# Education Statement

Education is what creates the longest-lasting impact on students and can help them fulfil their potential. Being able to inspire and guide students through teaching is one of the primary motivations that led me to pursue an academic career on the tenure track. Since joining the National University of Singapore (NUS) in July 2019, I have developed a distinctive teaching practice centered on student engagement, practical application, and continuous improvement through systematic inquiry. This statement presents evidence of my educational contributions across teaching practice, leadership, and scholarship, demonstrating sustained, cumulative impact on student learning outcomes.

## 1. Teaching Practice: Impact on Learning Outcomes

### 1.1 Course Portfolio and Development

Since my arrival at NUS, I have built a substantial teaching portfolio spanning undergraduate and postgraduate levels, with a consistent focus on robotics, artificial intelligence, and embedded systems. I have either designed from scratch or substantially updated every course I teach, ensuring that content remains relevant in these rapidly evolving fields.

**Table 1: Summary of Teaching Portfolio (2019–2026)**

| Course | Level | Role | Class Size | Years Taught | Latest Teacher Effectiveness Score |
|---|---|---|---|---|---|
| ME3241: Microprocessor Applications | UG (elective) | Designed, Co-taught | 15-70 | 2020–present | **4.4**/5 |
| ME5406: Deep Learning for Robotics | PG (elective) | Designed, Co-taught | 50-100 | 2022–present | **4.5**/5 |
| ME5405: Machine Vision | PG (elective) | Updated, Co-taught | 80-150 | 2021–2023 | **4.6**/5 |
| ME5418: Machine Learning in Robotics | PG (elective) | Designed, Solo | 95-150 | 2023–present | **4.8**/5 |
| RB2301: Robot Programming | UG (core) | Designed, Co-taught | 10-75 | 2025–present | **4.8**/5 |

### 1.2 Instructional Philosophy and Strategies

My teaching philosophy rests on three core principles: student engagement and cultivation of their autonomous thinking through active learning, bridging theory and practice, and systematic evidence gathering to improve learning outcomes.

**Student Engagement and Cultivation of their Autonomous Thinking through Active Learning.** I first experienced the power of student engagement during my PhD at the Swiss Federal Institute of Technology of Lausanne (EPFL), where I gave guest lectures and witnessed the fulfilling moment when concepts "click" for students. This experience has driven me to find innovative methods to keep students focused and enthusiastic. My primary vehicle for engagement is the flipped classroom approach, which I have progressively refined across multiple courses. Student feedback across all my courses consistently reflects the positive impact of my approach: students most frequently cite hands-on learning, passion for the

subject, and instructor approachability as key strengths in my teacher effectiveness reports, all natural outcomes of active, student-centered teaching.

In ME5406 (Deep Learning for Robotics), which I co-designed and co-teach with A/Prof. Peter Chen in 2021 to address growing graduate student interest in AI for robotics, I employ a half-flipped format. During the first two weeks of my half of the course, I deliver traditional lectures to establish foundational concepts. Subsequently, students review short, easily digestible videos before class, freeing lecture time for live demonstrations, hands-on coding exercises, and open Q&A sessions. This approach has yielded consistently improving feedback, reaching 4.5/5 in the most recent offering, a finding corroborated by a formal peer observation in AY2024-25, in which two faculty colleagues praised the effective use of interactive techniques and the clear alignment between theory and hands-on practice.

I further refined this methodology in ME5418 (Machine Learning in Robotics), a solo course I proposed and created entirely from scratch through NUS's Centre for Teaching, Learning and Technology (CTLT) Course Design Institute (a course-designing workshop open to NUS faculty) in 2023. The ME5418 course uses a fully flipped classroom format where students acquire theory through pre-class materials from the second week onward, with knowledge checks in the form in weekly online quizzes before class, while class time focuses exclusively on hands-on consolidation through exercises, mini-challenges, and an open-ended final project. The weekly quizzes that I developed engage students around common misconceptions and key theoretical concepts, preparing them to gain a deeper, more conceptual understanding of the week's content. The open-ended final project further enhances students' engagement and autonomy by requiring them to apply concepts to a problem of their own choosing. Student feedback has risen each year, reaching 4.8/5 in 2025, one of the highest scores in my department. Students explicitly identified the flipped classroom as a key driver of their engagement: multiple comments singled out the format as "innovative" and praised how it "greatly allows [them] to learn from practice," with one student nominating the course for a teaching award because it "promotes critical thinking and independent problem-solving." These observations confirm that the design choices directly serve my first core principle of student engagement and cultivation of autonomous thinking.

**From Theory to Practice.** For applied courses, the value of practical assignments cannot be overstated, as they keep students engaged and provide tools needed to fully absorb the subject. This principle became most salient when I was tasked with updating ME3241 (Microprocessor Applications).

Drawing inspiration from one of my favorite undergraduate classes at the University of Geneva, I completely redesigned this course around a final project where students implement their own arcade game for a physical Game Boy Advance (GBA) console. I sourced physical GBAs and cartridges to ensure students experience the highly rewarding achievement of playing their own game on actual hardware. The course is structured around progressively challenging practical exercises that provide opportunities to translate theory into practice, with the final exercise serving as the starting point for their project.

Initial student feedback was low, as the new course was significantly more demanding than previous versions and students could not rely on notes from seniors. In subsequent runs of this course, I started my lecturing with an explanation of the rationale behind this new design of the course, to ensure students are aligned with my objectives and that we can all embark on this journey together willingly. However, feedback has risen steadily as the course matured. In AY2023-24, I achieved a 5.0/5 teacher effectiveness score, the maximum possible. Students consistently note that despite initial difficulty, they are incredibly proud of their final achievement. Many among their final projects consistently attest that student teams went above and beyond minimum requirements to deliver a truly unique, well designed, and playable video game. This demonstrates that appropriately challenging practical endeavors can be instrumental in grounding theoretical content.

**Evidence of Learning.** I believe it is essential to consistently verify that students are grasping the taught material. My courses contain quiz slides at the end of each lecture, allowing students to self-assess their understanding of key concepts before answers and explanations are made available.

I also design assignments as interesting challenges of varying difficulty to build confidence and maintain engagement. I often rely on incomplete initial assignments where students fill in blanks before tackling larger tasks from scratch. Whenever possible, I include problems solvable via different methods to foster individual creativity rather than forcing adherence to standard procedures.

The COVID-19 pandemic enhanced my skills in testing students' true understanding by pushing me to devise final exam questions that could not be easily looked up online and required deeper reflection. I prepare students for such questions through mock exams discussed in class. I always compile summative post-exam feedback, enabling identification of concepts needing clarification while motivating students to refine their understanding for future courses and professional life.

### 1.3 From Design to Impact: A Reflective Account of Pedagogical Innovation in ME5418

ME5418 (Machine Learning in Robotics) represents my most comprehensive effort to design a course following evidence-based pedagogical principles. While developing this course, I participated in CTLT's Course Design Institute in 2023, applying their guidance on active and blended learning throughout. The course serves 100-150 Master's and senior undergraduate students per offering and has become a key elective in the MSc Robotics program.

**Course Philosophy and Learning Outcomes.** The course focuses on Reinforcement Learning (RL) for robotics, but goes beyond technical content to develop students' critical thinking skills. A central pedagogical goal is training students to evaluate when AI/data-driven methods are genuinely needed versus when first-principles approaches are more appropriate. This is a crucial skill for engineers who will need to effectively blend AI and traditional approaches in their work while resisting societal pressure to use AI indiscriminately. The five learning outcomes reflect this dual focus on technical competence and critical judgement:

1. Explain the main classes of Machine Learning methods and their use in robotics

2. Cast a specific robotic control problem into the reinforcement learning framework

3. Implement and train a deep RL agent for a standard benchmark task in Python

4. Describe, diagnose, and debug the standard issues that can hinder agent learning

5. Debate the use of AI/data-driven methods for a given robotic problem

**Flipped Classroom Rationale.** The course follows a fully flipped classroom format based on a conviction that engineers learn better by doing than by listening passively. Students acquire theoretical content through pre-class videos and readings at their own pace, allowing class time to be structured around three activities: addressing questions about the pre-class materials, applying concepts through code reviews and live demonstrations, and working on practical exercises individually or in small groups with instructor and teaching assistant (TA) support. This approach leverages my technical expertise and enables me to offer advanced, hands-on knowledge to students once foundations have been established through pre-class resources. As a result, time and space during class are truly dedicated to the students, for them to get their hands dirty and experience the translation of theory into practice. This philosophy resonates with students: the flipped classroom and hands-on project design consistently rank among the most-cited strengths in ME5418's evaluations, with students describing the course as "one of the best courses" they have taken and noting that the approach "encourages deep learning while ensuring the course remains interesting and accessible." I personally observed that students attend the class enthusiastic and engaged, especially during hands-on activities, leading to more in-depth discussions and interactions in-class, and ultimately to higher-quality projects.

**Assessment Design: Scaffolded Formative Assessments.** A distinctive feature of ME5418 is its heavy emphasis on formative assessments (65% of the grade), designed to provide timely feedback and ensure steady progression toward the final project. The assessment structure includes:

- *Weekly quizzes (10%):* Confirm understanding of theoretical content from pre-class materials, ensuring productive use of class time.

- *Project proposal with peer review (10%):* Teams propose a final project topic of their choice, based on their preferences and interests, articulating the robotic problem, discussing advantages and limitations of conventional approaches, and arguing for a data-driven solution. Proposals undergo peer feedback (guided by the instructor) before final submission for instructor approval.

- *Three intermediate deliverables (15% each):* Individual 2-page reports on each component of a standard RL project: the OpenAI Gym environment, neural network design, and learning agent implementation. These scaffolded submissions ensure students receive timely feedback, which students can incorporate to improve, throughout the course and not only at the end.

- *Final project (35%):* A 5-to-10-page report with full source code and video demonstration, where students apply course knowledge to a robotic problem of their choice.

This scaffolded structure serves multiple purposes: it prevents procrastination, provides multiple feedback touchpoints, and builds student confidence progressively. The intermediate deliverables ensure that by the time students reach the final project, they have already implemented and received feedback on each major component.

**Course Structure.** The 13-week course progresses from foundational concepts (Markov Decision Processes, value function estimation) through deep learning fundamentals (neural networks, deep Q-learning, policy gradients) to advanced topics (distributed RL, model-based RL, multi-agent systems, motion planning, articulated robots). Each week follows the same pattern: pre-class video and readings, pre-class quiz, then in-class code review, demonstration, and hands-on exercises, all centered around a few key questions that students are unpacking over the week. The final weeks shift to hands-on project assistance as students work toward their final submissions.

**Impact on Learning Outcomes.** The open-ended final project has been particularly successful in demonstrating deep learning. Students select their own target problem in robotics, ranging from autonomous navigation to manipulation tasks, and must justify their choice of RL approach over conventional methods to address it. Several teams have produced near-publishable work, demonstrating mastery that extends well beyond course requirements. The requirement to debate the appropriateness of AI methods (Learning Outcome 5) is directly incorporated in their research proposal and ensures students engage critically rather than applying RL indiscriminately.

**Responsive Improvement.** During the second offering of this course, I noticed student difficulties in writing research proposals for their final projects. Rather than simply providing feedback on their writing, I designed and incorporated a 15-minute mini-workshop on research proposal writing (detailed in Section 4.1). The workshop comprised an interactive component where students chose their preferred example between two proposals, followed by a participative mini-lecture on factors defining clear, high-quality writing for project proposals. Based on end-of-semester submissions, students already applied points taught during this brief intervention. I am currently working with NUS's CTLT to assess this intervention's impact both qualitatively and quantitatively, promoting evidence-based education.

**Student Feedback Trajectory.** Scores have risen each year: from 4.1/5 (course) and 4.3/5 (teacher) in AY2023-24 to 4.3/5 (course) and 4.5/5 (teacher) in AY2024-25 and in AY2025-26. These scores consistently exceed departmental and faculty averages, validating both the flipped classroom approach and the scaffolded assessment design.

## 1.4 Systematic Inquiry and Iterative Adaptation

My teaching practice is characterized by systematic inquiry into effectiveness and iterative adaptation based on multiple feedback sources.

**Student Feedback Analysis.** I carefully analyze quantitative scores and qualitative comments after each offering. For example, the initial low scores in ME3241 at 3.1/5 (course) and 3.4/5 (teacher) in AY2019-20 prompted me to reflect on scaffolding and support structures. Subsequent iterations incorporated more progressive difficulty curves and additional support resources, yielding dramatic

improvement to 4.5/5 (course) and 5.0/5 (teacher) by AY2023-24. More broadly, qualitative analysis of student comments across all my courses reveals a consistent pattern: students most benefited from the autonomy afforded by open-ended projects, the immediate applicability of hands-on, in-class exercises, and the opportunity to interact directly with the instructor during class time. These are all features deliberately embedded in my courses to serve the core active learning principles described in Section 1.2. This alignment between pedagogical intent and student experience is, I believe, the primary driver of the consistent upward trajectory in teacher effectiveness scores across all my courses.

**Peer Learning.** I have sought guidance from senior colleagues and NUS's teaching support infrastructure. My participation in CTLT's Professional Development Programme (PDP-T) in 2019-2020 provided foundational pedagogical knowledge. The Developing Rubrics for Assessing Student Learning workshop (2019) improved my assessment design. Most recently, I enrolled in the Reflective Inquiry in Teaching (RITE) Program for 2025-2026 to investigate novel approaches to further improve my courses through small, meaningful iterative improvements.

**Peer Review.** External validation of my teaching practice has also come through two formal peer review exercises. In AY2022-23, A/Profs. Peter Chen and Ilya Sergey observed a lecture of ME5405 (Machine Vision) and noted the clear progression from foundational to advanced concepts, comprehensive exposition with a measured pace, strong command of the subject matter, and effective use of intuitive examples to make technically demanding content accessible to a large cohort of 120+ students. In AY2024-25, A/Profs. Chui Chee Kong and Reza Shokri observed a lecture of ME5406 (Deep Learning for Robotics) and praised the solid preparation and logical flow from theory to application, strong facilitation of student engagement through live polls and interactive questioning, and the currency and relevance of the teaching materials. Both reports were endorsed by the Head and Dean, and the latter concluded that the session reflected a high standard of teaching consistent with our department's emphasis on research-informed instruction, student engagement, and practical application. I have taken to heart the minor suggestions offered in the first review, in particular on maintaining movement during delivery and adding more graphical examples, and continued to refine my practice accordingly.

**Table 2: Teaching Score Trajectory Demonstrating Continuous Improvement. Values are bolded when they are above both the department/faculty averages.**

| Course | AY19-20 | AY20-21 | AY21-22 | AY22-23 | AY23-24 | AY24-25 | AY25-26 |
|---|---|---|---|---|---|---|---|
| ME3241 (Teacher) | 3.4 | 4.0 | **4.3** | 4.1 | **5.0** | 4.4 | — |
| ME5405 (Teacher) | — | 4.3 | **4.4** | **4.6** | — | — | — |
| ME5406 (Teacher) | — | 3.6 | **4.4** | **4.6** | 4.5 | 4.5 | — |
| ME5418 (Course) | — | — | — | — | **4.1** | 4.3 | 4.3 |
| ME5418 (Teacher) | — | — | — | — | **4.3** | 4.5 | 4.5 |
| RB2301 (Teacher) | — | — | — | — | — | — | **4.8** |

*Note: I only included teacher effectiveness scores for classes I co-teach, as course feedback merges feedback over multiple instructors. For ME5418, which I teach alone, I provided both course and teacher effectiveness scores. All details of course and teacher feedback are provided in appendix of this dossier.*

## 2. Educational Leadership: Influence on Peers and Community

### 2.1 Curriculum Development: BEng in Robotics and Machine Intelligence

My most significant leadership contribution has been my role in designing a new undergraduate program. During AY2024-25, at the request of the Dean of the College of Design and Engineering (CDE), I served as a member of the taskforce that designed and proposed the new Bachelor of Engineering in Robotics and Machine Intelligence (RMI). In doing so, I leveraged my expertise in robotics to help us conceptualize a general curriculum that could offer students a "full stack" investigation of robotics over four years, from low-level mechanical design to high-level AI/autonomy.

**My Contributions:**

- I conducted benchmarking research to identify relevant programs at top universities worldwide, providing the team with comparative analysis to inform curriculum design.

- I participated in designing the overall curriculum structure and elective pathways.

- I proposed two entire courses for the new program: RB3301 (Introduction to Machine Intelligence) and RB3302 (Planning and Navigation).

- I was assigned to teach the new course RB2301 (Robot Programming), whose syllabus I prepared in collaboration with Dr. Lai Yan Kai (ECE), designing the hands-on component where students apply concepts through progressive group projects: autonomous obstacle avoidance, path planning, and full autonomous navigation on ROS-enabled ground robots with 2D LiDAR.

The program received Ministry of Education approval and commenced in AY2025-26. The first offering of RB2301 achieved 4.8/5 teacher effectiveness, validating our course design.

## 2.2 Course Updates

In addition to creating new courses, I have substantially updated existing courses to ensure content remains up-to-date within such rapidly evolving fields.

**ME3241 (Microprocessor Applications).** Upon joining NUS in 2019, I completely redesigned the second half of this undergraduate elective, which I co-teach with A/Prof. Hong Geok Soon (2020–2023) and then A/Prof. Chui Chee Kong (2023–2025). I updated content around a newer microprocessor and devised entirely new lecture notes, continuous assessments, and the final project. Drawing inspiration from a formative class I took as an undergraduate at the University of Geneva, I structured the course around progressively challenging practical exercises culminating in students implementing their own arcade game for a physical Game Boy Advance console, an experience students consistently describe as uniquely rewarding. I helped source physical consoles and cartridges to ensure students would have the satisfying experience of playing their own game on actual hardware. Though initial feedback was lower due to increased difficulty, with 3.1/5 (course), 3.4/5 (teacher), and 4.5/5 course difficulty ratings in AY2019-20, scores rose steadily as the course matured, reaching 4.5/5 (course) and a perfect 5.0/5 (teacher) effectiveness despite a comparable course difficulty rating of 3.9/5 in AY2023-24.

**ME5405 (Machine Vision).** After shadowing the previous instructor, I updated the second half of this postgraduate elective (co-taught with Prof. Chui Chee Kong) to introduce modern techniques that have become industry standard. My updates included feature extraction methods, object detection and classification algorithms, and deep learning-based approaches that now dominate the field. These updates contributed to consistently above-average feedback scores, reaching 4.4/5 (course) and 4.6/5 (teacher) effectiveness by AY2022-23. I handed off my materials when stepping back to manage workload, and will resume teaching this course in AY2026/27.

## 2.3 New Course Creation

Beyond updating existing courses, I have created multiple new courses that address identified gaps in the curriculum:

**ME5406 (Deep Learning for Robotics, 2021).** Co-proposed and designed with A/Prof. Peter Chen to address growing graduate student interest in AI for robotics, particularly for our 3+1+1 pathway students. This course has grown to serve approximately 150 students annually and has become a cornerstone of the Mechanical Engineering MSc program.

**ME5418 (Machine Learning in Robotics, 2023).** Proposed and created independently for the new MSc Robotics program, following CTLT's Course Design Institute methodology. This course fills a crucial niche by focusing on the specific intersection of machine learning techniques and robotic applications.

**2.4 Recognition: CDE Outstanding Early Career Award**

In 2023, I was awarded one of three CDE Outstanding Early Career Awards (OECA). While this award recognizes overall faculty performance, I was informed that my outstanding teaching scores and involvement in education were significant factors in the selection. This recognition validates my educational contributions and provides motivation to continue improving.

## 3. Student Supervision and Mentorship

**3.1 Research Student Supervision**

I have supervised a substantial cohort of research students, with several achieving notable success:

**Graduated PhD Students (7):**

| Student | Thesis Title | Duration | Publications | Achievements | Placement |
|---|---|---|---|---|---|
| Wang Yutong | *Learning Scalable Policies for Cooperative and Mixed Multi-Agent Systems* | 2021–2025 | 6 conf., 2 journal | Best Student Paper Award and Best Paper Award on Multi-Robot Systems, ICRA 2025 | ML Engineer, TikTok (SG) |
| He Chengyang | *Team-Inspired Representation Learning for Decentralized Multi-Robot Coordination* | 2021–2025 | 5 conf., 2 journal | NUS Research Scholarship; NUS ORIA (6-month Stanford visit) | Postdoc, Stanford (Prof. Mac Schwager) |
| Zhang Yifeng | *Distributed Reinforcement Learning for Decentralized Traffic Management in Urban Environments* | 2021–2025 | 4 conf., 3 journal | — | Research Fellow in my lab |
| Pamela Wang | *Guided Cooperation for Multi-Agent Teams* | 2020–2025 | 2 conf., 1 journal | SUTD-NUS Joint PhD Scholarship | Gap year |
| Dai Weiheng | *Distribution and Cooperation in Multi-Agent Systems via Reinforcement Learning* | 2020–2024 | 3 conf., 1 journal | — | Algorithm Engineer (LLM-based systems), Didi Global (Beijing) |
| Sun Ge | *Legged Robot Locomotion: Bio-Inspired Approaches to Environmental Adaptation and Interaction* | 2020–2024 | 3 conf., 2 journal | NUS ORIA (6-month EPFL visit) | Research Fellow in my lab, then Algorithm Engineer (Embodied AI), Alibaba (Shanghai) |
| Cao Yuhong | *Context-Aware Learning for Autonomous Robotic Deployments in Unknown Environments* | 2021–2024 | 10 conf., 3 journal | Best Student Paper Award at DARS 2022; Gold Prize at 8th China Intl. "Internet+" Competition | Research Fellow, my lab; then Senior Research Scientist (Robotics), Genesis AI (Bay Area, USA) |

**MEng Students (2):** Maxime de Montlebert, Yang Tianze (2 conf. papers; now PhD student at the University of Georgia).

**Undergraduate Students (2):** I have also mentored exceptional undergraduate students to publishable research, most notably:

**Jeric Lew (BEng):** Worked with me on Generative Models for Informative Path Planning, resulting in two conference papers. Admitted to the prestigious and highly competitive CMU Robotics Institute Summer Scholars (RISS 2024) program. Now pursuing MEng in my lab.

**Mehul Damani (BEng, NTU):** Collaborated on Traffic Signal Control for Optimised Urban Mobility, producing two conference paper and three journal papers. Now pursuing a PhD at MIT.

## 4. Educational Scholarship

**4.1 Case Study: The Reflective Inquiry in Teaching (RITE) Program**

My most substantive foray into educational scholarship is my participation in the Reflective Inquiry in Teaching (RITE) Program (2025–2026), offered by NUS's Centre for Teaching, Learning and Technology (CTLT). This program provides a structured framework for faculty to investigate small, evidence-based changes to their teaching practice. My inquiry focuses on training a key skill, proposal writing, with a broader goal of developing students' critical thinking and long-term learning capabilities.

**Context and Motivation.** I joined the RITE program to build upon the course I created through CTLT's Course Design Institute in 2023 (ME5418: Machine Learning in Robotics). While I am very satisfied with this course, which is the first I fully designed and teach solo, I wanted to systematically investigate how to further improve student outcomes. Through teaching ME5418 twice, I observed a recurring challenge: students struggled significantly with their initial proposal drafts and project reports. Specifically, they found it difficult to articulate their ideas, construct logical narratives, and argue methodically for their proposed approaches while exhibiting appropriate nuance (e.g., acknowledging limitations). This skill, namely the ability to build a coherent argument and communicate it effectively, is crucial not only for academic success but also for students' long-term professional development regardless of their future career path.

**Inquiry Question.** Following the RITE methodology, I formulated a focused inquiry question: *What effect does holding a short in-class writing workshop have on students' ability to articulate their ideas, work, results, and learned lessons in their proposal/report?*

**Intervention Design.** Drawing on James Lang's *Small Teaching* principles, I designed a brief (10–15 minute) in-class intervention that could be integrated into a regular lecture without disrupting the course flow. The intervention comprises two components:

1. **Assessing prior knowledge through exemplars.** Students are presented with two proposal examples (one well-structured, one poorly structured) and asked via *PollEverywhere*, an online polling app: "Which proposal example did you find most convincing?" followed by an open-ended prompt to describe what they found convincing. This activates students' existing intuitions about quality writing before instruction.

2. **Mini-lecture on proposal writing.** After discussing poll results, I present a structured "recipe" for methodical writing, covering:

   – *Proper structure:* Background/motivation (why is the problem important, what are the challenges), existing methods (conventional approaches, their advantages and limitations), and proposed idea (project summary, which limitations it addresses),

   – *Flow:* Ensuring logical progression where each sentence connects naturally to the next, avoiding disconnected ideas or the use of unintroduced concepts,

   – *Jargon:* Avoiding overly technical terminology that obfuscates meaning rather than improves clarity,

   – *Alignment:* Ensuring proposed states and actions actually address the stated problem.

**Implementation.** I implemented this intervention during Lecture 3 of ME5418 in AY2025-26 (29 August 2025). A CTLT education researcher observed the session and documented both the intervention and its reception. The observation notes captured several positive indicators: active student engagement during

the exemplar comparison activity (students discussed with peers before voting, compared their reasoning), visible application of concepts (students were seen analyzing proposals using the taught criteria), and peer learning dynamics. The observer noted that I circulated extensively during class activities, asking probing questions, guiding students on what to try next, and providing individualized support.

Cross-sectional data from the in-class poll (N = 100 students) showed that 75% of students correctly identified the better-structured proposal, suggesting reasonable baseline intuition that the intervention could build upon. Student responses regarding what made proposals convincing included "more technical/specific details" and "more specific details," indicating areas where the subsequent mini-lecture could deepen their understanding.

**Data Collection and Analysis.** To assess the intervention's impact, I am collaborating with CTLT on a pre-post evaluation comparing end-of-course group proposals between AY2024 (before intervention, n ≈ 33 proposals) and AY2025 (after intervention, n ≈ 33 proposals). The analysis employs multiple methods:

- *Quantitative analysis* using the AAC&U Critical Thinking Value Rubric, a validated instrument for assessing argumentation quality, as well as a direct, categorical assessment of proposal acceptability (approved/requires revision)
- *Qualitative reflection* on proposal quality based on teaching assistant feedback
- *Random sampling review* by the instructor to identify specific improvements

CTLT has hired student research assistants to conduct blinded data collection using both cohorts' proposals. The assessments are underway as of this writing.

**Preliminary Outcomes and Dissemination.** I presented a poster summarizing the inquiry focus, intervention design, and preliminary cross-sectional findings at an internal RITE showcase in January 2026. This poster served to gather feedback from CTLT facilitators and fellow RITE participants, helping refine the analytic approach before final write-up.

Based on teaching assistant observations and my own review of AY2025 proposals, students appeared to apply several points from the workshop, particularly regarding logical flow and avoiding undefined jargon. A formal comparison with AY2024 proposals will determine whether these improvements are statistically significant.

**Alignment with Small Teaching Principles.** This inquiry exemplifies several key strategies from Lang's framework: - *Predicting:* Asking students to evaluate exemplars before instruction primes engagement - *Connecting:* Linking abstract writing principles to concrete proposal examples students will soon produce - *Self-explaining:* Having students articulate what makes writing convincing deepens their comprehension - *Practicing:* The workshop provides a model students can apply immediately to their own proposals

### 4.2 Professional Development in Teaching

I have systematically pursued teaching development throughout my career at NUS, building a foundation for the educational scholarship described above:

| Year | Program/Workshop | Focus |
|---|---|---|
| 2025–2026 | Reflective Inquiry in Teaching (RITE) Programme (CTLT) | Educational scholarship |
| 2023 | Course Design Institute (CTLT) | Evidence-based course design |
| 2019–2020 | Professional Development Programme in Teaching (PDP-T, CTLT) | Foundational pedagogy |
| 2019 | Developing Rubrics for Assessing Student Learning (CTLT) | Assessment design |

This progression reflects a deliberate trajectory from foundational teaching skills toward systematic inquiry into teaching practice; moving from "how to teach" toward "how to study and improve teaching."

### 4.3 Innovative Educational Materials

I have developed original educational materials that embody evidence-based pedagogical principles:

**ME5418 Flipped Classroom Resources:** - Complete pre-class video and reading library covering reinforcement learning fundamentals - In-class coding exercises with scaffolded difficulty (e.g., Frozen Lake environment for tabular learning) - Mini-challenges that promote peer learning and friendly competition - Proposal writing workshop materials including annotated good/bad exemplars and the "recipe for methodical writing."

**ME3241 Progressive Practical Sequence:** - Series of increasingly challenging exercises building toward the final GBA game project - Documentation and starter code enabling students to see their work running on physical hardware.

**ME5406 Blended Learning Materials:** - Short, digestible video content for pre-class preparation - Live demonstration scripts for in-class coding walkthroughs - New lecture materials on imitation learning added in response to field developments.

## 5. Future Plans

### 5.1 Continuing Course Development

**ME5418:** I will continue refining the research proposal writing intervention and work with CTLT to formally assess its impact. Based on our findings, I plan to expand this into a more comprehensive research skills component to help students acquire this very crucial skill for their future career.

**ME3241:** I will investigate the AY2024-25 course score drop through student interviews and peer observation, implementing targeted improvements for future offerings.

**RB2301:** As a new course, I will closely monitor student feedback and iterate on the progressive project structure based on the first cohort's experience, as well as feedback from the first run's teaching assistant. As the second run of this course will see a drastically larger class size growing from 10 to 75 students, we are currently working on scaling up the tutorials part of the class to ensure that course quality can be upheld or even improved.

### 5.2 Educational Scholarship

I aim to publish findings from the ME5418 proposal writing intervention study, contributing to the literature on effective pedagogical interventions in STEM graduate education. This will mark my first formal contribution to educational scholarship independent of my technical research.

### 5.3 Leadership Aspirations

Building on my RMI program involvement, I aspire to take on additional curriculum leadership roles, potentially serving on departmental or college-level education committees. My experience designing multiple successful courses positions me well to contribute to program-level educational strategies.

## Conclusion

Since joining NUS in 2019, I have progressed from a novice instructor to a confident teacher, whose effectiveness students consistently rate above departmental and faculty averages. My educational contributions span course design and instruction, curriculum leadership, research student mentorship, and emerging educational scholarship. The consistent upward trajectory in student feedback scores, with recent scores of 4.8/5 for teacher effectiveness, demonstrates that the effort I continue to invest in teaching is yielding tangible improvements in student learning outcomes.

Teaching remains a truly rewarding and stimulating part of my academic work, serving as a constant source of self-reflection that helps me identify shortcomings, challenge myself, and continually learn and improve. I look forward to pursuing this journey of educational development and impact.