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Innovative Tutor Training in Engineering: Cultivating Equity, Diversity and Inclusion

Yvette Debergue[a]; Peter Lok[b],
Education Design Team[a,b]
Faculty of Engineering, University of Sydney
Corresponding Author Email: yvette.debergue@sydney.edu.au

ABSTRACT

CONTEXT

This paper outlines the approach taken to assist tutors in comprehending their rights and responsibilities within the classroom, particularly concerning issues of Equity, Diversity and Inclusion (EDI) at the Faculty of Engineering at the University of Sydney. There had been reports of inappropriate attitudes and behaviours directed toward students by peers and occasionally by tutors. In response, we designed and implemented an evidence-based program which drew from current best practices to promote EDI in STEM. We aimed to affect positive change in the way tutors think and act and have strong evidence to suggest that this goal was met.

PURPOSE

The purpose of the initiative was to enhance tutors' understanding of appropriate actions and responsibilities within the classroom when confronted by outdated viewpoints and inappropriate behaviours by students. The goal was to develop their understanding in modern pedagogical issues uniquely related to challenges in the STEM classroom. Strategies were developed to equip tutors to support students from equity backgrounds, or from diverse communities such as LGBTQIA, and to foster an inclusive learning environment, regardless of students' socio-cultural background or learning background.

METHODOLOGY

A school-by-school approach was used for this program design; each school has a unique student profile requiring tailored evidence-based solutions. While data was collected from the first school from the School Leadership and staff-student liaison meetings, subsequent iterations incorporated student focus groups. A thematic analysis of data resulted in bespoke case studies for discussion topics for the face-to-face sessions.

OUTCOMES

The program ran in three schools in the faculty in 2023. Evaluations have been overwhelmingly positive, with 95% of tutors finding the program worthwhile, would recommend it to their peers, that they had applied strategies to challenging situations in their own classrooms.

CONCLUSIONS

The program empowered tutors to develop their own solutions based on their growing understanding of EDI, immediately impacting students' sense of place in the STEM Classroom, and contributing to positively shape their future workplaces, whether in academia or industry. This program is scheduled to expand to additional schools in semester 2, 2024. While it is anticipated that the initial narrative data may vary, the innovative and evidence-based solutions crafted for the tutors will yield consistent results and ensures longer term sustainability of the program.

KEYWORDS Equity, Diversity and Inclusion – Tutors – Professional Development

Introduction

All new tutors in the Faculty of Engineering are required to undertake the Tutor Development Program, a practical introduction to tutoring and lab facilitation designed to help tutors start off successfully in the classroom or lab. This program has undergone multiple revisions and redesigns in the last three years to make it relevant and engaging for tutors. It has had demonstrable impact and excellent feedback with tutors saying it made considerable difference to their preparedness in the classroom and lab.

There remains, however, a need for professional development for tutors: many will continue to tutor for years and sometimes, for decades. In particular, we need to make sure that tutors continue to develop their understanding of current and contemporary issues in pedagogy as they relate to unique challenges in the STEM classroom (Rekha, 2023). Additionally, the rapidly changing nature of the educational landscape, and the emphasis on preparing graduates for the workplace, means we need to promote inclusion and respect for diversity in our classrooms. Our tutors are the mainstay of this as they perform the bulk of the teaching in many large units of study. The EDI in the STEM Classroom program aims to promote inclusive classrooms where students can learn in safe spaces, feeling respected and included, and foster a sense of belonging in students. It consists of two modules, one online and one face-to-face, designed to prompt tutors to both reflect on their own possible biases and those of their students.

The EDI program aims to promote awareness of the principles of equity, diversity and inclusion but also practical strategies that tutors can take away and use if the situation arises. This promotes psychologically safe classrooms, where students can feel safe, no matter who they are or where they come from. We want students to feel included, no matter their socio-economic or educational background. And most importantly, we want students to feel as though they belong – to the discipline or the degree, the school, the faculty and the university. And to do this, we need to help our tutors understand that there is no one size fits all approach to engaging with students in the classroom or lab. STEM fields have traditionally been dominated by certain demographic groups and we all need to be sensitive to the ways cultural backgrounds might influence students' perceptions of and interactions with other STEM students.

Literature review

The desire to provide comprehensive and sustainable educational opportunities for a diverse student population is a key goal of many educational systems and policymakers around the globe and it has been for some time (Medina-García et al., 2020). EDI means different things to different people, but they often overlap. For example, if we did not have diversity then we would not be having conversations about inclusion and belonging. And exclusion raises issues of the need for equity (Bossu, 2019). There exist many programs for teacher or tutor development in enhancing EDI principles in primary and secondary schools (Salleh, 2023; Devine & Ash, 2022), but not many at the tertiary level. This would appear to indicate that the programs are thought to be working at the lower levels and that therefore there is no need for EDI awareness at a tertiary level. Our data suggest otherwise and that there remains a strong case for EDI training for all teaching staff at the university level. The advantages of EDI training for teaching staff are such things as improved classroom cultures, leading to student success. Creating inclusive classrooms involves raising awareness of student and teacher social identities and allows exploration of barriers to learning such as unconscious bias, microaggressions and fixed mindsets (O'Leary et al., 2020). EDI training encourages the adoption of inclusive teaching practices that are shown to improve academic and emotional development among diverse students (Killpack & Melon, 2016). Teachers who undergo EDI training often report increased confidence in their ability to manage diverse classrooms effectively, as they have the knowledge needed to create positive learning environments, and this in turn leads to greater job satisfaction (Ortla, 2024). EDI programs that

promote the recognition and mitigation of biases such as racial, religious and gender and gender identity discrimination can help teachers to create more equitable classrooms where all students feel respected and included (Debergue & Lok, 2024).

Methodology

In late 2023, we became aware of a number of incidents that occurred over several semesters where students and tutors were reporting issues of gender and gender identity discrimination, prejudice, and bigotry. To prepare the pilot program to be rolled out in semester 1, 2023, we commenced data gathering in late 2022. A school was selected for the pilot program, which we will call School A and so we spoke to the School Leadership Team, the School EDI committee and also some of the school administration staff. What we did not do in this iteration was speak to the students themselves, but we did rectify this in subsequent iterations of the program.

The data we gathered enabled us to understand the attitudes and challenges prevalent in the School A with regards to understanding EDI principles and how to apply EDI in the classroom and lab. These challenges are certainly not limited to the tutors, but the EDI program *is* limited to tutors in its current phase. With the data we had, we wrote a proposal for funding, including budget for filming some short videos, and for students from across the faculty to be involved in the filming.

Design Methodology

We drafted a comprehensive set of discipline-specific scenarios suitable to be filmed, covering some key Diversity and Inclusion concepts: racial discrimination, religious discrimination, and gender and gender identity discrimination in the classroom and lab.

These were designed to sit in an online module in the Learning Management System (Canvas). Each of the topics in the online module had a short reading, a quick 2 or 3 question quiz for participants to check their understanding, and 1 or 2 short videos, each about a minute in duration, covering the key aspects of each topic.

Videos

There are two scenarios for each video: What to Do and What Not to do. Combining different types of instructional examples is considered by many to be a powerful teaching tool. Using examples of negative behaviours highlights the importance of positive actions and can help learners avoid common mistakes. It can promote correct decision making and allows for growth and improvement in the learner (Ormrod, 2019). Examples of positive behaviours, such as Videos of What to Do, can inspire learners and offer guidance on achievable goals. These videos can provide a clear path to follow and reinforce understanding of correct behaviour (Thompson & Yates, 2020). Keeping the videos to one minute or less also means learners are more likely to retain what they have just watched as they are just focusing on one concept at a time without feeling overwhelmed (Perry et al., 2023; Jordan et al., 2019).

In the first scenario, What Not to Do, the ‘tutor’, a paid actor, first addresses a student or a situation very badly, in a racist or bigoted or discriminatory manner, leaving the student very uncomfortable or angry or upset. The next short video shows the ‘tutor’ acting appropriately and modelling more inclusive behaviour: for example, using a person’s chosen pronouns without questioning any aspect of it. In doing this we were emphasising inclusive teaching practices and promoting cultural competence, as well as highlighting unconscious bias.

Readings

The readings were chosen for their brevity and ease of reading, and to complement the videos: a news article on Religious Discrimination in Higher Education; an Australian Govt Toolkit for promoting more girls in STEM; and an extract from a chapter on Diversity in STEM schools by

Laura Brown. We wanted to ensure that readings were accessible to time-poor tutors, while still being relevant and contextual. Industry specific rather than discipline specific, the aim with the readings was to gently introduce important concepts around diversity and inclusion in STEM in higher education that are then reinforced by the quiz questions and the short videos that round out each topic.

Quizzes

We wrote 2 or 3 quiz questions for each of the 3 readings, and this was to encourage tutors to complete the readings and of course, to improve comprehension and retention (Adesope et al., 2017).

Interactivity

We also incorporated elements of asynchronous activity after each set of videos. We used Padlet a digital communications platform, to capture tutors' immediate reactions and thoughts upon watching the videos. This has the added benefit of allowing tutors to thoroughly process the video content before responding and refer back to the videos if necessary. In addition, it promotes metacognitive development in providing opportunities for tutors to reflect in their own learning process and the ways their understanding evolved after watching the videos (Kuhn, 2000). In their comments on Padlet, tutors overwhelmingly condemned the actions of the tutor in the What Not to Do series of videos: Insensitive, unprofessional, inappropriate, offensive were some of the comments made. This strongly indicates tutors were successfully internalising the key messages of the videos.

Face-to-face sessions

In addition to the one-hour online module, there was a one-hour face-to-face session. We gave an overview of the policies and procedures of the university, the message being that our behaviour in the classroom and that of our students is guided by and informed by such things as Work Health and Safety Procedures, Learning and Teaching Policies, Coursework Rules, Assessment Procedures and that there are procedures in place for Bullying, Harassment and Discrimination as well. Lastly this topic also references the Anti-Discrimination Act 1977 (NSW) and other Discrimination Acts and the Australian Human Rights Act of 1986.

The message here is that what we do in our classrooms and labs is guided by the policies on assessment and coursework and by procedures on bullying and discrimination, and they in turn are guided by current legislation.

This sets us up for the next topic: Equity, Diversity and Inclusion. The online module covered specific types of discrimination, but the face-to-face module focuses on the broader challenges of EDI – how do we help our students feel included in class? How do we recognise and respect diversity in all its forms? How do we help those students who need something extra, a helping hand? And what do we do when we witness inappropriate behaviour? We developed a set of case studies, drawn from real life, drawn from reported or known incidents in School A.

Topics included students with disabilities; pronouns; sexual discrimination; general cultural issues of language and student equity issues. Tutors break into small groups to work through a given question and suggest some strategies. This active learning promotes a deeper understanding of material rather than passively receiving information and allows the tutors to pool their knowledge to tackle unseen problems. In this way, students are developing their skills and abilities and putting theory into practice (Davis & Wilcock, 2003).

By giving tutors the strategies and tools they need to thrive in the classroom, we are helping them to help their students feel comfortable bringing their whole selves to class (Moss-Racusin et al., 2014).

Reflection Activities

Each of the modules has a reflection activity built in as well. Tutors were asked to write 250 – 300 words about their thoughts on EDI now that they have completed the online module: whether and how they have altered and the direction they are taking in consideration of what they have just watched and read.

Reflecting on what we have just learned allows us to reinforce that newly acquired knowledge and to place it in context. Reflective practice is a habit of lifelong learning that helps us remain focused on our goal of being our best and most professional self (Gibbs, 1988). Prompts for starting off included:

- I used to do XXXX but from now on I will....
- I used to be sure of XXXXX but now I see that perhaps....

We made it clear that these reflections would not be marked and would only be read by the two convenors of the EDI Program. Completing both reflections also meant that tutors were now eligible to submit a pay claim for the modules.

Focus Groups – A useful category of data gathering

In semester 2, 2023 we delivered the program to two additional schools as well as the original school in the pilot program. However, each school is different, with their own ways of being, and the challenges of one school are not necessarily seen in another school. To uncover these differences, we ran some focus groups in two additional schools, School B and School C. Two groups of 8 students were invited to come and talk about their experiences with their tutors and offered the following information:

School B: students did not feel there was a problem with cultural or gender diversity and that in fact, the incredible diversity in the school was acknowledged and everyone felt included. However, students in the focus groups did feel that sometimes tutors were not always respectful of students' gaps in knowledge or how to assist them.

School C: Students in the focus groups from diverse backgrounds and equity groups said that they felt a lack of inclusive teaching practices, for example, an assumption that all students would know there are dedicated bus lanes in Sydney, whereas this is not commonplace internationally. Students also felt that tutors were not always respectful or understanding of diverse learning backgrounds of student cohorts.

In all, the student focus groups gave us rich data to develop further case studies for the face-to-face session. These included more of a focus on students from equity backgrounds and diverse learning backgrounds.

Implementation

Implementation of the program was relatively straightforward, we worked with the school administration to organise dates and times and room bookings, and we messaged the students with the details of the program. We prefer to offer a range of times for sessions including a lunchtime session and an evening session. The requirement was that the online module would be completed before the face-to-face session and the reality of this was that about ¾ of the attendees in the face-to-face sessions had completed the online module. Of those who still needed to complete the online module, most completed, but a few did not, making them ineligible to submit a timesheet at all.

Results

Feedback was overwhelmingly positive, and we have considerable evidence that we have made a difference to the way that tutors from these schools understand their role and responsibilities in the classroom and lab. Both qualitative (formal and informal) and quantitative evaluation measures strongly indicate that the program met the needs of tutors and individual schools.

Surveys were administered to each school after the face-to-face session and the results were overwhelmingly positive.

School A: Program delivered in March 2023 and September 2023

A Qualtrics survey was administered after the face-to-face session

- Over 60% of participants found the program worthwhile
- 75% would recommend the program to their peers
- 83% thought the program was delivered at the right pace.

The EDI program has two compulsory reflections and while the individual submissions cannot be shared for privacy reasons, some general themes can be shared.

Overall, participants revealed their gratitude for developing a greater awareness of: treating students as individuals, inclusion in the classroom, unconscious bias, what to do if a student is being disrespectful.

However, the standout topics in the reflections for School A were gender identity and using people's chosen pronouns. Participants were genuinely grateful to have been given this information as no one had ever explained this to them explicitly before they attended the EDI in the STEM Classroom program. Overall, School A reported, through their school leadership team, reduced rates of reporting incidents of harassment and discrimination in the classroom in semester 1, 2023 and increased confidence of tutors to deal with issues when they arise. Anecdotally, an administration officer in School A also reported the following after the EDI training:

- *Less reports/complaints of inappropriate comments.*
- *More conversations on creating EDI committees within the school (from students/tutors).*
- *More honest conversations on issues within the school as a whole.*
- *Two of our students who were most vocal on the EDI issues said they felt they could step back in pushing for more EDI focus; they could see active change taking place.*
- *A number of tutors asked for this sort of training to be available for all academics.*
- *One tutor even told me he was asked to discuss EDI issues in a job interview and the training helped him with his answer.*
- *Beyond helpful!!*

School B – Program delivered in August 2023

A Qualtrics survey was administered after the face-to-face session.

- 100% of participants agreed/strongly agreed they found the program worthwhile
- 100% of participants agreed/strongly agreed they would recommend the EDI program to their peers
- 100% of participants agreed/strongly agreed the program was delivered at the right pace.

Their main takeaways were learning about subtle biases, dealing with difficult students, and diverse students from equity backgrounds.

School C - Program delivered September 2023

A Qualtrics survey administered after the face-to-face session

- 100% of participants agreed/strongly agreed they found the program worthwhile
- 100% of participants agreed/strongly agreed they would recommend the EDI program to their peers
- 100% of participants agreed/strongly agreed the program was delivered at the right pace.

Main takeaways were the importance of recognising diversity among students who may look very similar, pronouncing peoples' names, and creating a sense of belonging.

Discussion

Across all three schools, 60-100% of participants found the program worthwhile and would recommend it to peers. There was also improved awareness of important topics that engineers will need in careers, treating people as individuals and respecting diversity, inclusion in the classroom which will lead to inclusion in the workplace, unconscious bias, gender identity, and using people's chosen pronouns. We saw positive behavioural changes: School A reported reduced incidents of harassment and discrimination, increased confidence in tutors to handle issues, and more open discussions about EDI issues. We also saw practical application of newly acquired knowledge as well: one tutor reported that the training helped in a job interview when discussing EDI issues. Another from School B said that he had an issue in a lab where he was able to draw on this EDI training to resolve the situation amicably. There was also consistent positive feedback on the program although that did vary from school to school. All schools reported high satisfaction with the program content and delivery pace.

Implications for Engineering Education:

1. Enhanced classroom environment: The increased awareness and skills gained by tutors can lead to more inclusive and respectful STEM classrooms, potentially improving student engagement and learning outcomes.
2. Addressing systemic issues: The program appears to be effective in tackling unconscious biases and promoting equity, which are critical for creating a more diverse and inclusive engineering education ecosystem.
3. Professional development: The training provides tutors with valuable skills that are increasingly important in both academic and industry settings, preparing them for broader professional responsibilities.
4. Improved student support: Enhanced understanding of diverse student backgrounds and needs can lead to better support for students from various equity backgrounds, potentially improving retention and success rates in engineering programs.
5. Cultural shift: The program seems to be influencing broader conversations about EDI within engineering schools, which could lead to more comprehensive and sustainable changes in engineering education culture.

These results strongly indicate that targeted EDI training can have a significant positive impact on the engineering education environment, promoting a more inclusive and respectful environment and a more effective learning experience for all students. While this program was targeted at tutors in the Faculty of Engineering, there are wider implications for continuing academics everywhere. Opportunities to use more inclusive language and examples, diversity in case studies, greater awareness of unconscious bias could lead to improved assessment methods, a greater emphasis on strength of diversity in teams and continuing development of soft skills such as empathy, communication and cultural competence.

Limitations

It was only 3 schools out of 7 and not all tutors attended the program. Those who chose to attend may have been more favourably disposed to EDI topics, and potentially skewing the results. Targeted long-term evaluation of the program was not consistent. Data is self-reported, which means it is subject to social desirability bias, especially for sensitive topics like EDI. We note the chosen method did not include control groups so we cannot take all the credit for making a difference.

Reflections on the program - what did we learn?

When we first established the program, I (first author) had assumed that the issues in School A were widespread across the faculty, perhaps even all 7 schools, but in fact, they are not. What came to light however, through the student focus groups in Schools B and C, was that there were other challenges that students and tutors were facing, also centered on the student experience. Treating students differently because of their different learning backgrounds is also potentially discriminatory in nature, although not subject to current legislation. The overwhelmingly positive feedback across all three schools suggests that targeted EDI training can have a significant immediate impact on engineering educators' awareness and attitudes. This indicates a strong potential for improving the learning environment in STEM fields. The enthusiasm and willingness to learn about EDI topics among participants suggests a readiness for change within engineering education. In future programs, we hope to address the limitations identified, such as the voluntary nature of attendance, more long-term evaluation of the program, and improved data collection. This would provide more robust evidence of the program's effectiveness.

Conclusions

It worked, and results are extremely encouraging. The data strongly indicate that across a number of measures, the program has been a success. Subsequent roll out to the 3 schools involved in the pilot program and the additional 4 schools in the faculty in 2025 will involve finetuning some parts and repeating others where we have demonstrable evidence of success.

Our objective was to help tutors understand their rights and responsibilities in the classroom and we believe we met that objective and went beyond by helping tutors understand different viewpoints and perspectives.

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