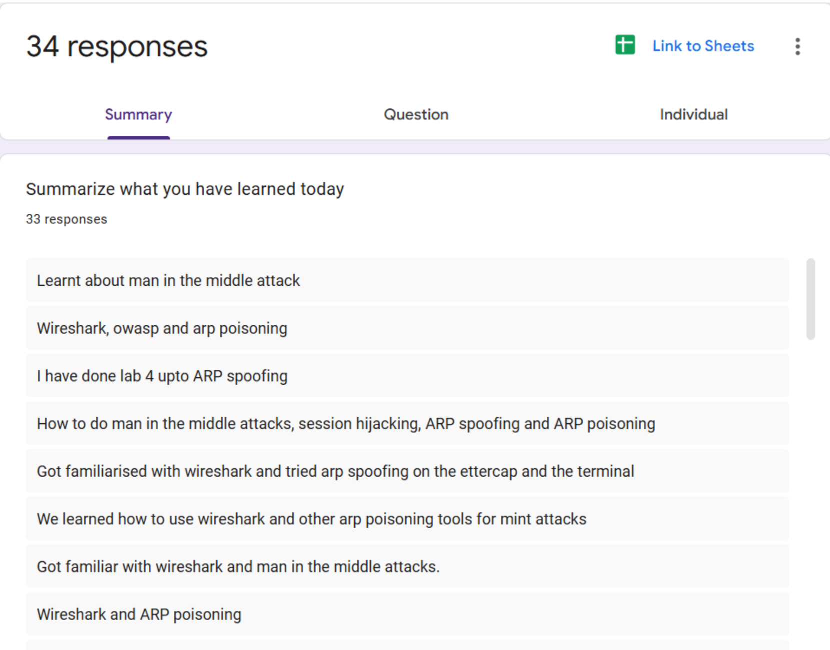

Figure 1: Summary of the tutorial session

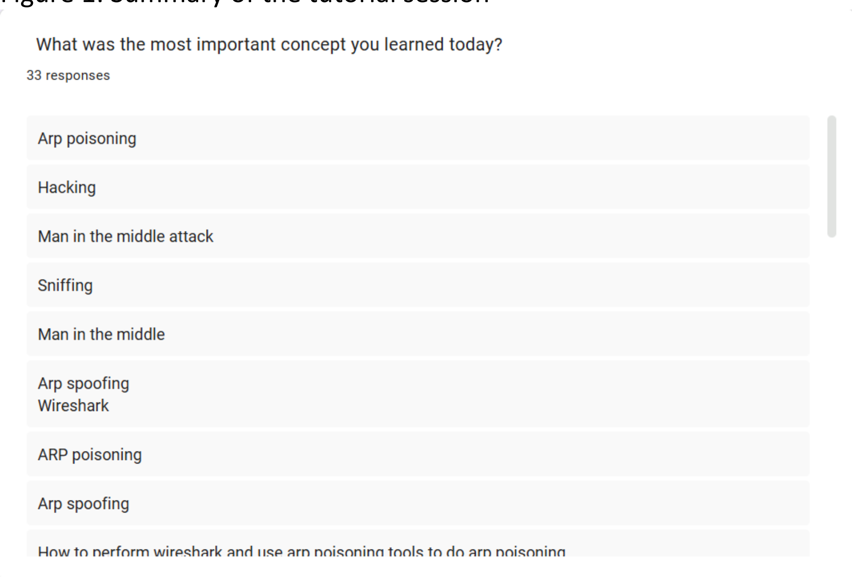

Figure 2: Most important concept in the tutorial session

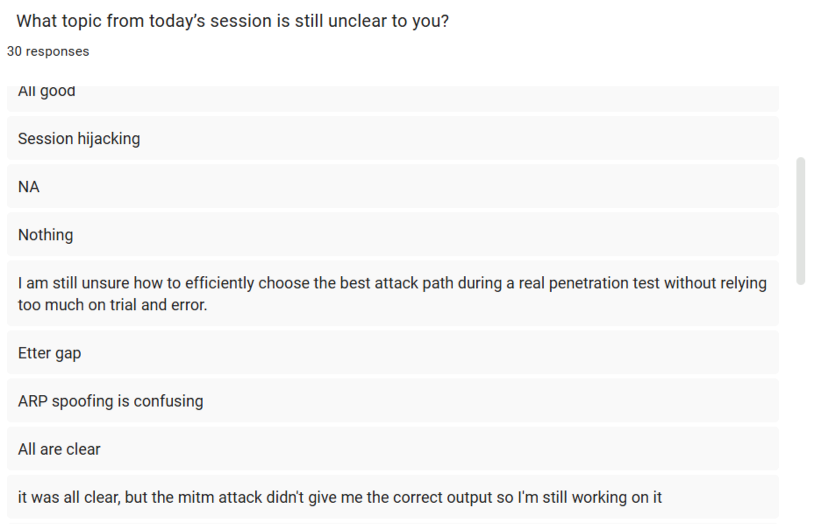

Figure 3: Unclear points of the lesson for the students

Discussion and Conclusion

The results of this research support a significant amount of existing literature confirming the effectiveness of formative assessment methods in enhancing student engagement and reinforcing learning. The significant level of meaningful feedback noted with 97.1% of Minute Paper participants successfully summarizing session material aligns with Angelo and Cross (1993), who assert that low-stakes, reflective evaluation tools stimulate metacognitive engagement and enhance conceptual memory. Moreover, the students remained focused after implementing the pre-announced minute paper, aligning with Kuh *et al.* (2008), who found that structured accountability mechanisms embedded within learning sessions are positively associated with heightened student engagement, particularly among undergraduate cohorts. Employing student-identified confusion as formative feedback to inform subsequent instructional planning further reflects Black and Wiliam (1998), who demonstrated that formative assessment strategies foster a dynamic, iterative link between student comprehension and teacher response.

These findings are useful for teachers in various subjects, especially to thoseare teaching complex content to teaching Gen-Z students. The Minute Paper, when used digitally through Google Forms, is a quick and easy-to-use tool that doesn't disrupt classes much but gives valuable information. Teachers in universities can easily use this method, especially if they have problems with students not paying attention or just sitting there. This study was conducted with a single set of students in a single subject. In order to determine whether the positive outcomes I observed are consistent across all subjects, universities, and student populations, this must be repeated with multiple cohorts in multiple courses. The findings may aid educators in improving their lessons. Pupils acquire more active engagement and self-directed learning. Students appear to benefit from the approach in terms of engagement and comprehension. To confirm this, more usage of Minute Papers across multiple modules is required to verify the positive influence on the teaching and learning environment.

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Reorienting my teaching and improving Gen-Z student performance via Interleaved Micro-Learning

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Abstract

Gen-Z students in Year-1 Web Development,25 students, and Year-2 Server-Side Programming, 20 students, struggled to solve problems independently and relied heavily on me to provide prescriptive, step-by-step coding instructions when I Lectured in traditional mode. This dependency made it difficult for students to grasp complex, abstract concepts while long lectures overwhelmed them, leading to high anxiety, lost focus and an inability to develop Higher Order Thinking Skills (HOTS). A teaching development course (MaTE, 2024) I followed led me to explore whether shifting my teaching from long, continuous lectures to structured, interleaved micro-learning cycles would help students transition from passive learners to active problem solvers and to impactfully change their academic performance. First, I determined how skilled the participants were at coding and observed their anxiety levels. Next, I changed teaching into the "micro-learning" technique, where a 15-minute lecture on theoretical knowledge alternated with 15 minutes of coding practice. To decrease cognitive load, I used daily-life analogies to explain theoretical parts. Coding practice was also interleaved with programming theory parts, to ensure students found answers. To evaluate effectiveness of changed teaching, I used pass rates and student perception feedback (for self-rated anxiety). Pre-intervention baseline pass rates were 62% in Year-1 Web Development and 58% in year-2 Server-Side Programming, with high average lecture anxiety (4.2/5). Post-intervention, pass rates surged to 75%–98% and 75%–100%, respectively. Perception data showed a massive drop in student self-rated anxiety (1.8/5). Through the use of micro-learning and interleaving methods, students were able to become less dependent on passive learning methods. This shift helped reduce stress in their learning environment, resulting in to improved learning and academic performance.

Keywords: Cognitive Load Management, Interleaved Instruction, Higher Order Thinking Skills (HOTS), Generation Z Learners, Active Learning

Purpose/Background

The term generation Z refers to learners who were born after the mid-1990s. They are called digital natives because their lives and education have been significantly affected by technology. First, Generation Z students excel at information processing and multitasking; yet, on the other hand, such problems as distraction, disengagement, and lack of retention have become the major obstacles to learning in a typical university class (Eskasasnanda *et al.*, 2025; Alruthaya *et al.*, 2021). The literature indicates the discrepancy between the needs of

Generation Z students and the current approaches to teaching, according to which the former need interactive and technology-assisted classes (Eskasasnanda *et al.*, 2025; Alruthaya *et al.*, 2021). Cognitive demands in programming and other subjects impose a heavy load on scarce resources, making cognitive load an important design issue (Philbin, 2023; Gao & Hew, 2023; Sands, 2019; Quintero-Manes & Vieira, 2024). Specifically, research in computer science education demonstrates that novices experience high levels of intrinsic and extraneous cognitive load while learning programming, and that well-designed scaffolding — such as worked examples, debugging procedures, and analogies — can enhance the learning process and decrease cognitive load through schema formation (Philbin, 2023; Gao & Hew, 2023; Sands, 2019). Evidence paralleling this finding also shows that micro-learning, which involves short, intensive learning sessions, increases academic performance, retention, learner engagement, and self-regulation compared to traditional macro-learning, partly due to low cognitive load and alignment with current learning trends (Senandheera *et al.*, 2024; Sathiyaseelan *et al.*, 2024; Jainuri *et al.*, 2025; Monib *et al.*, 2024; Mariana *et al.*, 2025). Meta-analysis of research findings from various disciplines reveals the positive impacts of micro-learning in acquiring knowledge, transferring skills, test scores, and motivation (Senandheera *et al.*, 2024; Jainuri *et al.*, 2025). In addition, interleaving practice, which involves practicing different concepts or problems instead of blocking, results in higher delayed test scores in STEM subjects, particularly in scenarios where tasks require differentiation of similar concepts (Sana & Yan, 2021; Foster *et al.*, 2019; Mielicki & Wiley, 2022). In this regard, Year 1 Web Development (n=25) and Year 2 Server-Side Programming (n=20) Gen Z students at APIIT Sri Lanka had challenges in independently problem-solving and depended on detailed procedural guidance during conventional classes. Extended lessons contributed to higher levels of coding anxiety (4.2/5) and failure to acquire higher-order thinking skills. After undertaking a teacher development course (MaTE, 2024), this research evaluated the ability of transitioning to interleaved micro-learning cycles to lower anxiety levels and enhance academic outcomes.

Methodology

For the baseline, I assessed my students' coding skill levels via a short diagnostic test (30–45 minutes) that I administered, which comprised multiple-choice questions on core programming concepts and short coding tasks. To measure anxiety, I used a single self-report item asking, "On a scale of 1 (not anxious) to 5 (very anxious), how anxious are you about coding in this module?" I collected this data anonymously at the end of Week 1 (Gao & Hew, 2023; Quintero-Manes & Vieira, 2024). From Week 2 onwards, I restructured each of my teaching sessions (which typically last about 90 minutes) into repeated 30-minute theory–practice cycles. I delivered a 15-minute theory segment covering 1–2 key concepts (e.g., loops, functions, HTTP requests, database queries), which I immediately followed with a 15-minute individual or pair coding task directly aligned to that concept. I incorporated at least one real-world analogy in connection with each concept to decrease the students' extraneous cognitive load and help them build schemata. For example, I described functions as "machine factories" and databases as "file cabinets" (Philbin, 2023; Gao & Hew, 2023; Monib et al., 2024). I deliberately interleaved concepts across all my classes, ensuring I integrated previous concepts into new tasks when I introduced new material (Sana & Yan, 2021; Foster et al., 2019). I determined the effectiveness of my intervention using two outcome measures. To measure my students' academic achievement, I calculated the official percentage of students who passed the module by obtaining satisfactory grades. I assessed this by comparing the baseline and intervention semesters—that is, the semesters where I utilized traditional lectures versus the semesters where I implemented interventions aligned with Senandheera et al. (2024) and Sathiyaseelan et al. (2024). Finally, I administered the anxiety measurement tool again during my last week of teaching

Results

Both cohorts, there were significant improvements in academic results and students' anxiety levels after implementing the interleaved micro-learning strategy. Table 1 provides details about pre-intervention and post-intervention results.

Table 1. Pre- and post-intervention outcomes by module

Module	Pre-intervention Pass Rate	Post-intervention Pass Rate	Pre Anxiety (Mean/5)	Post Anxiety (Mean/5)
Year 1 – Web Development (n=25)	62%	75–98%	4.2	1.8
Year 2 – Server-Side Programming (n=20)	58%	75–100%	4.2	1.8

For Year-1 Web Development (N=25), the pre-intervention pass rate of 62% increased to 75%-98% after the implementation of the intervention. For Year-2 Server-Side Programming (N=20), the pre-intervention pass rate of 58% increased to 75%-100%. Before implementing the intervention, the average score for self-reported anxiety level in both courses was 4.2 out of 5, implying a high anxiety level among students while programming. After implementing the intervention, the average anxiety score was reduced to 1.8 out of 5.

Discussion and Conclusion

The notable increases in pass rates for both modules are in line with the accumulating body of research demonstrating that micro-learning enhances academic achievement in tertiary education. In a meta-analysis study conducted by Senandheera et al. (2024), micro-learning resulted in statistically significant post-test scores compared to macro-learning, with an average increase of about 12.6 points. Micro-learning studies in introductory computer programming and data management have also shown increased test scores with the delivery of content in small, focused chunks (Sathiyaseelan et al., 2024; Mithun & Sankaranarayanan, 2024). The observed increase in pass rates (from around 60% to 75%-100%) follows the trend of substantial improvements in academic performance found in micro-learning studies (Pan & Harun, 2025; Senandheera et al., 2024; Skalka & Drlík, 2020).

The decrease in anxiety from 4.2/5 to 1.8/5 is also in line with the findings from research that effective application of active and micro-learning techniques is associated with lower levels of anxiety during the learning process. Cognitive thinking techniques implemented into programming classes have been found to decrease anxiety and enhance learning outcomes and motivation (Chang et al., 2023). Research reviews dedicated to programming anxiety highlight that supportive pedagogies, structured problem solving, and the use of analogies are crucial for anxiety reduction (Monib et al., 2024; Pan & Harun, 2025). Interleaving learning sessions with the use of many analogies in teaching and structuring learning activities without confrontation was one of the main factors behind the significant decrease in anxiety (Cooper et al., 2018; Hsu & Goldsmith, 2021). Although interleaving was not isolated experimentally, the deliberate mixing of concepts across tasks is congruent with evidence that interleaved practice outperforms blocked practice for long-term retention and flexible application in STEM domains (Sana & Yan, 2021; Foster *et al.*, 2019; Mielicki & Wiley, 2022). Active-learning meta-analyses across STEM also show that structured active learning narrows achievement gaps and reduces failure rates, particularly for lower-prepared students (Theobald *et al.*, 2020) - a finding consistent with the large gains observed across whole cohorts in this study. This intervention provides other computing instructors with an accessible and affordable means of incorporating micro-learning and interleaving in their teaching practices without the need for dedicated technology. Transferable aspects of this intervention include the following: time-blocked theory/practice sessions of 15 minutes each; close correlation of the mini lecture with the associated programming problem; intentional interleaving of new and existing knowledge; and continual assessment of both student performance and affective factors. Further research could examine any differences based on level of success, and its applicability to other computing courses.

In conclusion, this study adds practice-based evidence from Sri Lankan higher education to an emerging global consensus that micro-learning, implemented through interleaved, analogy-supported theory–practice cycles, can both improve programming performance and reduce student anxiety. The extent of improvement seen in pass percentages and the sharp decrease in anxiety levels mirror findings from experimental studies on micro-learning and programming anxiety, within the context of a genuine Gen-Z computer class. By documenting both achievement and affective outcomes and grounding the design in cognitive load and active-learning research, this study offers a concrete, replicable model for reorienting teaching in programming education.

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Changing teaching from Unfamiliar to familiar to Bridge the Gen Z Gap in Object-Oriented Programming

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Abstract

When a C# Object-Oriented Programming (OOP) module was previously taught with heavy reliance on traditional lectures and abstract, business-focused coding examples, disengagement among Gen-Z students was observed, as they generally favor immediate digital feedback and struggled to grasp abstract software architecture without it. Recognizing this pedagogical gap and using approaches learnt from a Teaching methods course, I changed teaching methods to explore whether integrating familiar multiplayer gaming mechanics, instead of conventional business examples, can improve the learning performance of 32 undergraduates in OOP. The instructional framework mapped fundamental C# OOP concepts onto the gameplay mechanics of *League of Legends* in order to create a more relatable learning environment. Within this framework, classes were introduced as the base templates for champions, while objects represented individual champion instances active within a match. The concept of inheritance was explained through shared characteristics among champion archetypes such as Mages and Tanks, which inherit common attributes and behaviors. Similarly, polymorphism was illustrated using universal item effects that interact differently depending on the champion using them. This analogy-driven approach was integrated into lectures to help students visualize programming concepts and connect abstract ideas with familiar systems. The success of this change was evacuated by direct observations and pass rates. The resulting pass rates data highlighted a clear improvement in student outcomes. Following the gamified intervention, the 32-student cohort achieved a 71% pass rate on their formal assignments, compared with 60% previously. Additionally, in-class observations confirmed that the vast majority of these students could successfully and independently break down and solve applied OOP coding problems during active learning sessions. Shifting the focus of OOP instruction to incorporate the familiar, highly engaging mechanics of *League of Legends* effectively addresses Generation Z's classroom disengagement. By translating complex software architecture into relatable, accessible frameworks, this approach not only recaptures student interest but also drives positive, measurable improvements in academic performance.

Background

Object-Oriented Programming (OOP) is a foundational pillar of software engineering, yet it remains a persistent hurdle for CS undergraduates. Traditionally, C# OOP is taught through abstract business analogies and text-based console applications—a medium that steepens the learning curve. A blank console offers no visual representation of state changes or underlying mechanics. Even when students grasp theoretical concepts, visualizing the backend logic linking code to text output remains difficult. Consequently, classroom disengagement is rising among Generation Z learners, who expect the immediate feedback of highly visual systems.

To address this, disconnect, this study explores transitioning the curriculum away from conventional analogies and toward the systemic, visual mechanics of multiplayer gaming—specifically *League of Legends*. By first demonstrating interactions through real gameplay—such as one champion attacking another and visibly depleting Health Points (HP), instructors establish a clear, visual baseline of the expected logic. When students subsequently code this logic into a traditional console application, the text output ceases to be abstract. They can directly map the printed console results back to the specific attributes and methods they observed visually in the game.

Recent studies have highlighted the growing effectiveness of gamification in programming and software engineering education, particularly in improving student engagement, motivation, and learning outcomes (Ishaq et al., 2024). Research by Gamification scholars has shown that traditional programming instruction often struggles to maintain student interest due to the abstract nature of programming concepts and the passive structure of lecture-based teaching (Behl et al., 2022). Jawad and Tout (2021) specifically argue that Generation Z students, as digital natives, respond more positively to interactive and game-oriented learning environments than conventional instructional approaches. Similarly, Ngandu et al. (2023) found that gamification techniques in software engineering education significantly improve participation, engagement, and learner motivation. Studies focusing on programming education further suggest that analogy-based and game-driven teaching methods help students better visualize abstract concepts, encourage active learning, and improve retention in challenging domains like Object-Oriented Programming (Costa, 2023; Jusas et al., 2022; Maryono et al., 2022). Recognizing this pedagogical gap, the purpose of this study is to explore an alternative instructional framework. By leveraging teaching methods focused on bridging the "unfamiliar to familiar," this research aims to utilize the highly engaging mechanics of *League of Legends* to make console-based OOP instruction more accessible and clear.

This study seeks to answer the following research question: Does integrating the visual and familiar mechanics of multiplayer gaming, instead of conventional business-focused examples, improve the academic performance and practical problem-solving capabilities of Gen Z undergraduates learning C# Object-Oriented Programming via console applications?
It was hypothesized that establishing a visual baseline of OOP concepts through gameplay mechanics would create a more accessible learning environment. The expected outcome was that this approach would help students visualize software architecture within console applications, thereby recapturing their interest, fostering independent problem-solving skills, and ultimately yielding measurable improvements in formal assessment pass rates.

Methodology

I conducted the study with a cohort of 32 undergraduate students enrolled in a standard C# Object-Oriented Programming module. Over the duration of the module, I implemented an instructional intervention that replaced the traditional business-centric curriculum with a gamified instructional framework. To bridge the gap between abstract concepts and console-based programming, I restructured my instructional delivery into a sequential process for each core programming topic.

Before introducing code, I presented real gameplay footage from League of Legends to establish a visual baseline. I highlighted specific interactions, such as one champion executing an attack against another, followed by the visible depletion of the target's health points. This provided my students with a concrete, visual understanding of the systemic logic and cause-and-effect relationships occurring within the software.

Following this visual demonstration, I explicitly mapped fundamental C# principles to the game's mechanics. Classes were taught as the foundational blueprints for characters, while objects were demonstrated as the specific, active instances of those templates existing within a match. Inheritance was explained through champion archetypes, as I created base classes for roles like mages or tanks containing shared attributes and behaviors. Polymorphism was illustrated using universal in-game items or commands that execute entirely different calculations depending on the specific champion object invoking them.

I then tasked the students with coding the demonstrated logic into a C# console application. Because they had already witnessed the visual gameplay, the resulting text-based console output was no longer abstract. I guided them to trace the printed text directly back to the specific attributes and methods executing in the background.

To evaluate the success of this instructional shift, I utilized both quantitative and qualitative measures. I measured student performance using the pass rates of their formal, applied coding assignments at the end of the module, which I then compared against the historical baseline pass rate of 60% from previous cohorts taught using conventional examples. Additionally, I conducted direct, in-class observations during active learning sessions to assess my students' ability to independently break down requirements, design the class architecture, and solve applied coding problems without requiring step-by-step intervention.

Results

The implementation of the gamified instructional framework yielded positive, measurable improvements in both academic outcomes and active student engagement during the module. The findings are categorized into quantitative performance metrics and qualitative classroom observations.

Data collected from formal assessments and in-class participation indicates a marked improvement over historical baseline. Following the intervention, the 32-student cohort achieved a 71% pass rate on their formal, applied Object-Oriented Programming (OOP) coding assignments. This represents an 11% absolute increase in student success compared to the historical baseline pass rate of 60%, which was established by previous cohorts taught using traditional, business-centric analogies.

Furthermore, the gamified approach significantly increased daily classroom engagement and practical output. Prior to the intervention, the previous cohort of 34 students averaged 10 submissions per in-class coding task. In contrast, the gamified cohort of 32 students averaged 22 in-class submissions per task, demonstrating a substantial increase in active participation rates.

Table 1: Comparison of Student Performance and Engagement in Two Cohorts

Metric	Historical Baseline (Previous cohort)	Intervention Group (Gamified cohort)
Sample Size (n)	34	32
Assessment Pass Rate	60%	71%
Average In-Class Submissions	10	22

Beyond the quantitative data, direct in-class observations revealed a distinct shift in student autonomy and problem-solving capabilities. Because the abstract programming topics were anchored in familiar League of Legends game concepts, students engaged more readily and confidently in class discussions. During practical coding sessions, the vast majority of the cohort demonstrated the ability to independently deconstruct complex requirements. Students successfully mapped out class architecture and applied core OOP concepts specifically inheritance and polymorphism with minimal reliance on step-by-step instructor intervention. This level of independence was a stark contrast to previous iterations of the module, where students frequently required continuous guidance. Visual gameplay demonstrations reduced cognitive load, allowing students to focus on C# syntax rather than conceptualizing abstract systems.

Discussion and Conclusion

The results of this study demonstrate that integrating familiar multiplayer gaming mechanics into Object-Oriented Programming instruction significantly improves both academic performance and active student engagement among Generation Z learners. These findings align closely with the work of Costa (2023) on cognitive load theory and game-based learning, which suggests that anchoring abstract concepts in familiar frameworks reduces the mental effort required to process new information. Unlike traditional business-centric examples, which often force students to simultaneously decipher both the programming logic and an unfamiliar corporate domain, the visual and systemic nature of *League of Legends* provides an intuitive, pre-existing mental model. By bridging the gap between observable visual mechanics and text-based console output, students can focus their cognitive resources entirely on software architecture and C# syntax. This corroborates prior educational research by Jawad and Tout (2021), indicating that experiential, highly visual learning environments are particularly effective for digital-native demographics. The pedagogical framework developed in this study offers a highly adaptable model for other computer science educators. While this research specifically utilized *League of Legends* to teach C# OOP concepts, the underlying instructional method can be applied across various programming languages and paradigms. Educators can map other complex, systemic video games to teach different computational concepts. For example, resource management or strategy games could be utilized to illustrate memory allocation, while factory simulation games could serve as a visual baseline for teaching asynchronous programming and concurrency. The broader takeaway is not the specific game but establishing a visual baseline before teaching abstract coding. While the observed improvements in pass rates and in-class participation are highly positive, the generalizability of these findings requires further investigation. The intervention was tested on a targeted cohort of 32 students within a single module. Furthermore, while the visual gameplay demonstrations successfully mitigated the need for students to be active players of the game to understand the concepts, the efficacy of this approach across student populations with zero gaming exposure or vastly different cultural touchstones remains untested. To establish broader generalizability, future research must replicate this methodology across larger, multi-institutional sample sizes and evaluate how different game genres impact comprehension across diverse student demographics, ensuring that the chosen analogy does not inadvertently introduce a new barrier to entry.

Building upon these findings, future work will focus on expanding this visually grounded instructional framework to encompass more advanced programming topics, such as complex data structures and algorithmic efficiency. Taking this work further is essential; as software engineering requirements become increasingly complex, traditional teaching methods are proving insufficient for retaining student interest and fostering independent problem-solving skills. By continuing to refine teaching methods that transition learners from the unfamiliar to the familiar, educators can systematically dismantle the barriers to entry in computer science.

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Students' perceptions on changing lectures to integrate model question discussions to improve student learning in server-side web development

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Abstract

It was noticed that while second-year students following the Server-Side Web Development module complete an in-class test as part of their assessment, many struggled to perform well despite being provided with revision materials and past paper questions. Noting this "knowing-doing" gap between student preparation and applying knowledge during assessments and the teaching concepts learnt at a teaching development course, we modified teaching to address this challenge. While previously, a single revision session was conducted at the module end to discuss model questions, this teaching change introduced, within each lecture or tutorial, the discussion of model questions related to each lecture or tutorial topic. This change aimed to help students reinforce the interpretation of theoretical concepts incrementally while helping them practice answering exam-style questions. This integration of model questions into lectures served also as a motivational mechanism encouraging regular lecture attendance and active engagement with the learning process. At regular lecture sessions, after explaining each key concept, the instructor presented model questions related to the topic and discussed them with students. These discussions focused on how theoretical concepts could be applied to solve exam-style problems. This approach allowed students to immediately connect theory with practical problem-solving while gaining continuous practice throughout the module rather than relying on a single revision session. The change was evaluated through student feedback. In feedback from 378 students after the in-class test, 357 students reported that lecture-integrated model question discussions helped them perform better than a single revision session, while 18 students provided a neutral response and 3 students did not find the approach helpful. Students indicated that this method improved their learning, answering skills, and confidence in tackling examination questions. The findings suggest that integrating model question discussions within lectures motivates students and enhances assessment preparation. This approach supports continuous learning, improves confidence in answering exam-style questions, and strengthens student engagement. Future implementations may include additional guided practice sessions and structured feedback opportunities to further support student learning.

Keywords: Active learning, model questions, student engagement, assessment preparation, web development education

Introduction

Assessment preparation remains a significant challenge in higher education, particularly in technical modules where students are expected to apply theoretical knowledge in practical and examination contexts (Biggs & Tang, 2011; Winstone et al,2020). In the Server-Side Web Development module offered to second-year students, it was observed that many students struggled to perform effectively during in-class assessments despite having access to revision materials and past papers. Students often demonstrated theoretical understanding during lectures but faced difficulties when required to independently answer structured examination questions. This reflects a "knowing-doing" gap where learners possess conceptual knowledge but lack confidence and practice in applying that knowledge in assessment situations. Traditionally, revision for the module consisted of a single revision session conducted towards the end of the semester. During this session, selected model questions were discussed with students. However, it was identified that this approach provided limited opportunities for continuous engagement and incremental reinforcement of concepts. As a result, a teaching intervention was introduced where model question discussions were integrated directly into lectures and tutorial sessions throughout the module.

The primary objective of this study was to evaluate whether embedding model question discussions into regular teaching sessions could improve student learning, motivation, and confidence in answering examination-style questions. The study also explored student perceptions regarding the effectiveness of this teaching strategy. Previous studies have highlighted that active learning approaches improve student engagement and learning outcomes in higher education environments (Prince, 2004; Panadero et al,2024).

Methodology

The intervention was implemented in the Server-Side Web Development module delivered to second-year undergraduate students. During each lecture session, the instructor introduced model questions immediately after explaining key theoretical concepts. These questions were designed to reflect examination-style problems relevant to the topic being discussed.

We implemented the intervention in the Server-Side Web Development module delivered to second-year undergraduate students. During each lecture session, we introduced model questions immediately after explaining key theoretical concepts. These questions were designed to reflect examination-style problems relevant to the topic being discussed. We guided students through the interpretation of the questions, the identification of relevant concepts, and the process of structuring appropriate answers. This enabled students to directly connect theoretical content with practical application. Unlike the previous teaching approach, where students encountered model questions only during the final revision session, our new approach provided continuous exposure to exam-oriented thinking throughout the semester.

Our teaching strategy also reflected the principles of formative assessment, where continuous feedback and practice opportunities help students regulate and improve their learning processes (Nicol & Macfarlane-Dick, 2006). At the conclusion of the in-class test, we collected feedback from students regarding the usefulness of the lecture-integrated model question discussions. A total of 378 students participated in the feedback process. We analyzed the responses to identify student perceptions of the intervention and its influence on their learning and assessment preparation.

Results

The collected feedback demonstrated a strong positive response toward the teaching intervention. Out of 378 students, 94.4% stated that integrating model question discussions within lectures helped them perform better compared to relying on a single revision session at the end of the module. 4.8% students provided neutral responses, while only 0.8% of students reported that the method was not helpful.

Students highlighted several benefits associated with the approach. Many reported that discussing model questions during lectures improved their understanding of theoretical concepts by demonstrating how those concepts could be applied in examination scenarios. Others indicated that the continuous practice reduced anxiety towards assessments and improved confidence when answering structured questions.

The intervention also appeared to encourage greater student engagement during lectures. Since students expected model question discussions to take place regularly, they were more attentive during teaching sessions and participated more actively in classroom discussions. This continuous reinforcement of learning supported better preparation for assessments and encouraged consistent study habits throughout the semester. These findings are consistent with previous research which emphasizes that active participation and continuous engagement positively influence student learning outcomes (Prince, 2004; Theobald el at,2020).

Table 1: Student Feedback on Lecture-Integrated Model Question Discussions

Student Response Category	Number of Students	Percentage (%)
Helpful / Improved Performance	357	94.4
Neutral Response	18	4.8
Not Helpful	3	0.8
Total	**378**	**100**

Discussion and Conclusion

The findings of this study demonstrate that integrating model question discussions into lectures positively influences student learning, motivation, and assessment preparation in technical modules. Students perceived the approach as beneficial because it enabled them to connect theoretical concepts with practical examination-style applications immediately after learning new content. This supports active learning principles where continuous engagement and application improve understanding and retention (Biggs & Tang, 2011; Winstone et al., 2020).

The intervention also functioned as a motivational mechanism by encouraging students to actively participate during lectures and tutorials. Students recognized the practical value of attending sessions regularly since model questions provided direct guidance on how theoretical knowledge could be applied in assessments. Additionally, the continuous practice opportunities reduced examination anxiety and improved confidence in answering structured questions. These observations align with formative assessment principles, which emphasize the importance of regular practice and feedback in supporting self-regulated learning (Nicol & Macfarlane-Dick, 2006; Panadero et al., 2024).

The teaching approach introduced in this study can be applied by lecturers and educators in other technical and non-technical modules where students struggle to transfer theoretical knowledge into assessment performance. Integrating model questions within lectures can support continuous learning rather than depending solely on final revision sessions. Educators may adapt this strategy by embedding short guided discussions, problem-solving activities, or examination-style practice questions into regular teaching sessions. This approach can be particularly useful in computing, engineering, business, and other assessment-oriented disciplines where students benefit from incremental reinforcement and application of concepts.

This work will be further developed in future module deliveries because the positive student feedback indicates that the approach contributes meaningfully to student engagement and confidence. Future improvements may include structured formative feedback activities, peer discussion opportunities, and additional guided practice exercises. Further investigation into actual assessment performance and comparative grade analysis may also help measure the long-term impact of the intervention more effectively. Continuing this work is important because improving assessment preparation and student confidence remains a significant challenge in higher education, particularly in technically demanding modules.

Although the findings of this study were highly positive, the results are based primarily on student perceptions collected from a single module within one institution. Therefore, the findings cannot yet be fully generalized across all disciplines or educational contexts. Additional studies involving multiple modules, institutions, and student groups would help validate the effectiveness of this teaching strategy more broadly. Future research could also explore the impact of lecture-integrated model question discussions on measurable academic performance, student retention, and long-term learning outcomes.

In conclusion, integrating model question discussions into regular lectures appears to be an effective teaching strategy for improving student engagement, confidence, and assessment preparation. The approach encourages active participation, strengthens the relationship between theory and application, and supports continuous learning throughout the semester. The positive outcomes observed in this study suggest that similar interventions could be beneficial across a wide range of higher education contexts.

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Student Perceptions on Scaffolded Note-Taking Support in Lectures to Change from Passive Listening to Active Learning

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Abstract

After having followed a Teaching Development course (MaTE_2026) and changing the need to observe and address student engagement in class, I noticed that many students listened passively in 'standard' lectures, transcribing headings without synthesizing content. Though this created an "illusion of engagement", students were often cognitively detached and also showed attention decay. As note-taking methods existed, but students seemed unaware of using these, I explored whether giving a structured note-taking guidance to 30 students following my Machine Learning & Data Mining module would change them to adopt active learning. A pre-activity survey showed 70% of students identified boredom as their primary barrier to lose focus. In implementing the structured, scaffolded note-taking change, based on Vygotsky's Zone of Proximal Development, I explicitly demonstrated the framework and moving away from the "blank page" approach. This was followed with real-time guided practice during the 2-hour lecture along with "catch-up" pauses for data synthesis. Success was evaluated through student perception surveys using Google Forms. Post-intervention feedback from 15 participants showed an immediate metric shift: their mean baseline focus score improved from 2.53 (out of 5.0) to a post-intervention helpfulness score of 3.69. Furthermore, 60% of respondents reported feeling completely engaged in the lecture, a change from their previous passive listening. Qualitative feedback, however, revealed that adapting to the new active-learning format for note-taking, while processing complex analytics content, caused temporary cognitive overload and mental fatigue. Scaffolded note-taking has proven effective in disrupting passive listening and shifting students toward generative processing. To further support students and reduce the extraneous cognitive load they experienced, I plan to pre-distribute "skeleton sheets". Since adapting to a new note-taking style naturally causes initial mental friction, I will treat this scaffolding as a gradual sequential process, progressively reducing structural aids as students build independent note-taking habits.
Keywords: *active learning; scaffolded note-taking; cognitive load; Zone of Proximal Development; student engagement*

Purpose / Background

Active learning has been positioned as a critical alternative to passive lecturing, particularly in technically demanding modules where sustained cognitive engagement is needed. Prince (2004) mentions that didactic instruction without active processing yields a rapid decay in attention beyond the initial 15–20 minutes. While delivering the Machine Learning and Data Mining (5DATA002C) module to second-year Business Data Analytics undergraduates, I observed a recurring “disconnect”: students appeared physically present but mentally passive, with their note-taking limited to copying headings or photographing slides. This shallow processing pattern raised a concrete teaching problem for me: how could I disrupt the passive transcription habit and re-direct students toward generative engagement during the lecture itself?

The research question I posed was therefore: Does providing scaffolded, structured note-taking guidance during a 2-hour lecture shift students from passive listening toward perceived active learning, as evidenced by their own focus and engagement reports? I expected that students who received explicit modelling and real-time scaffolding would report higher in-lecture focus and a stronger sense of being “locked in” compared with their baseline self-reports.

The literature offered two anchors for the intervention design. First, Vygotsky’s (1978) Zone of Proximal Development framed the case for guided practice which indicated that learners reach beyond what they can do unaided when a more competent guide structures the task and gradually withdraws support. Second, Sweller’s (1988) Cognitive Load Theory cautioned that introducing a new structural demand (a note-taking framework) while students are simultaneously processing unfamiliar analytics content risks overloading working memory. I therefore designed the intervention to balance scaffolded guidance with deliberate cognitive-load relief in the form of “catch-up” pauses.

Methodology

I conducted a single-cycle action-research intervention with 30 second-year undergraduates registered in the 5DATA002C Machine Learning and Data Mining module at the Informatics Institute of Technology. The study took place during one scheduled 2-hour face-to-face lecture, and I used Google Forms to administer a pre-intervention “pulse check” and a post-intervention reflection survey within the same session.

In the diagnostic phase, I asked students to self-report (i) their focus during a typical lecture on a 1–5 Likert scale, (ii) their dominant note-taking method, (iii) the primary barrier to their focus, (iv) whether their notes still made sense to them a week later, and (v) their perception of lecture pace. I used these responses to establish a baseline focus score and to identify the most common barrier in the cohort.

I then introduced the scaffolded note-taking intervention in three steps. In Step 1 (modelling), I displayed a structured note template on screen and explicitly demonstrated how I, as the lecturer, would convert one section of the lecture material into structured notes, naming the heading, recording the key term, sketching the relationship, and writing a one-line “what this means” gloss. In Step 2 (guided practice), I asked students to use the same structure on the next lecture segment and continued to teach as normal, but I paused every 8–10 minutes to give a 60–90 second “catch-up” window during which students completed their notes, asked questions, or compared with a neighbour. In Step 3 (individual guidance), I walked around the classroom during the catch-up windows to address questions about the structure rather than the content, since the structural demand was the new variable I had introduced.

Immediately after the lecture, I administered a five-item post-activity survey covering: helpfulness of the activity for staying focused (1–5 Likert), self-reported “locked-in” feeling relative to a typical lecture, the hardest part of the new method, willingness to continue using it, and an open-ended suggestion field. I treated the comparison between the baseline focus score and the post-activity helpfulness score as the central quantitative indicator and the open-ended responses as the qualitative complement. I reported only matched in-session responses; 15 students completed the pre-survey and 13 completed the post-survey, so I did not make any longitudinal claims beyond this single session.

Results

The baseline pulse check confirmed the disconnect I had observed. Across 15 pre-survey respondents, the mean self-reported focus score during a standard lecture was 2.53 out of 5, and 11 of 15 students (73%) named “I get bored or tired” as their primary barrier to staying focused. Note-taking habits were dominated by shallow strategies: 9 of 15 reported “writing down only the headings/key terms”, 3 of 15 reported “I don’t really take notes; I just listen”, and 2 of 15 reported “taking photos of the board/slides”. When I asked whether their own notes still made sense a week later, only 5 of 15 said “Yes”, while 9 of 15 said “Maybe/Sometimes” and 1 of 15 said “No”.

After the intervention, 13 students completed the post-activity reflection. The mean helpfulness rating for the scaffolded note-taking activity was 3.69 out of 5, a marked rise on the 2.53 baseline. Eight of 13 respondents (62%) said they felt more “locked in” to the lecture than during a usual session, three said “about the same”, and two said “no”. Nine of 13 (69%) indicated they would like to keep using and improving the method, with the remaining four selecting “Maybe” and none selecting “No”. Table 1 summarises the matched-construct comparison~~;~~ and Table 2 reports the most-cited difficulties students experienced while adapting.

Table 1. Matched comparison of pre- and post-intervention indicators.

Indicator	**Pre-intervention**	**Post-intervention**
Mean focus / helpfulness score (1–5)	2.53 (n = 15)	3.69 (n = 13)
Felt “locked in” relative to a typical lecture	Not measured	8 / 13 (62%)
Identified boredom/tiredness as primary focus barrier	11 / 15 (73%)	Not measured
Notes still make sense a week later (“Yes”)	5 / 15 (33%)	Not measured
Would continue using the method (“Yes”)	Not measured	9 / 13 (69%)

Table 2. Self-reported "hardest part" of using the scaffolded note-taking method (n = 13).

Hardest part of the method	Count	Percentage
Understanding the structure	6	46%
Keeping up with the lecture	4	31%
Distraction	3	23%

The qualitative feedback reinforced two themes. The first was a clear endorsement of the structure-and-revisit pattern where one student wrote, "I like how you revise everything so that we can do better", and another asked for a pre-distributed "summary sheet" to keep up. The second was a request to integrate live datasets and code as the slides progressed, suggesting that students experienced the structural scaffolding as enabling rather than constraining and wanted that scaffolding extended to the technical content itself.

Discussion and Conclusion

The results indicate that scaffolded note-taking measurably shifted student-perceived engagement within a single 2-hour session of an analytics-heavy module. The 1.16-point movement in mean self-reported score (from 2.53 to 3.69) and the 62% "locked-in" rate suggest that the intervention disrupted the passive transcription pattern that the baseline survey had captured. These observations align with Prince's (2004) review of active-learning interventions, which finds consistent gains in engagement when structured cognitive activity replaces passive reception, and they are consistent with what Vygotsky (1978) would predict: students bridged into a more demanding processing task once I made the structure of "good notes" explicit and rehearsed it with them in real time.

The qualitative pattern, however, also confirmed Sweller's (1988) cautionary point. Six of 13 students named "understanding the structure" as the hardest part, and four named "keeping up". I read this as extraneous cognitive load: while the structure was helpful in principle, learning the structure during the same lecture in which they were also learning new analytics content imposed a measurable burden. The student request for a pre-distributed "summary sheet" speaks directly to this; a partial template would shift effort away from inventing the structure and towards populating it.

I would recommend that any colleague adopting this approach in a technically dense module front-load the structural scaffold rather than introduce it inside the lecture. A 5–10 minute walkthrough of a worked example, distributed before class as a one-page skeleton, removes the "learn the structure now" demand that several of my students flagged, while preserving the in-lecture catch-up pauses that they responded to most positively.

I plan to run a second cycle in the same module with three changes: pre-distributed skeleton sheets, embedded live-code segments matched to the slide structure, and a paired pre/post matched-respondent design so that I can report individual-level change rather than group means. I consider this important because a baseline focus score of 2.53 in a final-year analytics module is a disengagement signal that scaffolding alone has only partially addressed; the intervention needs to evolve into a sequence of fading supports.

My findings come from a single intervention with 15 pre- and 13 post-session responses in one module at one institution, so I make no claim that the magnitudes transfer. What I do claim is that the design pattern - diagnose with a short pulse check, model the note-taking structure explicitly, build in catch-up pauses, and reflect immediately afterward, is portable, low-cost, and produced a same-session shift large enough to merit a second cycle. Further work in differently disciplined modules, with paired matching and a delayed retention measure, would be needed to test whether the engagement gain converts into durable note quality and assessment performance.

In summary, scaffolded note-taking is a feasible, low-cost mechanism for converting a "broadcast" lecture into one in which students actively construct knowledge. The intervention worked in the direction I expected; the next iteration must address the cognitive load that the scaffolding itself imposed.

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Students’ Perceptions on Changing Teaching by Incorporating Experiential Learning with Field Visits to Bridge the Theory–Practice Learning Gap

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Abstract

Higher education institutions increasingly recognize that lecture-based teaching alone may not sufficiently prepare students for the practical demands of modern workplaces. This challenge is particularly visible when students from non-business academic backgrounds are introduced to service industry concepts primarily through theoretical classroom instruction. The present study explored whether incorporating experiential learning through structured field visits could bridge the gap between theory and practice among 120 second-year science-stream undergraduates enrolled in the Service Industry Concepts module. Students first completed the traditional lecture component and then participated in six organized field visits to selected service-sector organizations, including media institutions, financial organizations, telecommunications companies, hotel and tourism establishments, healthcare facilities, and infrastructure development projects. Students used a structured observation framework and submitted reflective reports after each visit. Student feedback and reflective narratives were analysed using thematic analysis. The findings indicate that experiential exposure enhanced the operational and procedural knowledge of 55% of students regarding service delivery systems and organizational structures. Students reported a 60% improvement in conceptual clarity, increased motivation toward the subject, and strengthened analytical and critical thinking skills. Furthermore, 90% of students expressed a strong demand for incorporating additional field visits into the curriculum, emphasizing the perceived value of direct industry exposure in linking theoretical concepts with practical operations. Additionally, 80% of respondents mentioned that field visits improved their learning. Overall, the findings support experiential learning theory by demonstrating that field visits serve as an effective pedagogical tool for bridging the gap between theory and practice. This study contributes to the existing teaching and learning literature by providing empirical evidence on the pedagogical value of experiential learning in service industry education, particularly for students from non-business academic backgrounds.

Background

Universities are increasingly expected to develop graduates with both academic knowledge and practical workplace skills. However, many university courses still depend heavily on lecture-based teaching, which often limits students’ ability to connect theory with real organizational practice. We identified this issue in the Service Industry Concepts module for second-year science-stream undergraduates, where students understood service concepts only at a surface level and struggled to relate them to workplace environments.

To address this challenge, we introduced structured field visits to six service-sector organizations as an experiential learning strategy. Experiential learning, based on David Kolb's (1984) model, emphasizes learning through experience, reflection, and application. Recent studies indicate that experiential learning improves student engagement, motivation, and deeper understanding (Yardley et al., 2012). Similarly, field visits help students observe real systems, compare theory with practice, and develop critical observation skills (Stern & Powell, 2020).

The literature also highlights the persistent theory–practice gap in higher education, where students possess theoretical knowledge but lack the ability to apply it effectively in dynamic work settings (Jackson & Bridgstock, 2021). This gap can be greater among non-business students with limited organizational exposure. Overall, we aimed to examine whether field visits could enhance students' conceptual clarity, motivation, and practical understanding of service industry operations.

Methodology

We adopted a qualitative descriptive design to explore student perceptions and learning outcomes after introducing experiential learning activities. The participants were 120 second-year undergraduate students from the science stream enrolled in the Service Industry Concepts module. These students had completed the theoretical lecture component before participating in field visits.

Students engaged in six carefully planned field visits to organizations representing different sectors of the service economy: media institutions, financial organizations, telecommunications companies, hotel and tourism establishments, healthcare facilities, and development projects. We selected these to expose students to varied organizational systems, customer interfaces, technologies, and management practices. Before each visit, students received orientation sessions and training on a structured analytical observation framework. They were instructed to observe: service delivery processes, organizational hierarchy, communication systems, customer handling procedures, quality assurance methods, operational challenges, use of technology, and employee coordination.

We used a structured questionnaire as the main data collection tool. It consisted of questions designed to measure the main variables of the study, including conceptual clarity, motivation, critical thinking, understanding of operations, and the need for more field visits and overall learning outcome. We used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) for measurement. Two forms of qualitative data were collected: reflective reports submitted after visits and written student feedback on the learning experience. Thematic analysis was used to identify recurring patterns across student responses. Themes were coded around conceptual understanding, motivation, critical thinking, curriculum relevance, and recommendations.

Results

Table 1 shows that approximately 55% of students reported significantly improved understanding of how service organizations function. Processes such as customer flow management, complaint resolution, front-office operations, and interdepartmental coordination became easier to understand after observation. Around 60% of participants stated that theoretical concepts became clearer after the visits. Students better understood ideas such as service quality, efficiency, responsiveness, and customer satisfaction when seen in real environments.

Table 1: Students' feedback on field visits

Question	Agree	Strongly agree	Agree + Strongly agree
Field visits improved my understanding of theoretical concepts	46	25	71 (59.2%)
Field visits increased my interest in this subject	43	29	72 (60.0%)
Field visits improved my ability to analyze real-world problems	47	23	70 (58.3%)
I gained practical knowledge of service delivery systems	54	11	65 (54.2%)
Experiential learning should be a regular teaching method	33	74	107 (89.2%)
Field visits significantly improved my overall learning	44	51	95 (79.2%)

Many students described the field visits as more interesting and memorable than classroom lectures. They appreciated seeing how learning connected to future employment contexts. Recent studies similarly show that active learning environments significantly improve intrinsic motivation and learner persistence (Stern & Powell, 2020). Students demonstrated stronger analytical ability by comparing organizations, identifying operational strengths and weaknesses, and discussing how theory aligned or differed from practice. Approximately 90% of students recommended increasing field visits and practical exposure in future modules. They perceived such learning experiences as highly valuable for career preparation.

We analysed the responses to the open-ended question "What is your overall opinion or idea about the visit and the activities you observed?" using thematic analysis and categorized into five themes: conceptual clarity, motivation towards the subject, critical thinking skills, operations knowledge, and future demand for field visits. Overall, students expressed highly positive perceptions regarding the field visits and emphasized the value of experiential learning in understanding service industry concepts.

We identified conceptual clarity as a major theme, where students explained that the visits helped them connect classroom theories with real organizational practices. Responses such as "*It helped to connect theoretical knowledge with real-world practice*" and "*I visually gained the understanding of theories in a practical way*" indicate that observing real operations improved understanding of abstract concepts. Similarly, students stated that the visits provided "*a clear understanding of how hospital services are managed in real situations*."

Another important theme was motivation towards the subject. Many students described the visits as interesting, enjoyable, and inspiring. One student stated, "*We learned many things that we did not know. A great experience for life. I had a great desire to work in such a place*," while others mentioned that "*The visit was very interesting and useful" and that it "improved my interest in the subject*." These responses suggest that field visits increased student engagement and enthusiasm toward learning.

The analysis also revealed evidence of critical thinking skills. Students reflected on organizational practices and compared theory with real-world situations. For example, one student noted, "*Not always problems occur according to the book and it's fascinating how organizations actually face it*," while another stated, "*I understood the management process of an organization well, and what improvements can be added*." Such responses demonstrate reflective thinking and analytical observation.

The most common theme was operations knowledge, as students frequently referred to gaining practical understanding of workflows, customer service, and operational systems. Responses included "*We learned how a telecommunications company works and how they manage customer services and operations*" and "*The visit gave a clear understanding of how a finance company operates, including customer service, loan processing, and daily operations*." Students also appreciated observing technical processes such as electricity generation and control room operations.

Finally, students expressed a strong future demand for field visits, describing them as valuable and important learning opportunities. Comments such as "*More time please*," "*Very important for our studies*" and "It *is a great opportunity for us*" indicate strong support for integrating more experiential learning activities into university education. Overall, the findings suggest that structured field visits significantly enhanced students' understanding, motivation, critical thinking, and operational knowledge while strengthening the connection between theoretical learning and real-world practice.

Discussion and Conclusion

The findings support both classical and contemporary experiential learning theory. Students moved beyond passive reception of knowledge and engaged in a cycle of observation, reflection, and conceptual reinterpretation. This aligns with current evidence that authentic learning tasks improve transfer of knowledge to real contexts (Billett, 2001). Lecture-based teaching often introduces terminology but not lived understanding. Field visits allowed students to connect concepts such as workflow, service recovery, and organizational culture with visible realities. This reduced abstraction and strengthened comprehension. The intervention shifted students from passive listeners to active investigators. They observed systems, asked questions, compared sectors, and reflected critically. Such autonomy is associated with stronger long-term learning outcomes.

Modern graduate employability frameworks emphasize communication, adaptability, professional awareness, and problem-solving. Exposure to functioning organizations can help students develop these attributes before graduation (Jackson & Bridgstock, 2021). Science-stream students may possess analytical strengths but limited knowledge of service-sector operations. Experiential exposure therefore acted as a bridge into organizational thinking, expanding their interdisciplinary competence. The study offers several practical implications for universities. Courses with professional relevance should integrate structured field experiences, simulations, internships, or live projects rather than relying exclusively on lectures. Sustainable collaboration between universities and organizations can create mutually beneficial learning ecosystems. Student learning from field visits should be captured through journals, presentations, reports, and case analyses rather than only written exams. Experiential learning can help students from all academic streams gain workplace confidence and applied understanding.

This study demonstrates that structured field visits can effectively transform teaching and learning by bridging the gap between theory and practice. For science-stream undergraduates studying service industry concepts, traditional lectures alone were insufficient for developing clear operational understanding. However, direct exposure to real organizations significantly improved conceptual clarity, motivation, and analytical thinking. Approximately 55% of participants reported positive learning gains and recommended expanding field-based learning opportunities. These findings reinforce current international calls for active, authentic, and employability-focused higher education.
Experiential learning should therefore be viewed not as a supplementary activity but as a core pedagogical strategy capable of enhancing graduate readiness, interdisciplinary understanding, and meaningful student engagement.

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Changing Lectures with Interactive Memory Recall Activities to Enhance Student Attention & Engagement

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Abstract

Sustaining student attention and engagement throughout lectures remains a significant challenge in higher education, as attention levels often decline over time. This study examined whether integrating interactive memory recall strategies into lectures could enhance student attention and engagement. The research was conducted in two information technology undergraduate courses, 'Software Architecture and Design' and 'Software Process Improvements', with approximately 80 students. The study employed a cyclical action research approach comprising the stages of planning, acting, observing, and reflecting. Three structured memory recall strategies; Think-Aloud Protocol, Mind Mapping, and Object Prompting were integrated into lecture delivery during the intervention. The Think-Aloud method encouraged students to verbalize their reasoning processes while solving problems, thereby promoting metacognitive awareness and collaborative learning. Mind Mapping enabled students to visually organize and connect key concepts, transforming complex theoretical explanations into structured and meaningful diagrams. Object Prompting involved the use of physical or visual cues to stimulate memory through association, helping students reinforce conceptual clarity. Data were gathered through classroom observations, formative assessments, student-created mind maps, and written feedback. Results indicated improved attentiveness nearly 60%, increased participation by approximately 25%, and modest gains in recall-based assessments 57%. 80% Students reported that visual and interactive elements helped them maintain focus and better recall and learn complex topics. Overall, the study demonstrates that embedding interactive memory recall activities within lecture delivery can effectively bridge the gap between traditional content delivery and active learning. The findings emphasize the importance of reflective teaching practices, iterative improvement, and student-centered strategies in promoting deeper engagement and meaningful learning outcomes in higher education settings.

Purpose/Background

Maintaining student attention during extended teaching sessions continues to be a major concern in higher education. As lecture duration increases and content density rises, students often struggle to maintain focus, resulting in lower comprehension and reduced information retention. This challenge is particularly pronounced in theoretical subjects, where abstract concepts demand sustained cognitive engagement. This research explores the use of three interactive memory recall strategies; Think-Aloud Protocol, Mind Mapping, and Object Prompting to address these challenges. The intervention aligns with constructivist learning principles and action research methodologies that emphasize iterative cycles of reflection and improvement.

The concept of student attention and engagement has been widely discussed in educational psychology. According to (Ramsden 1992) and (Biggs 1999), deep learning emerges when students actively engage with material, while surface learning results from passive reception. Action research in higher education provides a means to bridge this gap by enabling instructors to iteratively improve teaching through reflection and experimentation (Carr & Kemmis, 1986; Zuber-Skerritt, 1992). Memory recall strategies have been recognized as effective mechanisms for enhancing long-term retention. The Think-Aloud Protocol encourages students to verbalize thought processes during problem-solving, thereby increasing metacognitive awareness (Pintrich, 2000). Mind Mapping, introduced by (Buzan 1993), supports visual-spatial organization of information, facilitating connections between concepts. Object Prompting uses physical or visual stimuli to reinforce recall, aligning with embodied cognition theories (Lakoff & Johnson, 1999). By integrating these methods, educators can transform lectures into active learning environments that promote reflection, interaction, and continuous engagement.

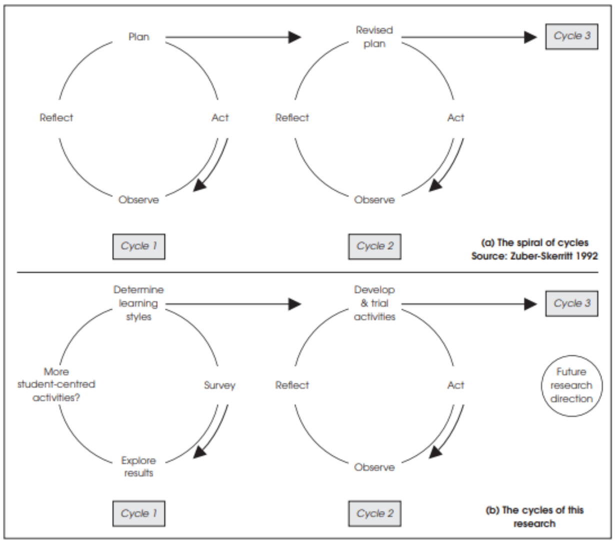

Figure 1: The action research process

Methodology

As depicted in Figure 1, this study followed a cyclical action research model consisting of four stages: planning, acting, observing, and reflecting (Zuber-Skerritt 1992). The research was conducted across two undergraduate courses (Software Architecture & Design and Software Process Improvements) at a computing department with approximately 80 students in total. As the course lecturer, the researcher utilized a four-stage cyclical action research model (planning, acting, observing, and reflecting) to address declining student attention and passive participation. During the acting phase, three distinct memory recall strategies were strategically embedded into two-hour lecture sessions: Think-Aloud activities, where selected students verbalized their reasoning processes step-by-step; Mind Mapping, where students collaborated to draw branching, color-coded diagrams on large poster boards; and Object Prompting, which used detailed whiteboard drawings as visual cues to drive interactive dialogue. To systematically evaluate these interventions, a mixed-methods approach was used during the observation and reflection phases. Data collection included classroom observation logs to track participation, evaluations of student-generated mind maps for conceptual accuracy, formative quizzes to measure knowledge retention, and qualitative feedback gathered through exit-slips and a comprehensive end-of-module survey.

Results

Initial classroom observations confirmed a pattern of reduced attention approximately halfway through lectures. The implementation of the three interactive strategies altered this baseline.

Figure 2 illustrates participation rates by strategy. The Think-Aloud Protocol raised voluntary verbal contributions from 32% to 58%, while Mind Mapping demonstrated the largest gain, increasing engagement from 28% to 65%. Object Prompting showed a 24% increase.

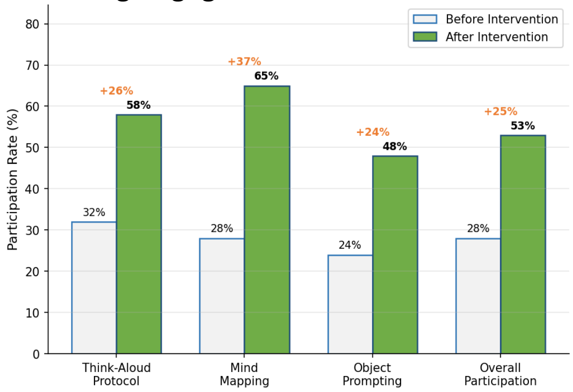

Figure 2: Student Participation Rate (%) Before and After Intervention, by Strategy

Figure 3 tracks mean recall assessment scores across the four intervention cycles. Scores improved progressively from a baseline of 41% in Cycle 1 to a peak of 60% in Cycle 4, with the final consolidated assessment yielding 57%. This modest yet consistent improvement indicates that repeated, embedded recall activities supported knowledge consolidation over time.

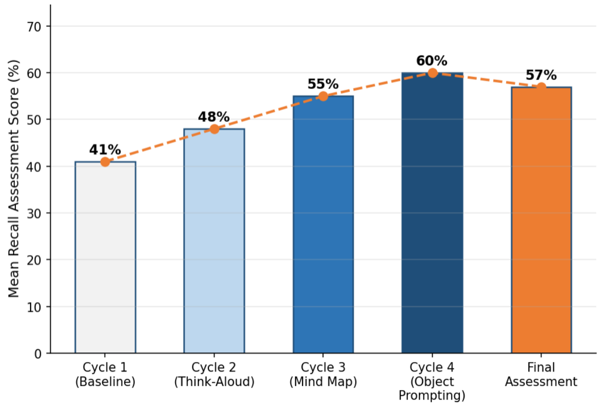

Figure 3: Mean Recall-Based Assessment Scores (%) Across Intervention Cycles

Figure 4 presents the distribution of responses to the statement: 'Interactive recall activities helped me stay focused and retain information.' A substantial majority (80%) agreed or strongly agreed, while only 6% disagreed, reflecting broadly positive student reception of the interventions.

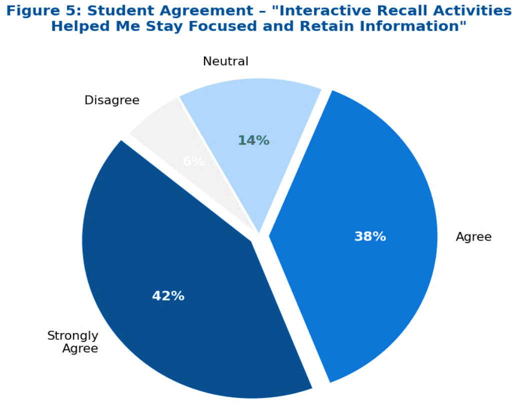

Figure 4: Student Agreement on Interactive Recall Activities Supporting Student Focus and Information Retention

Figure 5 consolidates the four principal outcome metrics reported in this study. The improvement represents the most prominent gain, followed by the 57% mean recall assessment score and the 80% positive student feedback rate.

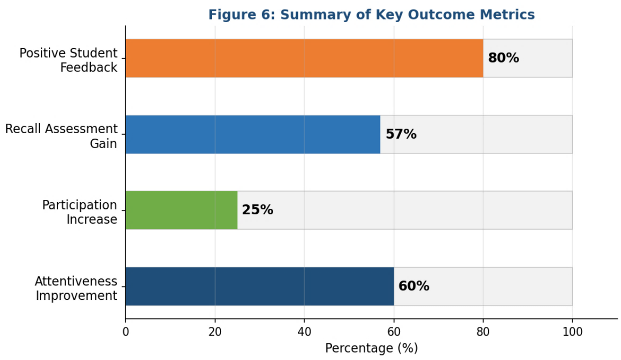

Figure 5: Summary of Key Outcome Metrics from the Intervention Study

Table 1 provides a structured comparison of the three recall strategies employed, their pedagogical focus, and associated key outcomes observed during the study.

Table 1: Comparison of Interactive Memory Recall Strategies with reference to focus area and key outcomes

Think-Aloud Protocol	Metacognitive awareness, verbalized reasoning	+20% participation; improved collaborative discussion
Mind Mapping	Visual-spatial organization of concepts	+37% engagement; knowledge interconnection
Object Prompting	Physical/visual cues for memory recall	+24% retention; conceptual clarity
Overall Intervention	All three strategies combined	~60% attentiveness; ~25% participation; 57% recall score

Discussion and Conclusion

This action research demonstrated that integrating memory recall strategies within lectures enhances student engagement, attention, and conceptual retention. The three techniques; Think-Aloud, Mind Mapping, and Object Prompting proved adaptable for diverse teaching contexts. While quantitative changes in academic performance were modest, qualitative feedback and behavioral observations confirm improved attentiveness and participation. The findings establish the theoretical underpinnings drawn from constructivist learning theory (Biggs, 1999; Ramsden, 1992) and metacognitive strategy research (Pintrich, 2000). The cyclical action research approach enabled iterative refinement, ensuring that each successive cycle built on observed strengths and addressed identified weaknesses. Future work should explore the long-term impact of these strategies across multiple semesters and disciplines, and examine how technological tools (e.g., digital mind mapping applications, AI-assisted recall prompts) can further reinforce memory recall and student collaboration. Continuous reflection and adaptation, central to the action research paradigm, remain essential for sustaining effective teaching practices.

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Perception of Physiotherapy Students on the Usefulness of Video Portfolios for Learning Basic Physiotherapy Skills

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Abstract

After completing basic sciences, physiotherapy undergraduates learn a large number of practical skills through a series of practical sessions. During these sessions, students practice skills after demonstrations by the resource person. However, the high number of practical classes often leads to boredom, resulting in reduced active participation. This limited engagement decreases session productivity, leads to complaints from clinical supervisors about poor competency in basic skills, and contributes to poor examination performance. Video portfolios have emerged as a strategy to promote active learning, reflection, and peer learning. Therefore, this study evaluates students' perceptions of video portfolios in learning basic physiotherapy skills. A descriptive educational intervention was conducted to address issues identified during practical sessions, involving 36 second-year physiotherapy undergraduates at the Faculty of Medicine, University of Colombo. Following a demonstration, students were divided into groups and provided with comprehensive reading material and standardized video creation guidelines. They were assigned to record video clips demonstrating suspension therapy techniques and upload them to a shared Google Drive as a future learning material. A self-administered five-item questionnaire assessed students' perceptions of video portfolios, and data were analyzed descriptively. There was unanimous agreement (100%) among students that the intervention improved participation, peer collaboration, and reduced boredom during the practical session, while 97.2% reported improved confidence in applying suspension therapy techniques in clinical settings. Video portfolios appear to be an effective and acceptable active learning strategy for undergraduate physiotherapy education. Their integration into practical teaching may enhance skill acquisition, student engagement, and preparedness for clinical training.

Background

Physiotherapy education requires students to acquire a wide range of psychomotor, cognitive, and clinical reasoning skills before entering clinical training. Traditional teaching methods in physiotherapy programmes often rely on didactic lectures and time-limited practical demonstrations, which may not adequately support long-term knowledge retention and skill mastery. Educational theories increasingly emphasize the importance of active learning approaches in health professions education. The Learning Pyramid, originally derived from Edgar Dale's Cone of Experience, categorizes learning methods into passive and active approaches, suggesting that active learning leads to higher retention and deeper understanding (Dale, 1946; Masters & Al-Rawahi, 2019). Evidence supports that active learning strategies are more effective than passive approaches in promoting knowledge retention and understanding (Liao & Chen, 2022). Active learning is particularly relevant to physiotherapy undergraduates, who must remember and perform numerous assessment and treatment techniques during their clinical training. Practical classes are designed to facilitate hands-on learning; however, constraints such as a high number of practical classes, passive teaching learning methods, large class sizes, limited resources, and restricted opportunities for practice and feedback may negatively influence students' confidence, competence, and performance during clinical placements and examinations. In response to these challenges, students frequently turn to online resources, particularly YouTube videos, to supplement their learning. While such platforms offer easy accessibility, the quality and accuracy of content are variable, which may lead to misconceptions and unsafe practice. To overcome this, students sometimes create self-recorded videos; however, without structured guidance, these recordings may lack standardization and clinical reasoning. Video portfolios represent a structured approach to student-generated video learning, enabling learners to actively demonstrate skills, reflect on performance, and engage in peer learning. Previous studies have shown that video-based learning and self-video recording can enhance clinical skill competency among medical and allied health students, including those in physiotherapy and occupational therapy education (Manas, 2022; Maloney et al., 2013; Cloete et al., 2018). Despite growing evidence supporting video portfolios, there is limited published literature from South Asian contexts, particularly in undergraduate physiotherapy education. Therefore, this study aimed to evaluate the perception of physiotherapy students on the usefulness of video portfolio for learning basic physiotherapy skills.

Methodology

I conducted a descriptive educational intervention using a post-intervention questionnaire to explore students' perceptions of video portfolios during a guided practical session. The study was conducted among second-year undergraduate physiotherapy students, Faculty of Medicine, University of Colombo during a scheduled practical session on suspension therapy. Participation was part of routine teaching activities, and I invited all students in the session to take part in the video portfolio activity. I delivered a one-hour lecture followed by a three-hour practical session on suspension therapy, covering its fundamental theories and principles. During the practical session, I assigned students to small groups consisting of five members. Each group was required to create a video clip demonstrating a specific suspension therapy application. The students were provided with video creation guidelines, which included general instructions for patient handling, the specific steps to be demonstrated for the application, and the expected technical properties of the video. I encouraged students to refer to reading materials developed by the resource person, which comprised clear instructions and photographs of suspension therapy applications. At the end of the session, I instructed students to upload the videos to a shared Google Drive folder to allow access for all students for revision and peer learning.

Students' perceptions and levels of agreement were assessed using a self-administered google forms questionnaire completed after the practical session. The questionnaire, developed from previously published studies, consisted of five Likert-scale items assessing active participation, peer collaboration, effectiveness of the guidelines, session boredom, and students' confidence in their skills. Responses were analyzed descriptively using frequencies and percentages. The activity was conducted as part of routine educational practice with permission from the Chairperson of the Applied Physiotherapy Stream, Faculty of Medicine, University of Colombo. Student anonymity was maintained, and participation in the questionnaire was voluntary.

Results

A total of 36 second-year physiotherapy students completed the feedback questionnaire. Overall, the responses indicated a high level of agreement regarding the effectiveness of creating video portfolios to enhance active learning, collaboration, confidence, and engagement during the suspension therapy practical session. Table 1 summarizes the distribution of student responses for each questionnaire item.

Table 1: Students' perceptions on the use of video portfolios during suspension therapy practical sessions (n = 36).

Question Number	Questionnaire item	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
1	Creating videos with the provided guidelines increased my active participation during the practical session.	27 (75.0)	9 (25.0)	0 (0)	0 (0)	0 (0)
2	Recording suspension therapy applications with the provided guidelines helped me to correctly practice the application.	24 (66.7)	12 (33.3)	0 (0)	0 (0)	0 (0)
3	Creating videos during the practical session increased my collaboration with other students.	24 (66.7)	12 (33.3)	0 (0)	0 (0)	0 (0)
4	Creating videos during the practical session reduced boredom.	19 (52.8)	17 (47.2)	0 (0)	0 (0)	0 (0)
5	Recording suspension therapy applications increased my confidence in applying them in clinical setups.	23 (63.9)	12 (33.3)	1 (2.8)	0 (0)	0 (0)

All participants either agreed or strongly agreed that video portfolio creation increased active participation, supported correct practice of suspension therapy techniques, enhanced peer collaboration, and reduced boredom during the practical session. Confidence in applying suspension therapy techniques in clinical settings was also high, with 97.2% of students agreeing or strongly agreeing and only one participant (2.8%) reporting a neutral response.

Discussion

In this study, I explored the effectiveness of video portfolios and physiotherapy students' perceptions regarding their use in learning basic physiotherapy skills during a suspension therapy practical session. Based on the questionnaire responses, I found a consistently positive student response across all questionnaire items, indicating that video portfolio-based learning enhanced active participation, collaboration, confidence, and engagement. These findings support the growing body of evidence advocating for active, student-centred learning strategies in health professions education. I observed particularly high levels of agreement regarding increased active participation, which align with experiential learning theory and the principles underpinning the Learning Pyramid and Dale's Cone of Experience (Masters and Al-Rawahi, 2019; National Center for Biotechnology Information, 2023). Recording and demonstrating techniques required students to actively engage in planning, practising, verbalising, and performing suspension therapy applications. In my view, this process moved learners beyond passive observation toward deeper cognitive processing, which has been shown to improve retention and skill mastery (Liao and Chen, 2022; Freeman et al., 2014). As a physiotherapy lecturer I believe that active learning strategies have been particularly recommended in physiotherapy education, where psychomotor learning and clinical reasoning are central to professional competence. I found that the improved collaboration reported by students highlights the social constructivist aspect of video portfolio use. Working in small groups to plan and record videos promoted peer discussion, feedback, and shared problem-solving. Peer-assisted learning has been shown to enhance understanding, communication skills, and learner confidence in medical and allied health professions programmes (Topping, 1998; Secomb, 2008). I observed that video creation reduced boredom during practical sessions is noteworthy. Reduced engagement and attentiveness during repetitive practical sessions is a recognised challenge in undergraduate physiotherapy education, particularly in the early years of training. I believe that incorporating technology-enhanced learning tools such as video portfolios can increase novelty, motivation, and learner ownership (Cook et al., 2008). Previous studies have reported that blended and digital learning strategies enhance student motivation and satisfaction when appropriately integrated into practical teaching (Liu et al., 2016).

I found that students' confidence in applying suspension therapy techniques in clinical settings was also positively influenced, with nearly all students reporting agreement or strong agreement. Confidence is a critical precursor to competent clinical performance, particularly in skill-based professions. Self-video recording enables repeated practice, self-observation, and reflection, which are key mechanisms for developing self-efficacy (Maloney et al., 2013; Bandura, 1997). In my view, the ability to revisit peer-generated videos after the practical session may further reinforce learning and reduce anxiety prior to assessments and clinical placements. Importantly, the use of structured video portfolios may address the increasing reliance on unregulated online video platforms such as YouTube. While such platforms are widely used by students, the accuracy and pedagogical quality of content are inconsistent (Azer, 2012). Implementing educator-guided video portfolio activities, I was able to help ensure that student practice aligns with curricular objectives, safety standards, and evidence-based practice. This may help reduce the risk of incorrect clinical skill acquisition.

Despite encouraging findings, I acknowledge that this study has several limitations. The use of a small sample from a single cohort limits generalisability. Data were based on self-reported perceptions rather than objective measures of skill performance. Future research should incorporate pre- and post-intervention skill assessments, validated questionnaires, longitudinal follow-up, comparative studies against traditional teaching methods, and exploration of faculty perceptions, feasibility, and assessment strategies to further evaluate the impact of video portfolios on clinical competence. Based on my findings, I conclude that video portfolios are an effective, student-accepted active learning strategy that enhances engagement, confidence, and self-directed learning in physiotherapy education and may improve learning outcomes and clinical preparedness.

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Changing teaching to improve critical thinking practice methods, with balancing student perceptions on fairness

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Abstract

When evaluating undergraduate feedback from previous cohorts, many students reported that cold calling-type space-retrieval practice motivated them. However, in evaluating the 2021/22 second professional BAMS batch, it was found that 11% of students felt unfairness and stress when directing questions to selected students by the teacher. To improve students' active engagement with the subject and achieve greater equity, I implemented a new teaching-learning activity (TLA) of Systematic Random Sampling. I used an attendance sheet to randomly select students for daily responding, and at the start of the session, I announced the selected students. Involvement in the daily Q&A activity was limited to those students. I continued this process across four consecutive lectures and distributed a questionnaire to gather feedback on how students perceived the approach, focusing on equality and fairness in student participation, their engagement and performance, and emotional effects of the activity. Descriptive Statistics, Mann Whitney U test and spearman correlation were performed using R software. A total of 67 students responded. The activity has had a moderate impact on motivation, inclusion and confidence (Median, Mode = 3.0). Students disagreed (Median, Mode = 2.0) that the new activity established equality. Students perceived it as less fair and experienced mild stress (Median, Mode = 2.0). Further, a statistically significant difference was found regarding Stress Level ($p = 0.031$) between male and female students. Over 81% of females reported moderate to severe stress. The weak association ($r = 0.11$, $p < 0.05$) between “Emotional Impact” and “Stress Level” suggests that stress level is not a strong predictor of emotional response. The Systematic Random method, that I thought ‘fairer’, caused 35 (81 %) of female students to feel stressed. Even though random questioning is technically more equitable, students felt inferior fairness because it replaced the “pain of being left out” with the “fear of being put on the spot”. The conclusion suggests that students perceive the cold-calling practice as procedurally fair.
Key words: Space retrieval practice, equity, fairness, motivation

Background

The teacher must be strategic and energetic to motivate students to think critically through interactive pedagogy (Bhuttah et al., 2024). To maintain a dialogic teaching environment, focusing on achieving higher levels of Bloom's taxonomy (Bloom, 1956; Anderson and Krathwohl, 2001), cold calling-type space-retrieval practice has been practiced as a teaching mode in multiple lecture sessions (Dallimore et al., 2013; Sumeracki, 2019). However, evaluation of student feedback implied that 11% of them suffered from stress and unfairness during this teaching-learning activity. To create a highly student-friendly environment, the interaction pattern was replaced by a systematic random questioning method.

Methodology

The second professional Bachelor of Ayurveda Medicine and Surgery (BAMS) under graduates of the Faculty of Indigenous Medicine, University of Colombo, were selected for the study (n= 80). I selected the students to answer the questions during the daily lecture hour through systematic randomization of their attendance sheet and informed the assigned student at the beginning of the lecture. After every 10 to 15 minutes of teaching, the revision questions were asked only of those students. I gave the student freedom to remain neutral if they were unwilling to reply. Students' feedback was gathered after four consecutive practices. By utilizing a mix of Likert-scale questions and categorical options, I aimed to evaluate the effect of the intervention on students' Perceptions on equality (interaction, attention, fairness), Engagement and Performance (Inclusion, Motivation, Confidence), and the Emotional and Psychological Impact (Stress levels).

Results

A cohort sample of 67 students provided feedback. Among them, females were predominant (80.6%). The following table provides a descriptive summary of the responses gathered across these key variables of the questionnaire. To facilitate the interpretation of the findings, the survey questions (Q1 to Q8) were evaluated using specific response scale, as Q1–Q3: 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree, Q4: 1-Never, 2-Rarely, 3-Sometimes, 4-Often, 5-Always, Q5–Q6: 1-Not at all, 2-A little, 3-Moderately, 4-Significantly, 5-Extremely, Q7: 1-Hurt, 2-Demotivated, 3-Ignored/Less important, 4-Neutral, 5-Respected and valued, Q8 : 1-None, 2-Mild, 3-Moderate, 4-Severe.

Table 01: Descriptive Statistics for All Survey Variables (N=67)

Variable	Median	Mode	Interpretation
Q1: Equal Interaction	2.0	2.0	Disagree
Q2: Equal Attention	2.0	2.0	Disagree
Q3: Fair Feedback	2.0	2.0	Disagree
Q4: Inclusion	3.0	3.0	Sometimes
Q5: Motivation	3.0	3.0	Moderately
Q6: Confidence	3.0	3.0	Moderately
Q7: Emotional Impact	4.0	4.0	Neutral
Q8: Stress Level	2.0	2.0	Mild Stress

Regarding the survey data, variables relating to "Equal interaction: (Q1), "Equal attention" (Q2), and "Fair feedback" (Q3), both the median and mode reported as a value of 2.0, highlighting that the majority of students disagreed that the new activity achieved these goals in the key section of perceptions of Equality. Then, in the Engagement and Performance section, students reported a more moderate personal impact. feelings of "Inclusion" (Q4), "Motivation" (Q5), and "Confidence" (Q6) all indicated a median and mode of 3.0, suggesting that students felt "sometimes" included and "moderately" Motivated or Confident. Finally, in the Emotional and Psychological Impact section, the "Emotional impact" (Q7) was largely neutral (Median and Mode: 4.0), and the reported "Stress level" (Q8) reached a median and mode of 2.0, indicating a baseline of mild stress across the cohort.

The Mann-Whitney U test was conducted to compare student perceptions across eight dimensions based on gender (Table 02). There were no statistically significant differences between male and female students regarding Equal Interaction ($p = 0.259$), Equal Attention ($p = 0.370$), Fair Feedback ($p = 0.841$), Inclusion ($p = 0.255$), Motivation ($p = 0.233$), Confidence ($p = 0.541$), or Emotional Impact ($p = 0.808$). However, a statistically significant difference was found regarding Stress Level ($p = 0.031$).

Table 02: Results of Mann-Whitney U Test to compare variables between males and females

Variable	Male Median	Female Median	p-value
Q1: Equal Interaction	2.0	2.0	0.259
Q2: Equal Attention	1.0	2.0	0.370
Q3: Fair Feedback	2.0	2.0	0.841
Q4: Inclusion	4.0	4.0	0.255
Q5: Motivation	4.0	3.0	0.233
Q6: Confidence	4.0	3.0	0.541
Q7: Emotional Impact	4.0	4.0	0.808
Q8: Stress Level	1.0	2.0	0.031

*$P < 0.05$ is considered statistically significant

In fact, over 35% of females reported moderate to severe stress, with an overall 81.1% stress prevalence in females. In contrast, stress prevalence in male students was as low as 40.0%, with 0.0% experiencing moderate or severe stress. Similarly, among the eight participants who did not explore their gender identity, the overall stress prevalence was 100.0%, meaning that 62.5% of this group experienced moderate-to-severe stress levels. Ultimately, these findings indicate that while random selection functions as an active classroom strategy, its emotional impact is heavily stratified, creating acute evaluative stress primarily among female and gender-undisclosed participants in this cohort.

The Spearman Correlation analysis highlights varied relationships between the surveyed variables (Figure 02). Moderate positive correlations are observed between "Equal Interaction" and "Fair Feedback" ($r = 0.59$, $p < 0.05$) and between "Motivation" and "Confidence" ($r = 0.5$, $p < 0.05$). A weak positive correlation exists between "Confidence" and "Stress Level" ($r = 0.08$, $p < 0.05$). This suggests a 'eustress' (productive pressure) dynamic (Selye,1974). While the unpredictable nature of systematic random sampling keeps students cognitively alert (Yerkes & Dodson, 1908), successfully navigating this evaluative environment actively builds their oral communication confidence (Bandura, 1997). "Emotional Impact" and "Stress Level" ($r = 0.11$, $p < 0.05$). Weak negative relationships are shown between "Fair Feedback" and "Inclusion" ($r = -0.21$, $p < 0.05$), due to random selection ensures long-term fairness in giving feedback, waiting for an assigned turn can temporarily make students feel less included in spontaneous daily interactions (Dallimore et al., 2013). And moderate negative correlation between student motivation and stress levels ($r = -0.32$, $p < 0.05$), confirming that elevated classroom stress systematically reduces internal student drive. The negative correlations between "Equal Interaction" and "Motivation" ($r = -0.43$, $p < 0.05$), and "Equal Attention" and "Motivation" ($r = -0.18$, $p < 0.05$) indicate that under strict random selection, students perceive less structural flexibility and balanced attention. Notably, the relationship between “Emotional Impact” and “Stress Level” demonstrates generally weak association, suggesting that stress level is not a strong predictor of emotional response.

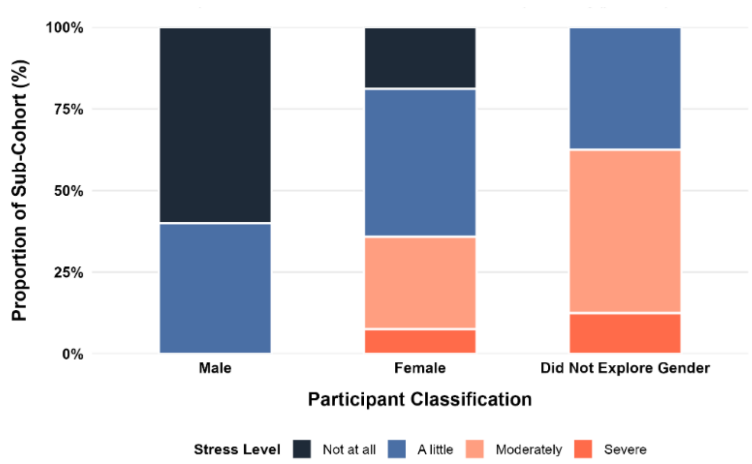

Figure 01: Gender-wise responses related to the stress level (Q8)

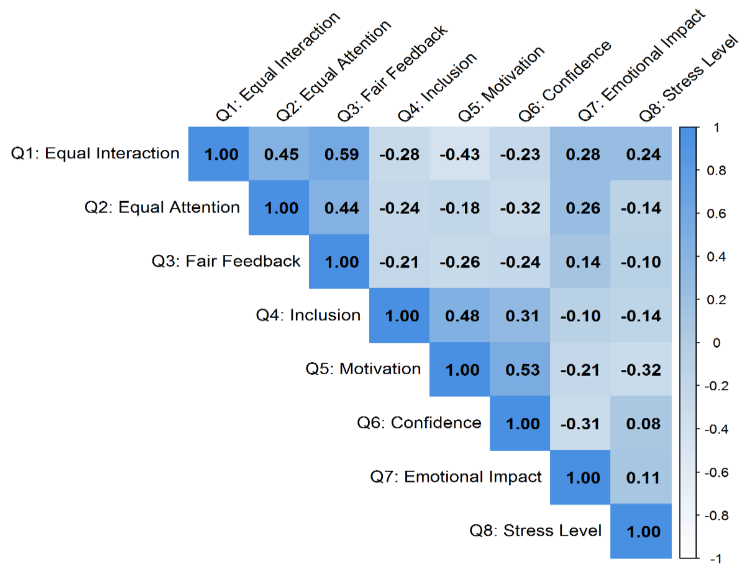

Figure 02: Spearman Correlation Matrix of Student Perceptions on the eight key questions (N=67).

Discussion and Conclusion

The findings suggest that students perceived the teaching activity as having moderate levels of inclusion, motivation, and academic confidence. Statistically, male and female students share nearly identical perceptions regarding equality, engagement and performance aspects. A Mann-Whitney U test confirms that female students experience significantly higher levels of stress ($p < 0.05$). This indicates that while the random questioning technique promotes engagement, it can create disproportionate psychological stress among female students.

Despite this, the stress does not appear to derive a specific negative emotional impact, as supported by the weak correlation observed between 'Emotional Impact' (Q7) and 'Stress Level' (Q8). The activity remained emotionally safe due to the psychological safety of the classroom environment was maintained, as evidenced by low descriptive metrics for negative emotional indicators (Median = 2.0, Mode = 2.0), confirming that the vast majority of students disagreed or strongly disagreed with feeling emotionally hurt, alienated, or ignored during the sessions. However, statistical analysis reveals a significant negative correlation between student stress and motivation. This inverse relationship directly indicates that elevated classroom stress will decreases student motivation, rather than serving as a positive drive for participation. Hence, compared to the previous teaching style, the newly introduced systematic method of random questioning from pre-defined individuals is not an alternative to the dialogic teaching activity. Instead, cold calling-type interaction should be seen as a way to keep students alert, though more research is needed to see if it actually improves critical thinking.

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