AAEE Citation for Outstanding Early Career Contribution to Engineering Education

Overview of Contribution and Context

I am a passionate engineering educator whose commitment to teaching motivated my doctoral studies. My teaching journey began in 2016 as a calculus tutor at the Federal University of ABC, Brazil, and continued as a tutor and lab demonstrator at the University of Newcastle while completing my PhD in Electrical Engineering. In 2022, I joined the University of Melbourne (Unimelb) as a Lecturer (education-focused) in Electrical and Electronic Engineering, coordinating four subjects and leading the (re)development of three. To strengthen my practice, I completed the Melbourne Teaching Certificate (2022) and the Graduate Certificate in University Teaching (2024). I actively contribute to the scholarship of engineering education, with three AAEE conference papers since 2022, a 2024 IEEE FIE paper, three further papers under review, and participation in the AAEE Winter School. I also belong to an engineering-focused SoTL group at Unimelb to embed evidence-based approaches in my teaching.

Overall, my approach to teaching has been informed by a holistic and student-centred approach that considers the engineering education literature, student feedback (e.g., End of Semester Survey, ESS), staff feedback (Peer Review of Teaching, PRT), multiple teaching observations, self-reflection, cross-institutional collaborations and my previous experiences. Since 2022, I have led a transformation of foundational electrical engineering subjects at Unimelb, moving them to authentic, feedback-rich, student-centred learning environments. Drawing on experiential learning (Kolb, 2014), authentic assessment principles (Dym et al., 2005), self-regulated learning models (Nicol & Macfarlane-Dick, 2006) and collaborative and team-based learning (Sukackė et al., 2022), I have designed and embedded open-ended projects, structured formative assessments, collaborative workshops, and multi-source feedback processes (AI, peer, instructor) to build both technical and professional skills.

Criterion 1: Approaches to teaching and support of learning that influence, motivate and inspire students to learn

Theme 1: Professional skills and project-based learning

Prior to 2022, Electrical Network Analysis and Design (ELEN30009) showed: (i) a heavy dependence on the final exam with a significant proportion of the subject mark in the final weeks of the semester; and (ii) limited opportunities for the development of general and professional skills. To foster the development of professional skills, I applied **project-based learning** (Chen et al., 2021) to introduce an open-ended, hands-on project that aims to emulate a real-world situation where students work together to come up with an innovative solution. This design project is used as a vehicle to **motivate peer and self-directed learning, enhance students' motivation, and develop engineering intuition** (Dym et al., 2005). The project also includes opportunities to **develop both research-oriented and workplace-relevant skills** around complex problem-solving, critical thinking, communication, and collaboration. Following issues with workload distribution and overall professionalism, I introduced peer feedback and self-evaluation for both the preliminary and final reports; hence allowing students to uncover critical insights about the quality of their work, and helping them improve evaluative judgement and self-regulated learning (Nicol et al., 2014). To better support student progress in the project, I also introduced project review meetings and various supporting materials and formative assessments for team practices, project management and effective engineering design processes. As a result, project report averages improved by 12%. In particular, "Project management" marks improved from 73% in 2024 to 87% in 2025, and "Discussion" marks improved from 62% to 79%.

> Evidence: "*The project is really helpful to know how to actually implement stuff we learned, which stimulates my interest in Electrical Engineering*" (Student, ESS 2023). "*The project was open–ended, exposing us to engineering design for the first time and challenging our creativity and problem–solving abilities.*" (Student, ESS 2024).

Theme 2: Formative assessment and timely feedback

Prior to 2022, ELEN30009 had: (i) low engagement with weekly recommended problems; (ii) many requests from students for problem-solving classes; and (iii) a need for additional feedback mechanisms both for students individually and the class overall. Therefore, in 2023, I introduced online weekly quizzes within the "Mastering Engineering" platform by Pearson. These problems allow students to practice and solidify the subject content and provide instantaneous self-feedback via multiple attempts and hints. Furthermore, the general data from class performance is used to inform bespoke tutorial classes, which then provide overall class feedback. The feedback here goes both ways: (1) students can appreciate the common misconceptions in the subject (self-regulation); and (2) it informs the subject coordinator of potential areas where students need further assistance. Hence, this provides a mechanism to close the gap between current and desired performance throughout the

semester with **constructive and timely feedback**, building upon the principles of formative assessment and **self-regulated learning** to enhance student learning (Nicol and Macfarlane-Dick, 2006). In 2023, less than 40% of students engaged with these problems (Table 1). To address this, I applied a key SoTL principle: student motivation is often tied to assessments. By linking the weekly quizzes to bonus marks for the mid-term and final exam, I incentivised sustained engagement, leading to over 75% of students engaging with weekly problems (Table 1). As a result of the introduction of formative assessments, more challenging engineering tasks (Theme 1) and collaborative learning strategies (Theme 3), student interaction with staff and other students significantly improved, as outlined in Table 2 and the student feedback below. Final exam scores also improved by 6%, despite longer and more challenging questions in the latest year.

Evidence: "*The weekly Pearson questions are brilliant, it's great to be able to see the standard of knowledge throughout the course. What makes the biggest difference is how these questions are reviewed in tutorial lectures where we can see the intended ways to complete the questions but also how the rest of our cohort is progressing with them*." (Student, ESS 2023). "*I thought the lecturer was very passionate about facilitating students learning as much as possible. He constantly sought feedback and was very aware of areas students struggled with and adjusted his teaching accordingly*." (Student, ESS 2024).

Table 1: Average mark and completion rates for weekly problems in ELEN30009.

	2023	**2024**	**2025**
Week 1	Avg: 89%. Completion: 59%.	Avg: 96%. Completion: 88%.	Avg: 96%. Completion: 86%.
Week 11	Avg: 62%. Completion: 18%.	Avg: 94%. Completion: 70%.	Avg: 88%. Completion: 80%.

Table 2: Student engagement in Ed Discussion (online student platform) for ELEN30009.

	2023	**2024**	**2025**
Total views	9.5k	22.2k	17.2k
Total posts and comments	243	494	389

Theme 3: Collaborative learning and engagement

Prior to joining the ELEN30009, the subject had limited opportunities for (semi-structured) group interaction outside workshop hours and limited lecturer-student interaction outside timetabled contact hours. Thus, in 2023, I introduced optional collaborative workshops, where I assist groups of students in working through suggested tasks in a shared whiteboard environment. These semi-structured and interactive workshops are a great opportunity to meet other students and develop subject proficiency. They have been specifically designed to **build learning communities and foster collaboration** within the cohort (Arkoudis et al., 2013).

Evidence: "*I was amazed by how helpful and friendly Matt was in answering any questions and discussing the course*" (Student, ESS 2023). "*The consultation classes were really good, as it allowed us to have dedicated time to work on problems, I wish more subjects in EEE did this*" (Student, ESS 2024).

On multiple occasions, students have valued my enthusiastic and engaging teaching style, my approachability, and clear explanations. Students were particularly thankful for the number of consultations and additional student resources provided and praised me for genuinely caring about their learning. Students have also often appreciated my efforts for the continued development of the subjects I am involved with, particularly by bringing **students' voices** into my teaching approaches.

Evidence: "*The manner Matheus adopted in delivering the lecture clearly demonstrated an enthusiasm for the subject material and conveyed the sense he truly cares about students' learning [...]. I would emphasize his ability to promote student reflection on how the knowledge they are acquiring can be applied. This encourages students to move beyond surface level.*" (Staff, PRT 2023).

Evidence: "*Matt's amazing encouragement, enthusiasm and teaching capabilities made this subject probably the best one I've had at uni so far*" (Student, ESS 2024). "*Matt's attitude towards providing resources for learning was amazing*" (Student, ESS 2023). "*I don't usually complete end of subject surveys but this subject was great Matt needs to run a workshop on his approach to this subject because it has been a breath of fresh air!*" (Student, ESS 2023).

Evidence: "*The constant improvement through student feedback is definitely appreciated. [...] Matt goes above and beyond by really engaging with the students on ways to improve the subject*" (Student, ESS 2023). "*The best lecturer. Matt takes so much time to craft the subject and it's very clear that he really takes the effort to understand the experiences of students trying to learn the subject*" (Student, ESS 2024).

Theme 4: Helping others and wider impact within engineering at Unimelb

I have contributed to the redevelopment of Advanced Control Systems (ELEN90064) at Unimelb, whereby an individual design project developed by myself and other collaborators promotes **critical thinking and evaluative judgement** through design decisions emulating real-world scenarios and continuous feedback, which improved the student experience, as highlighted in subject surveys.

Furthermore, I have conducted a comprehensive review of all electronics subjects within our department, followed by a proposal of curriculum changes to two of our main subjects, leading to enhanced content alignment and innovative assessment strategies. As the new electronics discipline coordinator in our department, I will continue to strive for structured improvements in teaching and assessment practices that promote the development of technical and professional skills.

Since 2024, I have been the subject coordinator for Autonomous Systems Clinic (ELEN90090), where students work collaboratively to engineer an autonomous robotic system. This open-ended, semester-long design project provides opportunities for students to build technical and professional skills simultaneously, e.g., communication skills, teamwork, self-management, innovation, and ethical conduct. Following constructive alignment principles, learning activities and assessments were designed that included both individually and team-assessed tasks, with a strong focus on the use of authentic assessments related to project work. In 2025, with the increasing popularity of GenAI tools, we introduced students to a structured, 3-tier feedback process experience incorporating AI, peer and instructor feedback in the context of engineering report writing. The combination of these sources allowed students to iterate, reflect, and refine their work more holistically, suggesting that structured, multi-source feedback can promote deeper learning. As a result, the teaching team observed clear improvements in report quality, while student reflections highlighted improvements in their **openness to AI, feedback literacy, and overall student engagement**.

Evidence: "I think that other project–based subjects should be structured in the way this one is. I enjoyed that the assessments were all set so that we could stay on track for the end goal, whilst receiving feedback." (Student, ESS 2024).

Evidence: "I am now more open to AI for projects in the early stages of ideation and to provide feedback, […] being mindful of not becoming heavily reliant on this tool"; "having multiple feedback passes forced me to move beyond surface-level descriptions and ask why each choice was made" (Student self-reflections, 2025).

I am also the current lead on a school-level project to investigate effective teaching and assessment strategies ("best practices") in engineering education, as reflected by the context and experiences in top-ranked subjects within the School of Electrical, Mechanical and Infrastructure Engineering. Once best practices have been identified and benchmarked against the literature, an online repository will be generated, including fact sheets, practical guides, assessment templates, and short videos for engineering academics. In addition, we aim to develop a community of practice to allow staff to learn from each other and provide opportunities for novel teaching practices to be developed.

Conclusion

Over the past three years, I have led a coherent program of innovation to transform electrical engineering subjects at the University of Melbourne through open-ended design projects, structured formative assessments, collaborative workshops, and multi-source feedback processes. These initiatives have simultaneously built students' technical proficiency and professional capabilities. My commitment to **evidence-based practice has delivered measurable, sustained, and transferable outcomes**. The overall subject score for ELEN30009 (out of 5) improved from 4.09 in 2021 to 4.69 in 2023 and 4.52 in 2024, placing this subject within the top 20% in our school for the last 3 years. Student engagement with formative assessments increased alongside project and exam marks. In 2023, I was awarded a "High Commendation In Excellence in Teaching and Learning for Early Career Academics" within our Faculty's Awards. As an early-career academic, I am committed to scaling these evidence-based practices across my institution and the Australasian engineering education community to enhance the quality of student learning.

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