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Inclusivity at the Coalface: Barriers Faced in Capability Development by Sessional Tutors

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ABSTRACT

BACKGROUND & CONTEXT

Engineering classes often remain non-inclusive across many student characteristics and much remains to be done to improve the experiences of all students in our discipline. A stakeholder group who has not yet been well engaged in this area are tutors, who deliver a large proportion of face-to-face teaching in engineering. These tutors have an oversized impact on the educational environment and experience for students, often with minimal or even zero formal development in this practice. We held workshops for tutors, on the moral and legal imperatives to creating an inclusive environment for students, and how structural, symbolic, and inter and individual actions reinforce hierarchies.

PURPOSE OR GOAL

This research investigates the initial barriers faced by tutors when learning to create inclusive educational experiences. This is to inform the identification of threshold concepts, namely the most transformative and therefore troublesome learning, on which to focus in future development. Our primary research question is “What are the troublesome concepts in tutor education about inclusive education in engineering and IT?”.

APPROACH OR METHODOLOGY/METHODS

We collected data through direct session observations, and an end-of-session questionnaire collecting both quantitative and qualitative responses. The observations focused on participant engagement and overall behaviour during different components of the development session. The questionnaire targeted a more comprehensive response to challenging topics. These data were analysed in the phenomenographic tradition to investigate participants' experiences. 4 semesters of development with n=536 participants have undertaken the workshop.

ACTUAL OR ANTICIPATED OUTCOMES

Our analysis so far indicates that participants fell into broad categories of response types, including mimicry, deep engagement, and resistant responses. Initial concepts arising as troublesome centre on resistance to the identification of non-inclusive situations or outcomes, and the ability of the tutors to have an impact on their teaching environments.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

Our work provides a strong contribution to understanding an understudied cohort with an oversized impact on the student experience. In identifying these barriers, professional development for tutors – a largely under-resourced activity – can target the most impactful elements of their learning.

KEYWORDS

Sessional Tutors, Inclusive Teaching, Threshold Concepts.

Introduction

Inclusive educational experiences in which all participants enjoy a sense of belonging with psychological and cultural safety is increasingly recognised beyond a desirable goal for its own sake, but as an enabler of better educational outcomes (Kefallinou et al., 2020). Achieving such experiences remains challenging, with significant research interest in various aspects of enablers and barriers. Many contributing factors, and stakeholders with diverse backgrounds and roles, lead to solutions and improvements sharing in this complexity. This research targets sessional tutors, a type of teacher which simultaneously provides the majority of in-person facilitation of teaching in our context, while also being the least studied and least developed (Hattam & Weiler, 2024; May et al., 2013). We look specifically at the barriers experienced by these sessional tutors undertaking professional development in inclusive teaching practices, in a large urban research-intensive university in Australia.

We addressed the primary question: “What are the troublesome concepts in tutor education about inclusive education in engineering and IT?”

Sessional tutor as a teaching position is an increasingly fluid one, encompassing roles such as teaching assistant, tutor, demonstrator, facilitator, and more. In this paper we use the term ‘sessional tutors’ as this is commonly used and understood in our national context.

Background

Inclusivity and the Engineering Education Context

Engineering education is a field which continues to experience significant issues along several axes of diversity of students, from recruitment, to outcomes, to overall experience. Gender, ethnicity, socio-economic status, and more – there are myriad ways in which students can experience marginalisation. There is evidence that this negatively impacts more than just the marginalised group, with benefits to both the overall experience (Capp, 2017), as well as learning from and learning to work with diverse teams (Ihsen & Buschmeyer, 2007). Beyond the confines of the campus, we have extensive evidence that this lack of diversity has detrimental effects on the products and services to which these graduates contribute (Perez, 2019).

These diversity challenges have proven to involve significant complexity, and potential solutions are not all-encompassing. Rather, they might target access, or accommodations, or language, or specific aspects of teaching. A key component of these involves professional development for teaching academics, such as targeting in-class facilitation behaviour, class design, or use of educational technology (Hitch et al., 2015). It should be noted that these challenges to student belonging are mirrored in challenges for academics, with similar axes experienced as challenges, where potential solutions may target broader culture and include both students and academics as intended beneficiaries (Anderson et al., 2020).

Sessional Tutors and Their Development

Likely due to the temporary and low-visibility historical nature of their employment, sessional tutors have experienced far less professional development in teaching than permanent academics. In addition, they are an understudied cohort overall, both in terms of their development as well as their impact on the student experience (Hattam & Weiler, 2024). This trend has shifted in recent years, with significant early findings indicating two critical aspects for this research. First, that sessional tutors perform a significant amount of, and perhaps even the majority of, education in Australia, including in engineering (Dart et al., 2024; May et al., 2013). Second, that sessional tutors have a significant impact on the experience of their students (de Lima et al., 2024). This establishes sessional tutors as a cohort in need of understanding if we are to address the challenges with inclusivity and belonging in engineering education.

While there is significant research on inclusive teaching and diversity in engineering education, and a nascent but growing body of work on sessional tutors, there is however a dearth of research on the intersection of these. The bulk of extant research on sessional tutors focuses on the development of skills involved (of which inclusive teaching is a part, but not a focus), as well as career progression, and their own inclusion and sense of belonging. Thus, this work largely relies on the application of existing research from broader engineering education and practice to the sessional tutor context.

Recent activity in the literature has made early inroads into questions in this domain. The design and early impact of related interventions in engineering education have been reported (Agresar et al., 2019; Fong & Ciston, 2020; I. Paredes et al., 2023; I. J. Paredes et al., 2024). Of note most identified examples were limited in evaluation to participant affective responses, with Agresar et al. (2019) also employing focus groups to identify participant responses to the development activities, focusing on their interpretation and application of inclusive teaching. (de Lima et al., 2024) identified and empirically measured the significant impact sessional tutors have on the inclusivity in engineering education. Much of the practice in this space appears to be founded on grey literature translating broader tertiary education material to a sessional tutor and/or engineering context, e.g. Saunders & Kardia (1997).

While this initial prior work supports the observed need for both research and development in this area, our understanding of sessional tutors and inclusive teaching remains limited.

Threshold Concepts

Threshold concepts theory provides a framework for focusing curricula on transformative, integrative concepts. Threshold concept theory has been used to examine traditional fields such as economics (J. H. F. Meyer & Land, 2003), and also professional identity and more (Flanagan, n.d.). Threshold concepts are commonly transformative, irreversible, integrative, bounded, and troublesome (J. H. F. Meyer & Land, 2005, p. 1) - with 'troublesome' emerging as both a key defining characteristic, as well as being useful for identification (Flanagan, n.d.). 'Liminality', or transitioning through a liminal space where transformation has yet to take hold and integrate learning is another key aspect introduced in later extensions to the theory, within which 'mimicry', or parroting terms and skills without yet understanding them will be relevant in the work of this paper (J. Meyer & Land, 2006).

Threshold concepts allow for approaches to teaching which target the most pivotal moments for learning. Given the severe complexity inherent to inclusive teaching coupled with the constraints of sessional tutor professional development, we sought to focus on threshold concepts to optimise the impact of training on tutor practice and the eventual student experience.

Methodology

Intervention

The intervention under study is a workshop on inclusive classes, which is a paid, mandatory component of a larger professional development program for all sessional tutors (now 'small-class teachers') in the engineering faculty of a large urban research-intensive university in Australia.

Institutional context

The inclusive classes workshop is delivered by a faculty team of engineering education research and practice experts – a departure from much of the literature examined above where development is provided either by central institution education development centres or by direct supervisors. Multiple sessions are run at the beginning of each semester.

The original motivation for adding the workshop to the development program was to address key strategic priorities for the faculty – improving the student experience, particularly as this

relates to a sense of belonging. This was also in a context of dissatisfaction in the faculty, institution, and broader public on inclusivity in both engineering and university teaching in general, with several reports and inquiries indicating the higher education sector and engineering specifically had issues in this space to address.

Key among these were the Australian University Accord (Australian Government, 2024), developed as a significant review of higher education in Australia which includes significant focus on inclusivity and key characteristics of interest, and updates to local legislation placing a proactive duty on universities among others to provide equal opportunity and access. While these were not solely responsible for motivating improvements to inclusivity, they did and continue to set the legal imperative which pairs with the moral imperative motivating this intervention, and are referred to explicitly with participants.

The constraints on professional development for our sessional tutors are severe. Short tenure of employment means the majority of sessional tutors are very new, with minimal teaching experience. Time and resource constraints place pressure on the length and frequency of development, as well as opportunities for follow-up or review. The most significant impact of this is that the workshops are 'engineering generic' – that is, they are delivered without the ability to tailor to the specific subjects and class types of each participant, which will vary significantly in size, type, diversity of students, etc.

These constraints further apply outside the workshop as well – the participants are subordinate teachers working with varied inputs and levels of control from their supervisors, who will themselves vary heavily in their level of expertise, focus, and available time for designing inclusive classrooms. This means the workshop participants are often limited in what aspects of their teaching they are able to influence and how. Some may be fully under their control, (such as in-room facilitation behaviours), some may be limited in control (such as activity design), and some may be entirely out of their control (such as subject learning outcomes).

In light of these motivations and constraints, the focus of the workshops are on providing participants with 1) an understanding of the context they are working within, including the legal and moral imperatives that should inform their actions, 2) a grounding in theories of inclusivity which can be understood to an effective level quickly and convincingly, and 3) a set of tools which can be applied to their own contexts to improve their teaching and thus the student experience, within the scope of influence they find themselves within.

Theoretical Inputs

The workshops leverage 3 key topics drawn from the research literature on inclusion:

- Unconscious or implicit bias (Agarwal, 2020)
- Marginalising hierarchies (Acker, 1990)
- How these hierarchies are reinforced (Acker, 1990)

Unconscious or implicit bias is introduced as a feature of normal human behaviour – not something that can be eliminated, but rather something that must be recognised and designed for to avoid negative outcomes as a result. Participants (and their students) may implicitly associate certain characteristics with certain roles, capabilities, responses, etc., leading them to make decisions based on these implicit associations rather than rational thought (Agarwal, 2020).

Marginalising hierarchies and how these hierarchies are reinforced are both drawn from (Acker, 1990), but heavily translated to the engineering education classroom context rather than an engineering company. Masculine characteristics may be correlated to assumed technical competence, while feminine characteristics may be correlated to organisational or administrative rather than technical roles in teamwork. Culturally foreign students may not understand local references, students who are first-in-family may not engage well with institutional support services, etc.

Workshop Design

The workshop duration was 2.5 hours, face-to-face. Two to four facilitators lead a Gradual Release of Responsibility (Salehomoum et al., 2022) model with participant co-creation of learning. This pairs an overall structure of

- *explain* (facilitators explain context, motivations, and theoretical groundings),
- *model* (facilitators embed best practice for inclusivity in the workshop design), and
- *practice* (participants practice inclusive design for their own teaching)

with ongoing participant input on their own experiences and table discussions.

The explanations focus on the theoretical groundings detailed above. Modelling involves several designed aspects of the workshop that participants can translate into their own teaching context. For example, using a 'talking piece' to empower and visualise equitable participation in group discussions, systematic approaches to whole-class input to mitigate bias in respondent selection, use of name tags and microphones to facilitate communication. The practice components initially involve drawing out participant perspectives such as what might have influenced their own implicit associations, and their interpretations of non-inclusive simulation/roleplay. It then moves into translating their understanding into designs and intentions for their future teaching.

The workshops were first held in Semester 2, 2023, for all sessional tutors in the faculty. It has been held subsequently each semester for new sessional tutors. In the first semester, class sizes were approximately 70-90 with 4 facilitators. In subsequent semesters the class size was approximately 30 with 2-3 facilitators.

Methods

This work is a component of an ongoing iterative design and research process – so while questions of e.g. eventual student impact are of intense interest; they are not the scope here. Instead, we are investigating the barriers experienced by participants in these workshops, which may represent or be associated with threshold concepts, with the intention to use these to improve the efficiency and effectiveness of the workshop as an intermediate step. We used two types of data collection through the 4 semesters the workshop has been running – an end-of-session questionnaire, which has been updated through the project, and facilitator observations.

Survey

Participants completed the questionnaire on paper, during the final 10 minutes of the workshop. This maximised the response rates, and ensured compliance with legal requirements involving assigned work (of which completing questionnaires sits in a grey area). While the questionnaire also included general operational and affective likert questions, this research analyses those open-ended questions relevant to the research question. The questionnaire underwent major revisions after the first iteration, and a minor tweak just prior to the most recent run. Each version of the questionnaire concluded with an opt in/out of research participation.

The first version of the questionnaire **1** presented four relevant open text questions (in addition to general operational and affective likert questions outside the scope of this paper):

1. What was the most significant new thing you learned in this workshop?
2. What do you plan to do to enhance inclusion in your classes, as a consequence of this workshop?
3. Is anything from the workshop that was concerning? If so, what?
4. Any other comments?

The second version **2a** presented 6 open text questions, 2 with paired quantitative preceding questions:

1. Have you noticed any of the inclusivity issues in education presented in today's session (Yes/No)
2. If yes, can you describe what it was you noticed and what impacts it might have?
3. Did you notice it as an issue at the time, or did this session lead to you reconsidering it?
4. Did you find anything from this workshop concerning? If so, what?
5. Were the theories presented in today's session useful to you? (Likert)
6. Please explain your response
7. What do you plan to do to enhance inclusion in your classes?
8. Are there any other comments you would like to add about your experiences?

This was slightly updated in **2b** to address possible confusion in question 1, changing it to:

1. In your prior experience as a student of teacher, have you noticed any of the inclusivity issues in education presented in today's session?

Observations

The facilitators observed participant engagement in the active learning components of the workshop, as well as the nature of the questions from the workshop participants. Although this observation was informal, it yielded key design insights which were incorporated into the workshop, and was used to triangulate the survey data during analysis. The observations were supported by a facilitator debrief session held after each workshop, and then a reflective review after each semester.

Analysis

The open responses were analysed following the phenomenographic tradition of familiarisation, categorisation, and contrast (Åkerlind, 2005). Each response as a whole (as in, per-respondent rather than per-question) was considered in contrast to others to identify commonalities. These yielded 'archetype' overall responses by participants which allowed deeper analysis of individual answers characterised as participants being within the 'liminal space' from threshold concept theory (Meyer & Land, 2006).

The debrief sessions and reflective review, along with the survey responses for each workshop, fed an iterative redesign process each semester to improve the sessions and target the intended outcomes. As the archetypes in the survey responses came into view, these were reinforced through facilitator observations of similar patterns in voiced answers to questions and group discussion participation.

Results & Analysis

A total of 559 sessional tutors have undertaken the development workshops, with $n=536$ consenting to participate in this research. The questionnaire has been updated over the iterations the workshop has been delivered in, with these updates and associated participant counts detailed in Table 1.

Table 1: Participant Counts

Semester	Questionnaire version	Participants
2023 S2	1	$n=227$ (consenting of 233 attendees)
2024 S1	2a	$n=138$ (of 147)
2024 S2	2a	$n= 88$ (of 90)
2025 S1	2b	$n=83$ (of 89)

Categories

Response archetypes fell into 5 broad categories, with exemplars from version 1 provided below:

- Participants who did not engage with the question(s). This was not always consistent across the questions, with some respondents being surface-level across the board:
 - 1. *Good discussion and talks we had in our group and whole [room]. It was great.*
 - 2. *I will practise all lessons I learnt at this workshop*
 - 3. *Nothing*
 - 4. *Thanks a lot. Absolutely useful for me.*
- while others deeply engaged in some of the questions but not all:
 - 1. *Not singling out students who are 'minority'. As a female in IT I often mention the fact women are the minority - this furthers the 'male vs female' in the mentality. Also not singling out people who are not working in groups - simply saying 'hey, join this group' so the students can avoid having to ask.*
 - 2. *Encourage all students to participate in discussion even if they don't need it to achieve the task. Reach out privately to my student of poor vision to see how I can support him.*
 - 3. *N/A*
 - 4. *N/A*
- Participants who engaged with the questions, but where it was indistinguishable between mimicry and understanding, i.e. the words of the workshop mirrored back directly:
 - 1. *There are many types of discrimination / non-inclusive cases than I have thought of. While I mostly considered more 'direct' discriminating activities, I learned that structures, languages, individual actions that can be affected by unconscious bias.*
 - 2. *I'll consciously be more inclusive - especially in terms of gender, nationality and educational background*
 - 3. *-*
 - 4. *The talking piece was a great idea to encourage everyone on the table to share their thoughts.*
- Participants who responded deeply to the questions and showed an understanding of the workshop topics:
 - 1. *I have been aware of unconscious bias due to my psychology background, but I've never think about it in the context of engineering education. This workshop helps me to use the knowledge and make classrooms better. Thanks! (I've also realised my unconscious bias during this workshop)*
 - 2. *Be aware of symbols, structures, interpersonal interactions and individual actions, then apply the knowledge to control the unconscious bias and promote equity depending on the context.*
 - 3. *No, it's all good.*
 - 4. *Hope that more non-gender examples can be given, e.g. Race, background etc. But I understand that gender is the most pronounced in engineering classes.*
- And a final category showed resistance to some aspects of the workshop:
 - 1. *How much teaching differs from what happens in the workplace, people in the workplace (as well as other activities) focus on efficiently and effectively solving problems, and cannot afford to have valuable knowledge, skills and expertise NOT put to work.*
 - 2. *(see item 1) I cannot afford to have students sitting in class without applying their knowledge, skills and expertise to work together in learning the subject matter.*

3. Too many strawman arguments.
4. See #3

These archetypes of responses have remained consistent throughout the iterations subsequently conducted – we use the terms **disengaged, partially engaged, surface/mimicry, deep, and resistant** responses. Disengaged responses were discarded from analysis, and partially engaged responses only considered the engaged portion. Analysis of surface/mimicry responses served to reveal participants' ability to identify what the workshop was looking for – that is, in no identified cases were participants mimicking something that was not what the workshop intended to be a learning outcome. Analysis of partially engaged and deep responses indicated gaps or weaknesses in the workshop design, such as a desire for focus on culturally and linguistically diverse students as several participants indicated these as the most relevant marginalised group of concern, as well as motivating the questionnaire design changes. Analysis of both the deep and partially deep responses focusing on the 'concerning' responses, and the overall resistant responses, however, is where this work anticipates evidence for troublesome knowledge, or the barriers to capability development which we seek to identify.

Troublesome Topics

Several themes emerged in the data, converging on troublesome topics experienced by the participants. We detail two prominent topics emerging from this analysis.

Resistance to Identifying Non-Inclusion

Resistance to identifying non-inclusion was the most common theme of responses indicating troublesome knowledge, with several cases of circumstances that could be interpreted as non-inclusive being considered by workshop participants as acceptable, including the exemplar for the 'resistant' response category given above.

In labs, students intend to take up work they want to do instead of discussing. Benefits including save of time and people who choose first is more likely to do well. But at the same time it take away the opportunity from people to work on other parts of the prac. Sometimes the boundary about whether something is non-inclusive is super unclear. Eg. in the scenario I mentioned in the previous part. I do consider student's job is to do well in a subject, this include specialise at something, the don't have to be specialist of everything, in the end it's all about collaboration and work on the parts you are good at (not your weakness)

I think it's possible that tutorial inclusion might not always be beneficial to the student actually. So as the last person who held the mic said, people can be introversial. What is the benefit of being inclusive in the perspective of student. Is it really worthwhile? Or do we really need to force them to participate too actively with other people?

Sometimes I think we may be overthinking things – e.g. maybe a particular male might enjoy/be good at a technical role and that's what he wants to do.

This resistance appears to be a clear symptom of troublesome knowledge that indicates these participants have encountered a threshold concept but have yet to master it. In the first example, it is clear the participant is not yet engaging with the idea that students' behaviour will be influenced by the circumstances of the classroom and wider contexts, and that 'specialisation' as they describe can be the product of non-inclusion rather than free choice. The second example is beginning to grapple with ideas of learning outcomes interacting with student preference, but not yet incorporating ideas of equitable opportunity with that complexity. The third example is similarly confusing free choice a student may happen to make, and symbols, structures, or behaviours which inhibit those free choices – and critically how free choices made by some may form part of those behaviours which inhibit the free choice of others. In each case, the students appear to have stepped up to the liminal space but have yet

to cross it, indicating that this is very likely a symptom of one or more threshold concepts in this domain.

Concrete Application

Difficulties in translating concepts to practice were raised in responses, aligning with observations from Agresar et al. (2019).

Could be quite useful but currently my tutor group is very small with voluntary attendance and other options for students. Classes don't have the size and diversity at present. (Average size is 3 students per session).

I need to think about the way to gather more participation in the class. My subject involves a lot of thought-processes and some time it's difficult to encourage the participation. Few students are more likely to do so.

I learned about different existing issues with inclusiveness. However the workshop also acknowledge it is impossible to turn someone totally gender inclusive in a 3 hour workshop.

These responses, while similarly identifying gaps in knowledge, are less specific in the concepts the students are approaching. Translating the general topics of the workshop to their specific contexts may be the barrier they are encountering, or understanding the non-inclusive aspects their contexts themselves. This is troublesome knowledge that motivates study of their application of inclusive practice, beyond the initial workshop stage.

Limitations, Future Work, and Conclusions

This work is an initial foray into this domain, and involves significant limitations in its implementation that motivate future work. The nature of the workshops is a time-bound snapshot of learning. It is likely that better insights would be gained into barriers and participants traversing the liminal space through more longitudinal views on both their learning and their implementation into practice.

The questionnaire-based data collection is limiting. While the method led to good breadth over the cohort for responses overall and provides a foundational springboard for future in-depth study, disengaged responses did not provide the rich data that is most valuable for this type of research, and even deep responses remained tightly-scoped snippets of insight. More in-depth techniques such as interview and observation of practice are needed, albeit with increased challenges of selection/participation bias.

Social desirability bias is a concern. While we are confident that the anonymity controls in place allowed for some participants to feel empowered to respond openly, we acknowledge that this will not be the case for all, limiting results. The nature of surface/mimicry responses aligning to the workshop's desired learning outcomes does provide confidence that participants experiencing this bias were at a minimum aware of what the workshop 'desired' them to learn.

A more existential potential limitation for this work is the intersection of 'capability' with 'belief' that this topic entails. This does not limit the ability of the work to answer our research question, but rather limits the potential applicability of the findings to practice. A participant may understand a given topic, but may be ideologically opposed to it. This will appear in the data and may be interpreted as the participant dealing with troublesome knowledge and thus being in the liminal space, without this being a true threshold concept.

Notwithstanding the above potential limitations, the findings yield an initial candidate set of troublesome concepts for sessional tutors, which with further work may yield threshold concepts to improve their capability development. This is a critical time for this cohort of engineering educators, and the potential impact on the student experience is significant. Targeting limited professional development towards concepts such as these in the most effective way is pivotal for realising this potential impact.

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