REFRAMING PROFESSIONAL LEARNING ASSESSMENT IN THE AI ERA

Toh Yen Pang

Biomedical Engineering Department, School of Engineering, STEM College
RMIT University

Alex Kootsookos, Chi-Tsun Cheng

Mechanical, Manufacturing and Mechatronics Engineering Department, School of Engineering, STEM College, RMIT University

ABSTRACT

The rapid adoption of generative artificial intelligence (AI) in higher education has prompted educators to reconsider how professional learning and assessment are designed and justified. While AI can improve feedback quality and efficiency, it also raised concerns about academic integrity and learner agency, i.e., the transition of students from passive recipients of information to active participants in their own learning. Traditional assessment practices are increasingly misaligned with contemporary digital competencies. This study examines AI integration in engineering education, with a focus on assessment design and educator reasoning. Using a qualitative approach, the study analysed open-ended survey responses from engineering educators at an Australian university. Participants reflected on their use of large language models for teaching, assessment and professional judgement. The results show that educators value AI for idea generation, but remain concerned about over-reliance, reduced learner accountability, and misalignment between AI use and intended learning outcomes. Educators emphasised the need for deliberately designed assessments that require learners to evaluate AI outputs, justify their decisions using evidence and disciplinary reasoning. The findings show that the educational value of AI depends on pedagogical intentions rather than the technology itself. When aligned with frameworks such as CDIO (Conceive-Design-Implement-Operate), AI-supported assessment can shift the focus from simple task completion toward the development of professional judgement and ethical awareness, positioning AI as a supplement for, rather than a replacement for, professional thinking.

KEYWORDS

Generative AI, assessment design, Large Language Models (LLMs), higher education pedagogy, engineering, Standards: 2, 7, 8, 11.

INTRODUCTION

The rapid advancement of artificial intelligence (AI) and digital technologies has reshaped how individuals access, produce and evaluate information in professional and academic contexts (Aiello, 2024; Hohenstein et al., 2023; Taeihagh, 2025). As AI-enabled tools increasingly facilitate personal learning and work (OECD, 2025; Pallant et al., 2025), the capacity to critically evaluate the accuracy, reliability and source of information generated by both humans and machines has become an essential professional capability (Hattingh et al., 2020). Higher education, therefore, faces growing expectations to prepare graduates who can engage with AI technologies in informed, ethical and reflective ways.

Education systems play a central role in developing these capabilities. In response to the pace and complexity of technological change, the Council of Europe's Committee of Ministers recommended adopting digital citizenship education, with explicit attention to the implications of AI for learning and teaching (Council of Europe, 2019). Holmes et al. (2022) also argued that educators must understand both the affordances and limitations of AI to retain pedagogical agency and ensure that technology supports rather than displaces educational intent. These perspectives position educators as key mediators between AI technologies, institutional policies and student learning experiences.

Within educational contexts, AI applications most commonly draw on machine learning and natural language processing (NLP) techniques (Holmes et al., 2022; Lund & Wang, 2023; Norouzi et al., 2020; Shaik et al., 2022; Sullivan & Keith, 2019). NLP-powered systems frequently employ conversational interfaces to support dialogue, feedback and supported learning (Litman, 2016; Sullivan & Keith, 2019). The public release of ChatGPT, a large language model (LLM)-based chatbot developed by OpenAI, in November 2022 intensified institutional and scholarly attention to these technologies (Erwin, 2023; Zamfiroiu et al., 2023). While ChatGPT and other AI-based academic tools have demonstrated the capacity to generate fluent academic-style text, their use has raised concerns about authorship, assessment validity and academic integrity (Cotton et al., 2024; Evangelista, 2024; Yeo, 2023).

Recent studies suggest that LLMs are already influencing teaching practices, feedback processes, and assessment design in higher education (Liang et al., 2025; Shi et al., 2026). Researchers report both opportunities (e.g., personalised feedback, richer assessment tasks, support for lesson planning) and risks (e.g., over-reliance, validity threats, equity concerns) that are driving changes in how courses and assessments are designed (Agostini & Picasso, 2024; Anson, 2024). Interviews with academics across European universities further emphasised the importance of supporting students in understanding how LLMs operate, verifying AI-generated outputs, and acknowledging AI use transparently (Symeou et al., 2025). This body of work suggests that the educational value of AI tools does not lie solely in their outputs, but in how they are pedagogically framed, regulated, and embedded in assessment and learning activities.

Despite growing interest, limited research examines how educators interpret institutional AI policies, translate them into assessment design decisions, and balance opportunities for learning support with concerns about academic integrity. This gap is particularly relevant in engineering education, where assessment plays a central role in developing transferable competencies such as critical thinking, ethical judgement, communication and lifelong learning, consistent with professional accreditation expectations.

Pedagogical theories such as constructivist and experiential learning approaches provide a valuable lens for examining these issues. Such approaches emphasise active engagement, reflection, and the co-construction of knowledge, positioning educators as facilitators who guide learners through complex problem spaces rather than transmit predefined solutions (Brandon & All, 2010; Kolb, 2015; Moosavi & Bush, 2021). These approaches align with lifelong learning models that link education, professional development and future workforce needs (Figure 1) (Griffin & Care, 2015). However, the emergence of generative AI can disrupt this traditional learning cycle by altering how professional skills are acquired and verified.

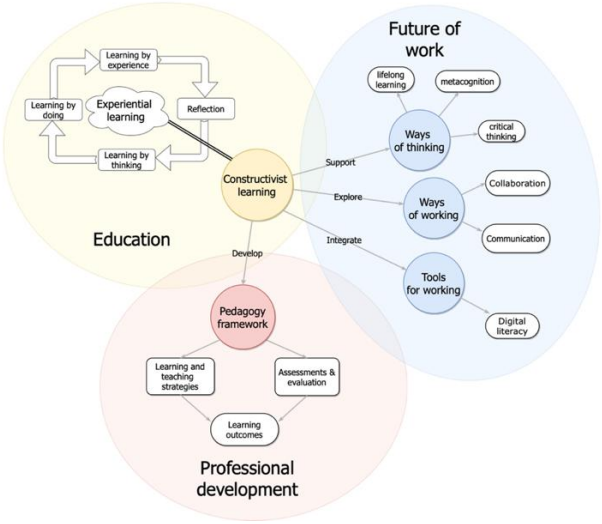

Figure 1. A lifelong learning process that uses constructivist and experiential learning approaches to cultivate professional development and prepare the future workforce

As AI technologies, particularly those leveraging NLP and LLMs, become increasingly prevalent in educational contexts, educators face critical decisions about their adoption and use. Exploring how educators make sense of these tools within their teaching practice and assessment design is essential for identifying effective strategies, addressing challenges, and ensuring that technology supports meaningful learning experiences and professional skill development while upholding academic standards and integrity. Therefore, the study is guided by the following research questions:

- RQ1: How do educators conceptualise the role of NLP/LLM tools in supporting students' research, writing and professional skill development in higher education?
- RQ2: What pedagogical and assessment design strategies do educators employ when integrating NLP/LLM tools into existing curricula?
- RQ3: What challenges, risks and trade-offs do educators identify when incorporating LLM tools into assessment and feedback practices?
- RQ4: How do educators adapt assessment structures and expectations to maintain academic integrity while enabling student engagement with AI tools?

METHODOLOGY

Research Design

This study adopted qualitative research to examine how academic staff engage with AI-powered natural language processing (NLP) tools, such as ChatGPT, in teaching and research contexts. The study was designed as an initial scoping and pilot investigation, with an

emphasis on reflective practice, professional judgement, and evidence-informed innovation in assessment and feedback, particularly in relation to the use of AI in engineering education.

Participants and context

Academic staff were invited to participate via email, which included an information statement outlining the study's purpose, the voluntary nature of participation, and data-handling procedures. Participants accessed a Microsoft Forms questionnaire and responded anonymously. The survey was open for two weeks and distributed to staff across four engineering disciplines: Aerospace and Aviation, Electrical and Biomedical Engineering, Manufacturing, Materials and Mechatronics, and Mechanical and Automotive Engineering. These disciplines were selected to capture a range of teaching contexts, class sizes, and assessment practices commonly found in engineering degrees. Two reminder emails were sent to improve response rates and reduce non-response bias.

Data collection and analysis

Data were collected using four open-ended questions that invited participants to describe their experiences, decision-making processes, and reflections on the use of AI-based NLP tools in their teaching and research. Open-ended questioning enabled participants to articulate their perspectives in their own words, supporting the identification of unanticipated practices and concerns, particularly around feedback, academic judgement, and the evolving role of the educator.

Data analysis followed established qualitative analysis procedures informed by (Braun & Clarke, 2006) and (Thomas & Harden, 2008). The process involved three stages: 1. Open coding, where responses were examined line-by-line to identify meaningful units of text related to AI use, pedagogical intent, and perceived impact on teaching and feedback. 2. Axial coding, where codes were compared, refined, and grouped into broader categories through iterative discussion among the research team, and 3. Selective coding, where core themes were finalised by examining alignment between the data, emerging interpretations and the study aim. A constant comparative approach was applied throughout the analysis to identify consistencies and contrasts across participants and disciplines. To enhance analytic rigour, themes were repeatedly cross-checked against the raw data, and divergent or minority views were retained to avoid over-simplification. Appendix A outlines the analysis workflow, including the mind mapping and keyword synthesis used in this study.

RESULTS

Eleven academic staff from four engineering disciplines completed the open-ended survey. Participants reported varied levels of experience with NLP/LLM tools, ranging from exploratory awareness to active classroom use. To address the research questions, findings are organised into four themes. Each theme corresponds directly to one research question and represents a synthesis of staff perspectives on the role, integration, risks and assessment implications of NLP/LLM tools in higher education.

Educators' Perception of NLP/LLM Tools as Learning and Professional Skill Supports

Participants have considered AI tools, especially ChatGPT, as supportive learning aids rather than authoritative sources of knowledge. They emphasised that its educational value depends on how it is positioned within disciplinary practices and how students are guided to exercise judgement when using it.

Several educators stressed the importance of educators first understanding the tool themselves, including its limits within specific disciplines:

> *Staff need to become familiar with ChatGPT themselves to determine the limitations of AI within their own discipline... Place the AI within the context of a broad range of tools used to gain information: eg databases, search engines. (Anonymous #6)*

In relation to professional skill development, educators highlighted its potential to support communication, comprehension and language clarity, particularly for students with diverse linguistic backgrounds:

> *I believe it can be a useful tool to assist diverse student populations - providing extra help to students by facilitating discussions among them and also could offer as a language translation service for non-native speakers. (Anonymous #8)*

Pedagogical and Curriculum Design Strategies for Integrating NLP/LLM Tools

Participants described a range of deliberate pedagogical strategies for integrating ChatGPT into existing curricula. Rather than embedding the tool implicitly, educators emphasised explicit instruction, modelling and scaffolding, which focus on cultivating students' critical use of tools (e.g., prompting, checking, refining outputs) rather than letting them rely on AI as an unexamined answer machine.

One commonly reported approach involved teaching students how to ask effective questions and interrogate AI-generated responses:

> *To ensure students make the most of their interactions with ChatGPT, educators should teach them to ask follow-up questions, request justifications for its answers, and challenge its responses with "why" and "what-if" questions. This approach encourages critical thinking and helps students develop effective questioning skills. (Anonymous #4)*

In terms of practical classroom use, staff reported applications in formative feedback and discussion facilitation:

> *[1] Using the tool to provide personalized feedback - student submit their work on ChatGPT which checks and provide feedback on grammar, syntax and I believe style. 2. Facilitating discussions among students on a particular topic - students engage in dialogue and explore different perspectives on particular issues arising. (Anonymous #8)*

Challenges, Risks and Pedagogical Trade-offs

Educators identified several challenges in incorporating ChatGPT into teaching, particularly regarding accuracy and governance.

Concerns about misleading outputs were prominent:

> *I think the most important advice is to understand the limitation of the AI. A nicely written definitive answer can be very wrong! (Anonymous #7)*

Participants also highlighted the difficulty of establishing consistent guidelines in a rapidly evolving landscape:

> *Once the tool is better established, a conversation is needed to better manage its use by the students. Currently the tool, and its use by the students is evolving and it is difficult to frame a guideline. (Anonymous #3)*

Several educators reflected on broader pedagogical trade-offs, including a shift away from content coverage towards skill development:

> *Had to think deeply about what skills I really want the students to learn & develop and reassure myself that it's o.k to potentially deliver less content if the students learn more. (Anonymous #6)*

Assessment Adaptation and Academic Integrity in AI-Enabled Learning

Rather than prohibiting ChatGPT, participants described assessment redesign as the primary mechanism for maintaining academic integrity while enabling meaningful engagement with AI tools.

Educators reframed integrity as an ethical and reflective practice:

> *It's important to recognize that using ChatGPT should not be considered cheating. Instead, it's like having a "wise friend" who can answer questions and provide guidance. The real concern lies in ethical issues, such as whether someone is using ChatGPT's ideas without proper credit or not taking the time to verify its answers in different contexts and conditions. (Anonymous #4)*

Several staff reported shifting assessment emphasis towards justification, critique and validation:

> *The emphasis of assessments has shifted away from content to the presentation and validation of data. In addition, assessments now include a self-critique from the students of how the data was found. (Anonymous #6)*

A proactive approach to assessment testing was also reported:

> *I have modified my assessments to avoid students pasting the questions onto AI platforms and getting instant answers. Before handing out assessments to students, I test my questions using available AI tools to see what responses the AI tools are giving. I adjust the question until I get to a point where it is apparent the students would need more than just AI tools to resolve the problem at hand. (Anonymous #11)*

DISCUSSION

This study examined how engineering educators conceptualise, integrate and regulate the use of NLP/LLM tools within teaching, assessment and feedback practices. Given the small scale of the study, the findings represent emerging patterns in educator reasoning rather than generalisable outcomes about effectiveness.

The findings suggest that educators do not perceive AI as a replacement for human judgement; instead, they position it as a critical tool for enhancing disciplinary communication and idea development. By framing AI in this way, the study connects technological integration with CDIO-aligned competencies, emphasising that reflection and professional reasoning are essential components of engineering practice.

Rather than describing ad hoc adoption, participants reported deliberate pedagogical strategies for integrating AI tools. These included explicit instruction on questioning techniques, modelling appropriate use, and embedding AI within inquiry-based and formative learning activities. Such practices reflect CDIO principles that prioritise learning processes over tools and position students as active participants in knowledge construction. However, the variability in these reported practices suggests that AI integration remains uneven and highly dependent on individual educator judgement, necessitating further case-based research to examine how these strategies function in practice.

Despite the benefits, educators identified risks involving inaccurate outputs, accessibility gaps, and the ambiguity of 'acceptable use' in a constantly evolving technological landscape. These issues were characterised as ongoing assessment (re-)design constraints rather than temporary obstacles, requiring continuous instructional adjustment. Notably, the study reveals a trade-off between traditional content delivery and deeper skill development; thus, AI acts as a catalyst for educators to more explicitly define and justify their learning objectives.

In response to these challenges, participants reported a strategic shift toward redesigning assessment tasks to emphasise justification, critique and reflection. This approach seeks to mitigate AI misuse 'by design' by making the student's reasoning process visible. Within this framework, academic integrity is redefined as a structural alignment between learning outcomes, assessment expectations and procedural transparency, moving away from a reactive reliance on computational detection tools toward a culture of student accountability.

To implement the findings of this study within a CDIO context, engineering educators should shift from a focus on technological policing to intentional assessment design that prioritises professional reasoning. Practical application involves integrating AI as a supervised assistant throughout the CDIO lifecycle, particularly in the Conceive and Design phases. Students can use AI to simulate project constraints or explore ideas, provided they maintain a "justification log" that explains why they chose or rejected specific AI suggestions. This approach shifts the student from a passive recipient of AI outputs to an active participant who must critically evaluate, verify and justify the machine's technical reasoning against disciplinary standards. Ultimately, by embedding evaluative judgement and transparency into the curriculum, educators can balance the trade-off between covering course content and developing great professional skills. This ensures that academic integrity is built into the assignment's structure rather than relying on detection tools.

CONCLUSIONS

This study demonstrates that engineering educators do not regard generative AI as a replacement for professional expertise, but as a supervised assistant that requires active oversight. Rather than providing a solution to structural assessment challenges, AI tools are perceived as offering a controlled aid for idea development, feedback drafting and reflective prompting. These benefits must be interpreted within the qualitative scope and institutional context of this research.

The findings indicate that the primary challenge associated with AI in higher education is pedagogical rather than technical. Educators emphasised the need for clear assessment intent and explicit design decisions to mitigate risks related to over-reliance and reduced learner agency. By shifting students from passive recipients of information to active participants in their learning, educators can maintain academic integrity. From a CDIO

perspective, AI supports professional skill development when assessment tasks prioritise justification, evaluative judgement and disciplinary reasoning.

In conclusion, maintaining integrity in AI-rich environments depends less on detection mechanisms and more on redesigning assessments that promote transparency and critical engagement. Future research should examine the long-term impact on learner outcomes and equity across broader engineering contexts to ensure AI remains a supplement to, rather than a substitute for, professional thinking.

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BIOGRAPHICAL INFORMATION

Toh Yen Pang is an Associate Professor at the Dept. of Biomedical Engineering at RMIT University. He presently holds the positions of Deputy Head (Learning and Teaching) and Program Manager for Biomedical Engineering. He is a Chartered Professional Engineer (CPEng, MIEAust) and a Fellow of the Higher Education Academy (FHEA). His higher educational research focus areas are technology-enhanced learning, pedagogical innovation in engineering education and courses and programs development. Pang is the CDIO Member School's representative for RMIT in the Australia & New Zealand region.

Alex Kootsookos is a Senior Lecturer at the Dept. of Mechanical, Manufacturing and Mechatronics (MM&M) Engineering at RMIT University. She presently holds the position of Deputy Head (Learning and Teaching) in MM&M Engineering. Her research interests include pedagogical innovation, eLearning and engineering education.

Chi-Tsun Cheng is a Professor at the Dept. of Mechanical, Manufacturing and Mechatronics (MM&M) Engineering at RMIT University. Concurrently, Dr Cheng is the Academic Lead—Research Development at the School of Engineering, and he is also one of the leads of the RMIT Digitalisation Network under the RMIT Enabling Impact Platforms. He is a Chartered Professional Engineer (CPEng, MIEAust) and an IEEE Senior Member. Dr Cheng's research interests include Wireless Sensor Networks, Internet of Things, Industry 4.0/5.0 Technologies and Advanced Manufacturing.

Corresponding author

Toh Yen Pang
Biomedical Engineering Department,
School of Engineering, STEM College,
RMIT University, Melbourne, VIC 3000,
Australia.
tohyen.pang@rmit.edu.au

APPENDIX

This appendix presents the mind-mapping and word-cloud techniques the research team used to visually organise the specific data for each theme. This involved looking at the language and phrases used by the participants in relation to the research questions and in the context of a pedagogical model that could provide insight into the meaning of the data collected.

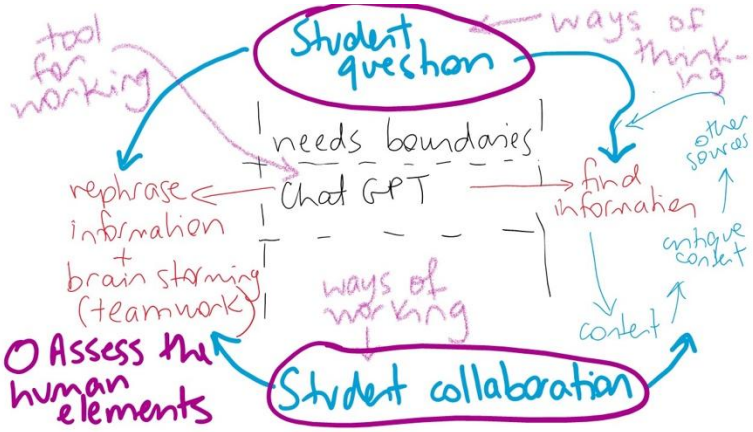

Figure A1: A mind map was created to visually organise themes that emerged from the data related to the future of work and pedagogy for the context of the study.

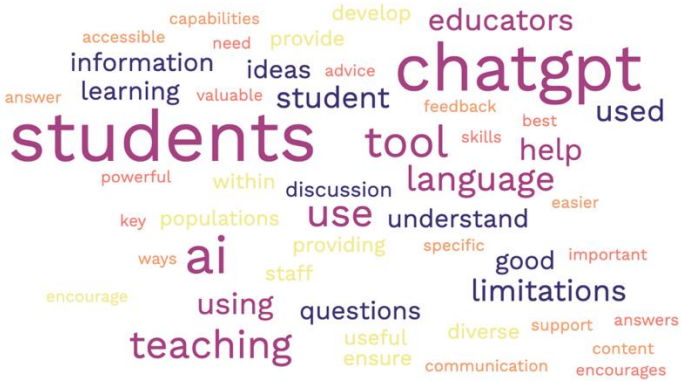

Figure A2: A word cloud used to quickly identify the most common words or phrases that emerged from the collected data, which helped the research team to identify key themes.