



# Practical Strategies for Integrating GenAI in the Classroom: Impact on Student Learning and Perception

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## ABSTRACT

### CONTEXT

Generative Artificial Intelligence (GenAI) is here to stay in the higher education sector. The implementation of GenAI tools in engineering education courses is happening at all institutions across the world. Research into the impact of GenAI on students' learning and their perception is of critical interest in contemporary higher education. With new technologies and GenAI capabilities evolving so fast, a group of researchers at six different universities investigated the benefits, pitfalls and misconceptions of the use of GenAI from a students' perspective.

### PURPOSE OR GOAL

The research questions this research seeks to address are:

1. What is students' perception of benefits and pitfalls on the use of GenAI prior to completing the GenAI teaching and learning activity?
2. How can students' experiences of GenAI teaching and learning (T&L) activities be interpreted through Laurillard's Conversational Framework (LCF) to understand changes in their perceptions?
3. What insights emerge from students' qualitative feedback after participating in GenAI-integrated activities, and how do these reflections inform teaching practice and future integration of GenAI?

### APPROACH OR METHODOLOGY/METHODS

GenAI was implemented into six different courses (and associated assessment tasks) at five universities in Australia. The courses are predominantly discipline specific courses in engineering but vary in year level. Surveys were conducted with students of various discipline and year level for their feedback and perception on the use of GenAI. All have completed GenAI T&L activity.

### ACTUAL OR ANTICIPATED OUTCOMES

Results show that students generally have a positive experience on the use of GenAI as an in-class teaching and learning activity. Students used a variety of GenAI tool/s depending on the institution, learning activity and personal preferences. Students noted that scaffolded activities or structured inquiries using GenAI increased their confidence in understanding positive uses for GenAI. While there were differing views on how GenAI could be used in creative tasks. Finally, they identified ways GenAI learning experiences could translate into current or future professional practice.

### CONCLUSIONS/RECOMMENDATIONS/SUMMARY

Adapting to the disruption of higher education by GenAI is an ongoing issue. Understanding student perceptions of the benefits and pitfalls of GenAI allows teachers to improve instruction in constructive uses of GenAI and in countering misconceptions. What is agreed overall, is that the integration of GenAI into higher education is seen by students and teachers as essential tools to prepare students for the workforce of tomorrow. The study will be useful for educators looking for insights into student understandings on the place of GenAI in higher education.

### KEYWORDS

Generative Artificial Intelligence, GenAI, integration, CoPilot, ChatGPT, student perceptions

# Introduction

Generative Artificial Intelligence (GenAI) is here to stay in the higher education sector in all disciplines across the world. The implementation of GenAI tools in engineering education courses is happening at all institutions. Research into the impact of GenAI on students' learning and their perception is of critical interest and is the current trend in higher education. There have been numerous studies on the use of GenAI, these include evaluation of GenAI tools' performance against university assessments (Nikolic et. al., 2024), mathematics (Wardat et. al., 2023), medical studies (Currie et. al., 2023), microbiology (Das et al., 2023), economics (Geerling et. al., 2023). Other research highlights numerous benefits of using GenAI tools in education. These include the ability to create assessments (Zhai, 2023), shape pedagogical practice by improving flipped learning (Rudolph et al., 2023), develop enhanced learning resources (Atlas, 2023), provide virtual personal tutoring (Mhlanga, 2023), brainstorm ideas (Sok & Heng, 2023). ChatGPT (a common open access GenAI tool) has also been found to enhance student productivity by providing useful information and resources, assisting in improving language skills, facilitating collaboration, time efficiency, and offering support and motivation (Fauzi et. al., 2023).

Therefore, rather than eliminating GenAI tools in higher education, a more effective approach to consider is how implementing the use into the classroom environment may yield greater productivity. Further, increasing use in industry means that our graduates must be equipped to employ GenAI in their discipline practice. However, making this transition requires a comprehensive understanding of student perceptions and capabilities regarding the use of these tools, as well as a careful intervention and evaluating change in students' perception by deploying the use of GenAI tools across different engineering courses.

Belkina et. al. (2025) recently completed a detailed systematic literature review of implementation case studies, identified benefits and pitfalls on effective GenAI use in education context through the lens of conceptual education framework. Laurillard's Conversational Framework (LCF) Theory (Laurillard, 2012) is used to categorise the different case studies based on the six learning types, each fostering unique skills and competencies in learners: Acquisition (A); Investigation (I); Practice (P); Discussion (D); Collation (C); Production (Pr). LCF learning types can be used to classify the intervention used in this study and relevant to the context of preparing students for the future and their employability. While GenAI integration into classroom has been adopted across Australasian recent times, the gap in literature is a pedagogical approach to GenAI integration framework. This paper combines utilising a pedagogical education framework and the application of this into GenAI integration design. The initial studies on students' perception of GenAI tools, classroom integration and their experiences including use in the workplace is reported.

The aim of this research is to explore the implementation of GenAI tools in engineering education and students' perceptions of using GenAI in the classroom. The research questions presented are:

1. What is students' perception of benefits and pitfalls on the use of GenAI prior to completing the GenAI teaching and learning activity? (RQ1)
2. How can students' experiences of GenAI teaching and learning activities be interpreted through Laurillard's Conversational Framework to understand changes in their perceptions? (RQ2)
3. What insights emerge from students' qualitative feedback after participating in GenAI-integrated activities, and how do these reflections inform teaching practice and future integration of GenAI? (RQ3)

## Methods

### Research Design

The research was conducted on engineering students in four phases: (i) the pre-survey was administered before GenAI teaching and learning activity at the start of term; (ii) GenAI implementation facilitated workshop activity; (iii) the post-survey was administered post GenAI teaching and learning activity/ies and (iv) focus group discussions were held after term completion where students are asked to reflect on the GenAI activity.

This research followed a mixed methods approach based on the foundation of case study methodology (UNSW ethics approval iRECS5789). The findings are substantiated through the analysis of multiple intervention cases conducted across various institutions (Case and Light, 2011). The instrument tool used is semi-quantitative surveys via the Qualtrics platform, followed by qualitative approach through the completion of focus group discussions. The blended approaches can provide valuable insights complimenting the quantitative approaches (Borrego, 2007). The authors recognise the limitations in this study include the different facilitators for the GenAI T&L activities across the institutions. However, this diverse samples provide a holistic insight into different example case studies which will benefit other educators who are looking to implement similar GenAI pedagogical framework/s into their course and/or curriculum design.

## Survey

The survey method has been used to gather data for this study. It is the most common method employed to inform responses to the research questions focused on understanding students' perception and/or GenAI use in classroom teaching (Honig et. al., 2025). There are four parts to the survey and 21 questions in total. Firstly, demographic data which were questions related to the teaching landscape (code, level, discipline, institution). Secondly, qualitative questions based on students' pre-intervention experience with GenAI. Thirdly, quantitative prompt statement type-questions on students' awareness of AI use and ethics in their respective institution using a standardised 5-point Likert scale. Lastly, qualitative questions on students' perception on the use of AI specifically for education and future workplace.

## Focus Group

The qualitative component of the method involved focus group discussions conducted after the implementation of GenAI activities in the classroom. Sessions were held either online or face to face, depending on participant needs. Discussions were recorded and transcribed in a de-identified manner. Participants reflected on their experiences with GenAI-supported learning, guided by open-ended questions designed to elicit critical insights and diverse perspectives. The discussion topics were structured to answer the research questions (RQ1-3).

## Data Analysis

The final dataset used includes pre-survey responses from five Australian universities: University of New South Wales, University of the Sunshine Coast, University of Tasmania, Western Sydney University and University of Wollongong. All data from the survey and transcripts from the focus group has been de-identified including course code, course names, student identification numbers.

# Results & Discussion

## Phase 1 Student pre-GenAI teaching and learning activity survey

Section 1-2 provides insights to students' experience on GenAI use and institutional training provided prior to the GenAI teaching and learning activity to provide context for answering the research questions. Section 3 explicitly details findings into RQ1.

### *1. Students' experience with GenAI*

In the pre-course survey, students were asked to indicate their use of digital technologies across five functional categories: academic research and studying, communication with peers and instructors, entertainment and personal activities, organising and managing daily tasks, and online shopping and financial transactions (Table 1). Students were asked to select all that applies. Descriptive statistics based on binary coding (1 = selected, 0 = not selected) revealed high levels of engagement with digital technologies for academic research and studying (94.5%), entertainment and leisure activities (83.5%), and communication purposes (82.0%). Use of digital tools for online shopping and financial transactions was slightly lower (73.5%), while the least

selected category was organising and managing daily tasks (63.0%). On average, students reported using approximately 4 out of the 5 categories (Mean = 3.97, SD = 1.36), indicating a broad but variable adoption of digital technologies prior to the course. These findings establish a baseline for evaluating changes following the GenAI intervention introduced in the post-course phase.

With nearly 95% of students using digital technology for academic purpose, the pre-survey also asked whether they had used GenAI tools (e.g., AI writing assistants, AI art generators) for academic purposes, the majority of students indicated some level of engagement.

**Table 1: Students who selected the Digital Technology Usage Purpose**

Digital Technology Usage Purpose	% of Students
I use digital technologies for academic research and studying.	94.5
I use digital technologies for communication with peers and instructors.	82.0
I use digital technologies for entertainment and leisure and personal activities.	83.5
I use digital technologies for online shopping and financial transactions.	73.5
I use digital technologies for organising and managing my daily tasks.	63.0

Specifically, 57.0% reported occasional use, and an additional 16.5% reported frequent use of such tools. Meanwhile, 23.0% of respondents were aware of GenAI tools but had not used them, and only 3.5% indicated that they were not even aware of such tools. These findings suggest that, prior to the course, GenAI technologies were already present in the academic workflows of nearly three-quarters of students, highlighting both a significant adoption rate and an opportunity to further develop students' critical and ethical understanding of these tools in educational contexts.

When students were asked specifically about their use of artificial intelligence (AI) technologies across five categories (Table 2), a large majority reported using AI for personalised learning and study aids (86.0%), reflecting the widespread adoption of tools such as intelligent tutors and AI-driven summarisation platforms. Moderate engagement was observed for data analysis and research (56.5%) and for language translation and communication (42.0%), suggesting that while students are beginning to integrate AI into academic workflows, its use is not yet ubiquitous. Use of AI for entertainment purposes, such as AI-generated music or games, was reported by only 21.5% of respondents, and 13.5% indicated other uses. On average, students reported using approximately 2 out of 5 AI-related categories (Mean=2.20, SD=1.07), indicating that while exposure to AI technologies exists, functional engagement was still relatively narrow prior to the course.

**Table 2: Students who selected AI Technology Usage Purpose**

AI Technology Usage Purpose	% of Students
Personalised learning and study aids	86.0
Language translation and communication	42.0
Data analysis and research	56.5
Entertainment such as AI-generated music or games	21.5
Other activities	13.5

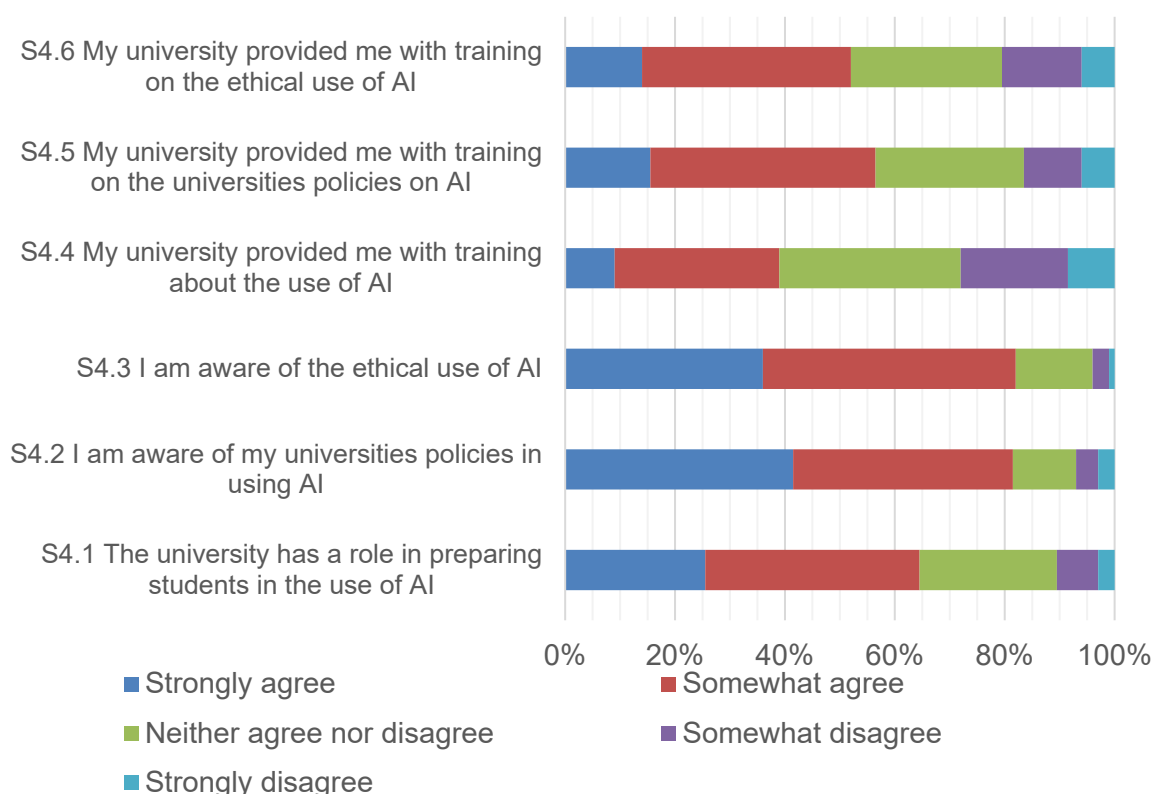
A Pearson correlation analysis was conducted to examine the relationship between students' general digital technology usage (Q8) and their engagement with AI technologies (Q9). The results revealed a very strong positive correlation between the two variables ( $r = 0.987$ ), indicating that students who adopted a greater number of digital technology tools were also highly likely to engage with a broader range of AI applications. This near-linear relationship suggests that AI adoption is not occurring in isolation, but rather as an extension of existing digital practices. Such a

finding reinforces the view that digital readiness and familiarity with general technologies may serve as a foundational factor for meaningful AI integration in educational contexts.

The survey also explores the specific purposes which students use GenAI tools in their academic work. Students again were asked to select all that apply. The top uses were Research and writing, Studying or Tutoring and Ideation and brainstorming (all scored above 50%). This was followed by the next three purpose (>30%): Seeking feedback on their work, Help with numerical questions and Translation or editing. Lastly, generating code or working on programming assignments (19.5%) and Creating presentations or visuals (16.5%) were the least scores.

In terms of students' perception on the accuracy and relevance of the outputs from GenAI tools, only 7 out of 200 students selected the extremities responses: "Not accurate and relevant at all" (4) and only 3 for "Very accurate and relevant", most sit between "somewhat" and "moderate" with 15% selecting "Depending on the GenAI platform, the subject matter and the prompt". Students were then asked to indicate which GenAI platform they had used for any purpose—academic, personal, or entertainment. Usage was highly concentrated around a few well-known platforms, with 93.5% reporting the use of GPT-based tools such as OpenAI's ChatGPT. Grammarly AI was the second most commonly used tool (34.0%), followed by Google's AI products (20.0%) and Bing AI/Copilot (14.5%). Other tools such as DALL-E (4.5%), Brainly (3.5%), DeepAI (2.5%), and Codex (0.5%) saw considerably lower levels of adoption. Only 4.0% of respondents indicated they had not used any generative AI tools. On average, students reported using approximately 1.8 different AI tools (Mean = 1.79, SD = 0.88), suggesting relatively narrow engagement concentrated on mainstream tools, particularly GPT-based platforms.

## 2. Awareness of AI use and ethics at the institution



**Figure 1: Students' awareness of AI use and ethics. Strongly agree (5) to disagree (1)**

Figure 1 provides a summary of students' perception and awareness of GenAI and ethical use before completing the GenAI activity. Students largely agreed that universities have a responsibility to prepare them for AI use (S4.1: 64.5% agreement) and reported strong personal awareness of AI policies (S4.2: 81.5%) and ethics (S4.3: 82.0%). However, this perceived awareness does not appear to stem from formal institutional support. Only 39% reported receiving training about AI use

(S4.4), and just over half (S4.5: 56.5%, S4.6: 52.0%) reported training on AI-related policy and ethical use. These discrepancies suggest a potential "perception–support gap", whereby students feel aware but may lack structured institutional guidance. This gap may have implications for ethical alignment, policy compliance, and trust in AI-supported education.

### 3. Perceptions of the usage of GenAI for education

The top three benefits and pitfalls selected by students is summarised in Table 4. The questions were framed as What do you see as the “benefits” or “challenges” of using GenAI tools for academic purposes? Students could select multiple options.

**Table 4: Top three benefits and challenges of GenAI tools use from a students’ perspective**

Benefits	Challenges
1. Access to a wide range of information and perspectives	1. Challenges in verifying the accuracy of generated information
2. Improved speed and efficiency in completing assignments	2. Potential bias /misinformation in responses
3. Enhanced creativity and idea generation	3. Ethical concerns about using AI in academic work

## Phase 2 GenAI intervention development and implementation (RQ2)

This section provides context to the pedagogical approach to GenAI T&L activities design to answer RQ2. Table 5 provides a summary of the GenAI interventions used in this study. Each intervention is classified according to the LCF learning types to illustrate its intended role in supporting student learning. It is noted that the focus of our research question in this paper is on the implementation of the GenAI activity and students’ perspectives rather than the development of the activity itself.

In all courses, the activity was implemented as part of an in-class activity, facilitated by the teaching staff for the course. It is recognised that there are limitations with multi-institution and/or multi-discipline study, that is, different teaching instructors are used to facilitate the activities. However, consistent integration of GenAI activity was adopted across sample courses based on the four phases described in the Methods - Research Design section in this paper.

**Table 5: GenAI activity and Laurillard’s Conversational Framework (LCF) learning types**

ID #	Level	Discipline, Course type, activity overview	GenAI tool	LCF
C1	1-4	Chemical, elective, a 2-hour workshop using GenAI for research, brainstorming and ideation. Students worked in a team-based environment on a sustainable project-based problem. The task required the team to come up with potential solutions which could be checked by the facilitator by the end of the class. No marks attached to the task, but students would then continue to work in the project throughout the term, delivering reports at intervals.	Copilot recommended (but not required). Most used Copilot but also ChatGPT.	A, I, P, D, C
C2	1	Electrical, core, Students solved a typical 20-minute in-class electrical problem using GenAI. The task required a numerical solution and diagram, followed by critical evaluation of the AI output and submission of their own final answer. Students had one week and submitted both their solution and screenshots of their AI interactions. Marking was based on task completion rather than answer correctness.	Students allowed to choose GenAI, most used ChatGPT	P
C3	3	Chemical, core, a 2-hour workshop style using GenAI for research, brainstorming and ideation on a technical problem. No marks attached to the task, but students	Students allowed to choose GenAI,	I

		continue to work on the problem delivering written reports at intervals.	most used Copilot	
C4	all	Multi-disciplinary, term long engagement with GenAI used to support open-ended WIL-based project work. Example cases were done in workshop-styled lectures that students could adapt to their project.	Students allowed to choose GenAI, variety used.	A, I, P, D, C
C5	2+	Electrical and Civil, core for articulation students (Yr 3 UG/Yr 2 PG), a 2-hour workshop on reading and summarising an academic article. Students were required to write a prompt or series of prompts to generate a summary of an article aligned with a provided topic. They were required to document all prompts and then compare their written summary and the GenAI produced summary. This comparison included highlighting and annotating based on similarities and differences. Students of PG course version were required to submit for marking.	ChatGPT or Copilot recommended	I
C6	3-4	Mechanical, Electrical, Civil and Mechatronics, core. No marks attached to the task however, the task Enhanced student's understanding on the system reliability problem using AI. Students are taught at least five different methods for solving a reliability problem. When applied correctly, each method should yield the same numerical value for the system reliability.	Students allowed to choose GenAI, all used ChatGPT	A, I, Pr, P
C7	3	Chemical, core, laboratory course. Students have the option to use GenAI to develop a plan/proposal for an experimental project to help students develop project planning skills by stepping students through project planning process (scope, aims, work breakdown etc.). Students present their experimental proposal as a team (which is marked), three times in term.	Copilot recommended (but not required).	Pr

### Phase 3 and 4 – Student post-GenAI teaching and learning activity (RQ3)

Based, on the focus groups conducted post-GenAI intervention, positive experiences were had by students on their use of GenAI to support their learning in the classroom. Sample quotes include:

*“I think it could improve me learning it because it does give you so much, and you could ask it anything, in any expense, and it will try and find an answer or give you an answer.”; “definitely improves efficiency when we’re learning”; “with GenAI, it’s [learning and development] definitely faster and more efficient to get to that result”*

The general positive experience in student’ perceptions are consistent with that found in other GenAI integration found in literature (Bonsu & Baffour-Koduah, 2023). Students agreed that GenAI was useful for research and writing, ideation and brainstorming, and guided problem-solving during study. This was consistent and reinforced the results of the pre-survey.

*“I use it when I study. If you enter a question, it will actually ask you follow-up questions and guide you through the process, it really helps with studying. I think you still have to study and understand the material, but it’s a really helpful tool.”; “we use AI was to generate ideas”; “the use of GenAI during C1...to generate ideas especially on summarising [the topic area] can be treated as the broad starting point and so students can go in, read those in detail and do further research on it. So, it’s a good starting point of the projects and assignments”*

Some students also personally experienced the unreliability of GenAI-generated sources, “*some of the articles I could not even find*”, highlighting the need for critical evaluation. Students also acknowledged the importance of applying discipline-specific knowledge when using GenAI.

*“There are two sides to this point. On one hand, using AI can give you an advantage by helping you gain a deeper understanding. But on the other hand, if you’re using it incorrectly, like just copying answers without actually learning, then someone who isn’t using it might end up learning more, at least in theory. However, if a person knows how to use AI intentionally and as part of their studies, it can actually enhance their understanding.”*

This is also consistent with other GenAI integration studies where Shoufam (2023) noted that to effectively utilise GenAI tools (ChatGPT), students still need a sound background in the relevant field of study. Furthermore, all students agreed it was important to integrate into classroom teaching. Some also elaborated the fact that it is currently being used in their discipline-specific workplace and further elaborated the importance of it in our daily lives in the future.

*“I think it would be good to have an elective that teaches students the practical use of AI and how to actually use it effectively, because it’s not easy to get the results you want, your prompt has to be correct.”; “definitely should be included in the course because I have personally used it in the workplace”*

This segway the discussions to focus on their GenAI learning experiences connection to future career opportunities and impact on their employability with many students already confirming the use in their workplace.

*“I think AI is definitely going to play a major role in future jobs, especially in engineering. So, learning how to use AI both ethically and practically will probably help me find a job and succeed in the future.”*

## Conclusion & Recommendations

What is clear is that GenAI tools are here to stay in all disciplines and everyday life. This study captured students’ perceptions, highlighting the benefits of efficiency and faster assignment completion as key benefits, alongside enhanced creativity and idea generation. However, the pitfalls about reliability and accuracy, including experiences of “hallucinations,” underscore the need for critical evaluation skills. Post-activity reflections indicated that guided use of GenAI fostered greater awareness of both opportunities and pitfalls, with students calling for more structured GenAI “tutorials”. Importantly, students recognised the value of early exposure to GenAI for developing ethical, responsible use and improving employability “*to understand how to use it effectively early on...and how it can be used is beneficial*”. Building these skills can only provide students with the competitive advantage to improve their employability in the future. Future work will further analyse pre/post survey differences and refine teaching approaches informed by the theoretical LCF lens and balance GenAI integration with independent learning.

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