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Preparing International Graduate Students to be Teaching Assistants in a Student-centred Learning Context

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ABSTRACT

Graduate students are often engaged as teaching assistants in higher education but lack the necessary pedagogical experience and training to effectively facilitate student-centred learning of undergraduate students. Lack of training can hinder and limit their students' learning. The gap here is to identify effective strategies and approaches to prepare graduate students to facilitate student-centred learning. This paper reports an attempt to prepare international graduate students to be teaching assistants in a university in Singapore that adopts student-centric learning. It examines the graduate students' *apriori* teaching and learning experiences, teaching orientation, and reflections on learning to teach. Data from 66 graduate students were analysed using mixed methods. The results showed variation amongst internationally educated graduate students in their prior experiences of learning, which was reflected in their past teaching experiences. Generally, participants reported higher exposure to teacher-centred teaching practices and practices of the same. The students' pre- and post- teaching orientation indicators and reflections showed that the students had more acceptance of the student-centric learning methods by the end of the short course and were cognisant of when to use teacher and student-centric teaching methods. This study demonstrates one possible approach to preparing international graduate students to facilitate effective student learning, and emphasises the need to understand graduate student profiles in preparing them to be teaching assistants.

Keywords: International graduate students; graduate teaching assistants; higher education; student-centred learning, teacher preparation

There is a growing trend of engaging graduate students as teaching assistants for undergraduate students in many universities internationally (Di Benedetti et. al., 2022; Nasser-Abu Alhija & Fresko, 2020; Park, 2004). Graduate Teaching Assistants (GTAs) play a supportive role and assist university faculty members in taking care of administrative duties, helping to prepare lecture notes, tutoring, supervising lab/practical sessions, and marking formative homework assignments so that faculty members can focus more on other critical aspects of teaching (Di Benedetti et al., 2022).

Traditionally, GTAs are engaged based on their disciplinary expertise and experience. Requirements for teacher training or certification were not known in the past (DiPietro & Buddle, 2013). However, there is a growing emphasis on teaching quality (Austin & Wulff, 2004; Gibbs, 2012; Nicholls, 2014; Winter et al., 2015; Reeves et al., 2016) and this has led to universities making concerted efforts to support the professional development of both faculty members and graduate students as teachers (Austin & Wulff, 2004; Sorcinelli et al., 2006; Gibbs, 2012). This preparation is also for the GTA's future academic career (Rodríguez-Campos & López-Montoya, 2017; Jackson, 2020). However, graduate students could be more extrinsically motivated by factors such as the stipend than the pedagogical aspects (Nasser-Abu Alhija & Fresko, 2020).

The need to prepare for teaching is even more pronounced in the current Volatile, Uncertain, Complex, and Ambiguous (VUCA) world as we face curriculum reforms, internationalisation, transnational education, technological advancements, and the pandemic situation (Altbach et al., 2019; Salmi, 2020). Adding to this is the diversity among international graduates who serve as teaching assistants (Meadows et al., 2015). One aspect of this diversity is the international graduate students' prior teaching experience.

The education system and teaching methods in universities vary from country to country and between educational institutions. Regmi (2012) conducted an extensive systematic literature analysis of major databases on teaching methods and reported that the choice of teaching method can be either direct teaching or facilitation or shades of both, as being dependent on the social, environmental, and psychological contexts.

In general, teaching methods are classified as teacher-centred or student-centred teaching methods (Trigwell & Prosser, 2004; McCabe & O'Connor, 2014; Trinidad, 2020). In direct teaching or lecturing, the instructor is seen to be the knowledge repository, transferring knowledge to students through a lecture, and this is seen as a passive form of learning. The second is the student-centred teaching methods, which involve the use of active learning strategies (e.g., use of discussions, hands-on activities, immersive learning activities) and the adoption of instructional methods such as problem-based learning, project-based learning, team-based learning, design thinking, studio-based learning, and case-based learning in varying combinations and/or with lectures. Trinidad (2020) states the tenets of student-centred learning to be (i) a balance of power between faculty instructor and students, that is, the (ii) the onus of learning is shifted to students, and there is (iii) a shift in the role of the faculty instructor to be a facilitator and guide. (iv) The learning content is to contribute to knowledge generation rather than just knowledge acquisition, and (v) purpose of the evaluation is to provide feedback for learning rather than just to grade students.

Although there are advantages to both teaching approaches (Narayanan & Gafoor, 2006), the student-centred teaching methods are known to be more engaging, hence leading to more motivation and interest in learning, and are known to provide increased opportunities for the practice of 21st century skills such as communication and collaboration skills required as today's graduate skills. Hence, universities are encouraging the adoption of student-centric teaching methods (Trinidad, 2020).

Chuang (2012), and Hallinger and Lu (2013) report that eastern countries are likely to embrace more of the traditional lecture-based teaching methods in comparison to the west. This is possibly due to the social, environmental, and psychological contexts cited by Regmi (2012). There can also be variations between institutions in any country. It is reported that lower-year faculty members tend to use more student-centric methods than higher-year faculty members in universities in the United States (Benabentos et al., 2021). and certain teaching methods tend to be used more predominantly in certain disciplines. For instance, medical universities are known to adopt problem-based learning as business schools adopt case-based learning. Thus, international graduate students' prior exposure and experience with teaching methods are likely to be wide-ranging.

Trigwell and Prosser (2004) found that teachers' conceptual beliefs of teaching determined their teaching practices. Gow and Kember (1999) found that teachers' beliefs are correlated with their students' learning approaches. They found that students taught by teachers with student-focused beliefs used deep learning approaches (Biggs, 1999). O'neal et.al. (2007) found that the training of graduate assistants correlated with retaining their undergraduate students. Taken together, these studies suggest that the preparation of graduate students to be teaching assistants is likely to have positive "trickling effects" on their students. Several studies in the literature contend that well-planned training courses can help prepare GTAs effectively (Nasser-Abu Alhija & Fresko, 2020; Smallwood et al., 2022).

One question that arises from this is whether and how exposure to different types of teaching methods influences graduate students in their teaching, especially when we have a cohort of international graduate students. While there are several studies on teacher transformation and preparing graduate students to be teaching assistants, many of the earlier studies focused on the traditional modes of teaching, such as preparing for assisting the traditional lecturing-tutorial-practical/lab model (e.g., Darling & Earhart, 1990). Several other studies that report preparing GTAs for student-centric teaching methods tend to focus on training for specific disciplines rather than for generic common curricula, and teacher preparation is conducted by the disciplinary faculty or department rather than the central teaching and learning centre (Smallwood et., al., 2022; Utschig, Carnasciali, & Sullivan, 2014; Moore, 2005). Also, very few focus on preparing international graduate students to be teaching assistants. In addition, some of the evaluation studies of preparing GTAs for student-centred learning tend to be comparative studies of training versus no training (Schultz et al., 2022) rather than examine the relationship between GTA's orientation and their practices. Such studies may focus on one or two aspects only. In contrast, our context was a combination of the various facets and focused on preparing international graduate students for general curricula. Our GTAs were to teach the common first-year Science, Technology, Engineering, Arts/Humanities, and Mathematics (STEAM) courses, and the training was to be conducted by the central office of the Learning Sciences Lab.

Our motive for this research was twofold: to design, develop, and evaluate the GTA course for our own internal use, and to inform the broader higher education context on training international students. This paper reports the design of a generalised, metacognitive/reflective, structured, and practiced-oriented teaching course to prepare international graduate students to be teaching assistants in a student-centred learning context, examines their acceptance of student-centric teaching methods post-course, and analyses their perception of the course. The specific research questions were:

- **Research Question 1**: What are the graduate students' *apriori* teaching and learning experiences of teaching?
- **Research Question 2**: Are graduate students more receptive to adopting a student-centric teaching approach by the end of the course?
- **Research Question 3**: What can we learn from the graduate students' reflections and experience of this course for wider application?

Assuming that graduate students are likely to attempt the teaching method that they are familiar with or exposed to, the question is whether an effort to help them recognise their teaching orientation, gaps if any, and raising their awareness of teaching methods can help them to learn to accept and practice more student-centred teaching methods (Di Benedetti et al.,2022, Park, 2004).

METHODS AND MATERIALS

Educational context

The Singapore University of Technology and Design (SUTD), originally set up in collaboration with MIT (Sockalingam et al., 2021), was recognised as a leading emerging engineering university globally in a report by Graham (2018).

SUTD offers Engineering and Architecture education and embraces student-centric active learning pedagogies. SUTD curricula are interdisciplinary and industry-focused. Unlike traditional engineering courses such as electrical, mechanical, civil engineering, etc., SUTD students are exposed to interdisciplinary courses in Engineering Product Development, Engineering Systems Design, Information Systems of Technology and Design, Architecture Sustainable Design and Design, and Artificial Intelligence. All SUTD undergraduates take foundational STEAM (Science, Technology, Engineering, Arts/Humanities and Mathematics) subjects, along with an introduction to design thinking and programming. SUTD provides a "T-shaped" education whereby students get a deep foundation of STEAM knowledge and skills in the first year and specialisation in the later years.

First-year students learn in cohorts of 50 where they are taught by teaching teams of faculty instructors and GTAs, with an instructor-to-student ratio of 1:11. Lessons typically run for two to three hours, and are steeped in active and interactive learning interspersed with mini-lectures. Overall, SUTD's pedagogy is characterised by (i) active and collaborative learning, (ii) design–centric, project-based learning, (iii) experiential and authentic learning, (iv) interdisciplinary curriculum, and (v) a wide variety of formative and summative assessments (Graham, 2018; Sockalingam et al., 2021).

About the course

This teaching course (in the reported format) was built from scratch and implemented eight times from 2017 to 2019. More recently, the course has been modified to address the pandemic's impact on teaching, learning, and professional development.

During the process of designing the course, various teacher training courses were referred to, including the MIT teaching courses, and it was decided that designing and developing a tailor-made course for SUTD would be more appropriate given its "unique" educational context. The traditional teacher preparation model of starting with the concepts and beliefs was adopted (Guskey, 2002). Other factors taken into consideration in the course design include the academic calendar, cohort size, the number of graduate students, time, and resources, etc.

Each course was run over six weeks of 3-hour lesson blocks. The student cohort size of each class was approximately 25 on average. The course was designed to be non-discipline-specific, metacognitive, structured, and practice-oriented.

- This course admitted graduate students from all disciplines in the same cohort, and aiming was to prepare them for the first-year common interdisciplinary courses. This made the training course general and non-discipline specific.
- The course is intended to help graduate students become self-aware of their own teaching orientation through various metacognitive tools such as a pre-course survey on past teaching/learning experiences and teaching orientation profiling. Deliberate opportunities were regularly provided to get the students to reflect on their teaching experiences, beliefs, and practices in the form of in-class discussions, and post-class reflection writing. This made the course metacognitive.
- The course introduced graduate students to various student-centred teaching methods and skill sets, and tasked them to design a learning activity for deep and surface learners. This allowed for knowledge acquisition and application in a structured way.
- Finally, the graduate students were to design and deliver a microteaching session with plenty of peer learning opportunities. This made the course practice-oriented.

The course is framed and underpinned by the principles of "constructive alignment" (Biggs, 1996). It aims to introduce the concepts of student-centred teaching methods that are aligned with SUTD's pedagogical philosophies.

Course design

The course's intended outcomes are that graduate students can design and deliver suitable teaching methods as needed by the learning outcomes and be equipped with essential teaching skills such as questioning skills and skills to assess student learning and provide constructive feedback to their learners. This was delivered as six lessons over six weeks, and details of each lesson are listed below.

- **Lesson 1**: Introduction of the teaching context at SUTD. This was conducted through various reflective activities, discussions with peers, guest lectures, and sharing of experience by past teaching assistants, faculty members, and librarians in combination with active lecturing, to provide multiple perspectives on the GTA's teaching role at SUTD.
- **Lesson 2**: Introduction of various student-centric teaching methods through a problem-based learning activity on the task of helping diverse (deep and surface) learners to engage and learn. To this end, the

graduate students in their groups were to design a mini-lesson to engage diverse learners based on the principles of constructive alignment (Biggs, 1996).

- **Lesson 3**: Introduction of various facilitation skills such as questioning skills, using technology to measure student learning, and getting students to role-play and use Socratic questioning to practice facilitation skills.

- **Lesson 4**: Introduction of concepts on assessment, grading, and provision of constructive feedback by getting students to design an assessment (from Lesson 2) for their designed activity using constructive alignment (Biggs, 1996,1999).

- During **Lessons 5 and 6**, graduate students were to conduct a "microteaching" session (Allen, 1967) of their designed student-centric teaching activity in five to ten minutes, and peers, as well as instructors, provided feedback on the microteaching activities. Graduate students were divided into four groups and the sessions were delivered by two groups each in Lessons 5 and 6. The sessions were assessed by the author or a guest instructor.

All the lessons utilised different examples of student-centric learning and active lecturing so that students could experience and model the activities. Students were to submit a reflection blog at the end of each lesson, and they were briefed on reflective writing as it could be a new experience for some. There were several continual formative assessments that were metacognitive in nature (reflective blogs, critique, think-pair-share, group discussion, peer feedback, self-evaluations, etc.), and the course ended with a summative assessment of microteaching. The course also included a conceptual MCQ test on teaching and learning.

The course was mandatory and to be taken for credit as a pass/fail course. Students could resubmit their assignments/redo their microteaching till satisfactory. The focus of the course was on learning rather than grades. More information on the course implementation can be found here (Sockalingam et.al., 2017).

Participants

Graduate students taking the training course "Teaching at SUTD: Engaging the Learners" were invited to participate in the research study on a voluntary basis. The study was conducted in a natural setting. A total of 80 students were enrolled in three runs of the GTA course in Academic Year 2017/18. Sixty-six students consented to participate in the study (IRB 17-131). Our graduate students were international students and were aged between 20-30 years, with a 50-50 mix of female and male participants.

Instruments

i.   **Pre-course Self-report Survey on Teaching**
     Students were asked to respond to a short qualitative and quantitative questionnaire on their prior teaching and learning experiences as well as teacher training using the **pre-course survey**. This questionnaire was updated to include an additional question on defining the various teaching methods that they had mentioned as experienced in two of the three3 runs.

ii. **Pre- and Post-Course Teaching Inventory**
     Teaching beliefs can be classified as (1) student-centric or (2) teacher-centric, and these can be measured using well-established inventories. We used a questionnaire on the **Approaches to Teaching Inventory** and adapted it to be used in our context with permission (Trigwell & Prosser, 2004). There are nine questions on student-centred teaching and nine on teacher-centred teaching in this questionnaire. All questions are positively constructed (see Appendix). A 5-point Likert scale was used to score on individual questions, with 1 being "Strongly Disagree", and 5 being "Strongly

Agree". The teaching inventory was administered in Lesson 1 (pre) and Lesson 4 (post) before the microteaching lesson. This can be taken as a mid-point measurement.

iii.   **Post-course Reflection**

At the end of the course and after microteaching, all students were invited to submit a reflection based on the following question:

"*Having gone through this course on "Teaching at SUTD: Engaging the Learners", has your conceptions of teaching changed, strengthened, or remained the same? Explain with relevant examples*."

These reflections were analysed and classified into four categories: (i) shifted towards more student-centred learning approaches, (ii) remained status quo as when they started, (iii) shifted towards more teacher-centred approaches, or (iv) if the response was out of point/unclassifiable. These responses were then further analysed and classified based on learning outcomes (anticipated themes) of the five lessons and emerging themes according to the methods described by Saldaña (2021). Mentions of themes were counted only once per student.

All instruments were administered using SUTD's learning management system.

Analysis

The quantitative data from the pre-course survey and Teaching Inventory was analysed using Excel. An online T-test calculator (https://www.graphpad.com/quickcalcs/ttest1.cfm) was used to establish if there was a shift in participants' responses on the Teaching Inventory. Since the pre-course self-report was administered online as an "anonymous" option, it was not possible to map and track the individual respondents of the pre-course with the teaching inventory and the reflection data points.

RESULTS

Prior teaching and learning experience of the graduate students

Graduate students were asked to indicate in the pre-course survey where they received their formal undergraduate and pre-tertiary education and the typical range of years. Out of the 66 participants, 33% indicated they received their pre-tertiary and undergraduate education in Singapore, and others elsewhere. The next biggest groups were from China (26%) and India (20%) (Figure 1). In the survey findings, 70% of the participants indicated that the duration of their pre-tertiary and undergraduate studies ranged from 16-20 years. Around 52% indicated that they had prior teaching experience. Of these with past teaching experience, only 8% indicated that they had received formal/informal teacher training before this course. Formal training was typically for academic work as a lecturer, and informal training was for informal situations such as in teaching Bible studies.
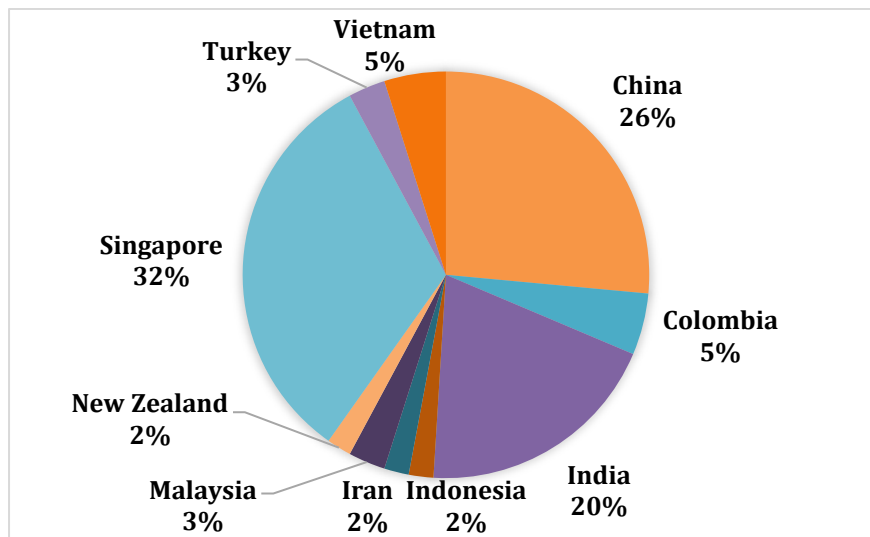

Figure 1. Country in which participants obtained their longest formal pre-tertiary and undergraduate education.

Since the three largest participant groups were from Singapore, China, and India, these groups were the main focus for this paper. Figure 2 shows the experienced teaching method, and Figure 3 shows the attempted teaching method. This analysis is at a group level and not at an individual level.
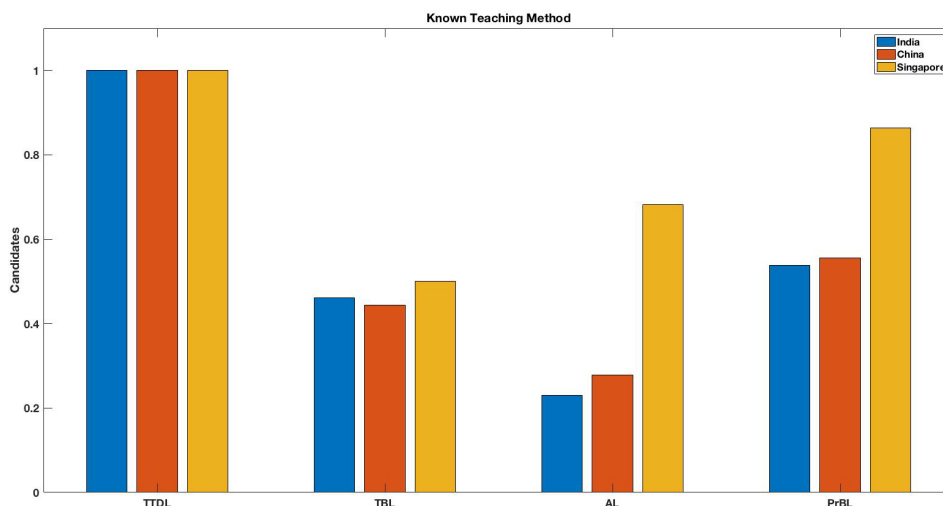

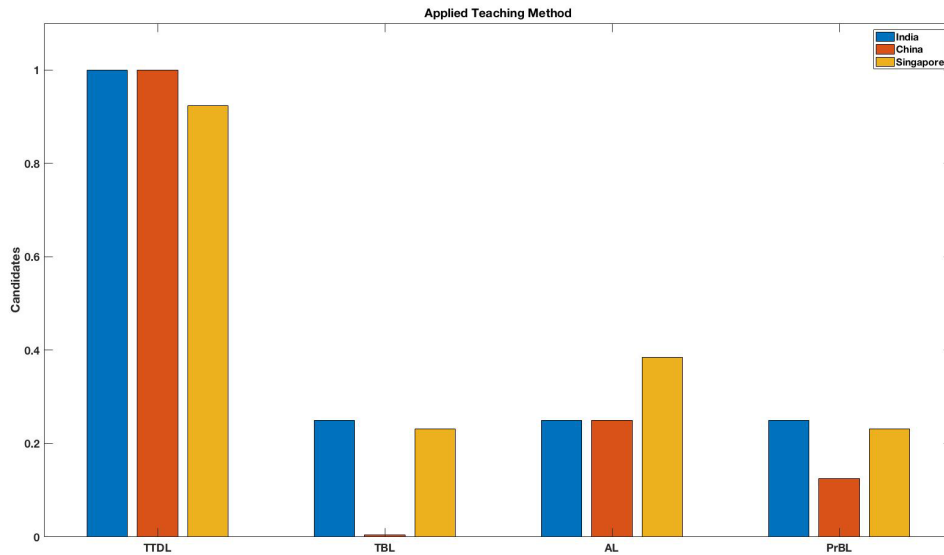*Figure 2*. Teaching methods indicated as experienced.

Figure 3. Teaching methods indicated as attempted in the past.

The results are that: (1) All participants were exposed mostly to the direct teaching/lecturing method, (2) All participants have mostly used the direct teaching/lecturing method in the past. In general, a higher percentage of graduate students educated in Singapore indicated that they were exposed to student-centric teaching methods compared to the other two groups. Interestingly, the usage of student-centreed teaching methods seemed to be much lesser than their exposure level to these methods across the three groups. This suggests that even if exposed to student-centred methods, graduate students may not have felt ready or had the opportunity to practice student-centred teaching earlier.

Teaching orientation

Figures 4 and 5 present the responses on the teaching inventory of the nine teacher-centred teaching questions and the nine student-centred teaching questions. In general, students seemed to score questions on teacher-centred teaching lower or similar to before. However, they rated higher for questions on student-centred teaching post-course as compared to pre-course. Independent T-test analysis of the 18 questions showed that indeed there was no significant difference in the graduate students' response towards teacher-centred teaching when the pre- and post-course responses were compared. Item analysis indicated that the reduced shift was in providing notes/information.

On the other hand, there was a significant positive shift in the scores for student-centred teaching post-course; with pre- ($M = 3.80$, $SD = 0.53$) and post- ($M= 4.22$, $SD = 015$), with T $(130) = 12.39$, $p <0.0001$. The most distinctive shift was for the questions on "deliberately provoking debate and discussion", "setting aside time to discuss" and "helping students to generate their own notes, rather than providing".
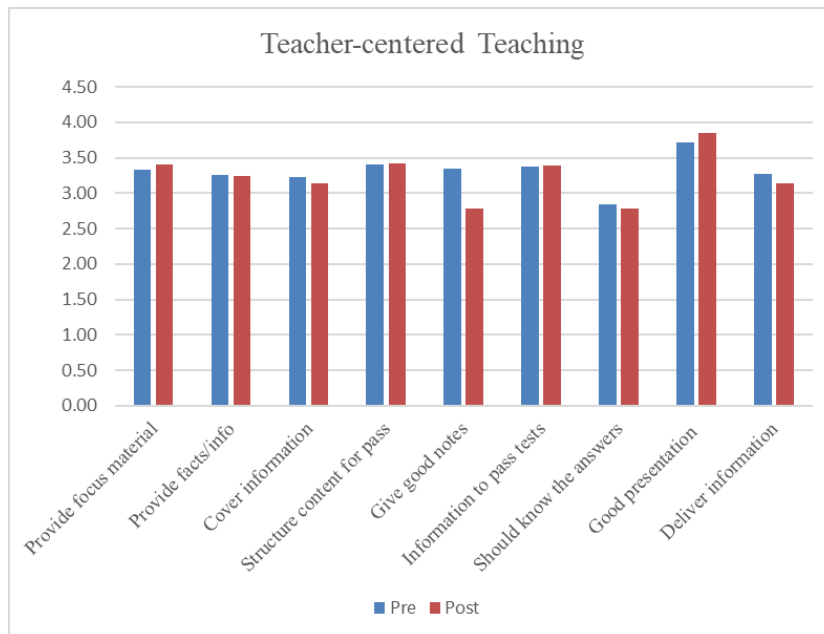
Figure 4. Students' response on Teaching inventory pre- and post-course on Teacher-centred Teaching
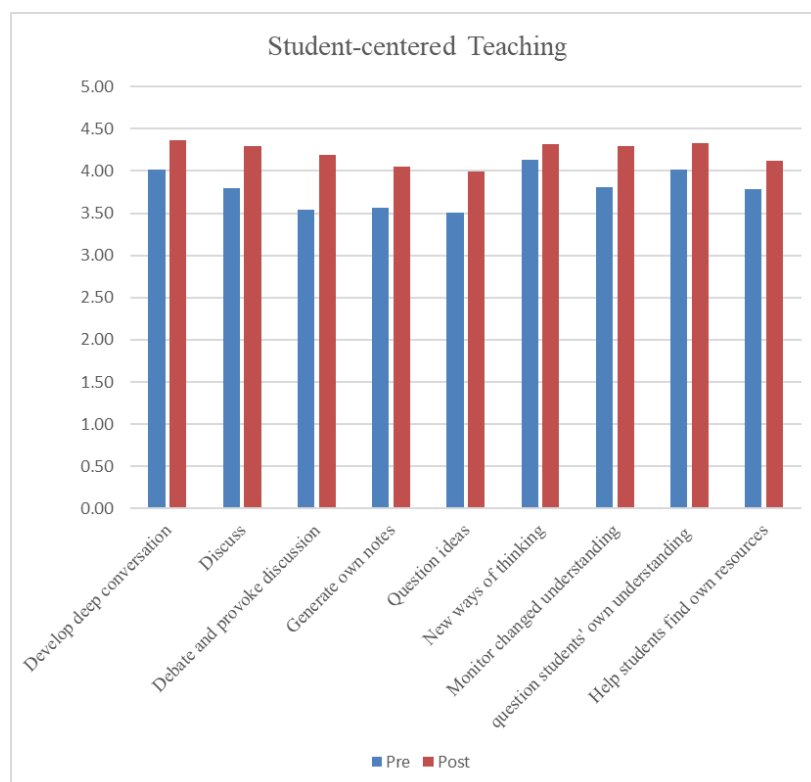

Figure 5. Students' response on Teaching inventory pre- and post-course on Student-centred Teaching

Graduate students' reflections on their learning journey to be a teacher

At the end of the course, participants were asked whether the course had changed their conceptions of teaching post-course. These reflections were analysed and classified into having changed or not, and in which thematic areas. It was found that 91% of the participants indicated that the course had helped shifted their concepts towards more student-centred learning. 6% indicated that they were neutral and 4% was unclassified as they had addressed the question accurately. These results are discussed further in the next section.

Those who indicated they were neutral had mentioned that they were already exposed to student-centred teaching methods, and hence their conceptions did not change but they felt more confident. Below is a quote from such a participant:

> *"After going through this course, I do not believe that my conceptions of teaching have changed significantly. Of the teaching methodologies gone through in class, I have experienced most of them during my time in school and in university. However, this course has allowed me to relate these experiences to the concepts introduced over the course of the six weeks."*

There was also the view that while there is a place for student-centred teaching, there is also a place for teacher-centred teaching. It must be emphasised that the course did not profess that direct teaching/lecturing is bad/to be avoided. The intended outcome was that students were aware of various student-centric methods and teacher-centred teaching, and knew when and how to adapt to context. It can be inferred that TPI responded that students could see the value of direct teaching and that they were now more aware of student-centred teaching methods.

Student reflections were further coded and classified into themes that were mapped to the lesson learning outcomes of the course and frequency counted. Additional themes that did not map to the learning themes were classified as emerging themes. There were two such emerging themes: "Technology" and "Reflection" (Table 1).

Table 1

Mention percentage of various themes mapped to the lesson learning outcomes

Code*	Themes	Percentage
L1/L2	Students are aware of **Active Learning/Student Centric** methods	71
L5/6	Students found **microteaching** to be positive	50
L1/L2	**Referred to specific active learning/student-centric methods/strategies lesson**	46
L4	Students see the need of conducting **assessments and feedback** in their teaching	44
L3	Students recognize and cite **facilitation skills** and experience from the course	35
E1	Students **value the use of technology to facilitate** teaching and learning via the course	15
E2	Students **value the experience of reflective writing**	13

*"L" stands for Lesson and "E" stands for emerging themes

DISCUSSION

This paper reports the approach of a generalised, metacognitive/reflective, structured, and practiced-oriented teaching course to prepare international graduate students to be teaching assistants in a student-centred learning context, and examines students' perceptions of teaching methods by the end of the course. This section examines the implications of the findings for future teacher training preparatory courses in similar contexts.

Prior knowledge, experience, and misconceptions of graduate students

The first research question was on the graduate students' *apriori* teaching and learning experiences of teaching. The results indicated that graduate students participating in the study were more exposed to teacher-centred teaching prior to the course and were more comfortable in using the same type of teaching methods before the course. This result was not surprising as one would expect exposure and knowledge before being able to practice skills. An implication of this is that we need to be aware of instructors' experience and exposure in designing for their teacher training. This also means that if there is no intervention for such students, they are likely to continue to practice mainly teacher-centric teaching methods. While there are studies that report the impact of teacher experience on teaching experience (e.g., Podolsky et al., 2019), there is a lack of study on whether exposure and knowledge of teaching methods have an impact on teaching practices. This study provides some insights that exposure is critical for practice.

Another interesting finding was that even though graduate students indicated that they had taught using team-based and project-based learning in their pre-course survey, discussions during the subsequent Lesson 2 of Run 1 (on student-centred teaching methods) revealed otherwise. Several students did not have a good understanding of the teaching methods and were misusing the nomenclature. As such, an open-text question was included in the pre-course survey for the subsequent runs (Runs 2 and 3) to get students to briefly explain the various teaching methods selected in the pre-course survey itself as an open-ended question. This exercise validated that many students had a common misunderstanding of the terminology at the beginning of the course. Team-based learning was the most misunderstood teaching method. A couple of quotes are given in Table 2 on the misunderstandings.

Table 2

Misunderstanding of teaching method nomenclature prior to the teaching course

Define Team-based learning
"Group study"
"Collaborative learning by doing" "Activities together and learning from each other"
"Peer-to-peer learning"
"Explore/discuss knowledge as a team"
"Work in groups to do projects and discussions"
(Misunderstanding: The idea of learning in teams/groups is referred to as team-based learning.)

Define Project-based Learning
"Project work (team or individual) - learn by doing."
"Students study and apply knowledge to finish a project"
"the knowledge they learn in class helps students to consolidate the knowledge and apply to some interesting projects."
(Gaps in understanding: The idea of simply using projects in learning or learning to apply knowledge on projects versus using projects to drive learning)

These findings reveal students' lack of understanding of student-centric methods and misconceptions before the course. From the constructivist point of view, just as prior knowledge can aid in helping, inaccurate knowledge and misconceptions can be hazardous. It is critical that inaccurate knowledge is identified and addressed through preparatory teacher training courses (Ohst et al., 2015). Since student-centric teaching methods are varied, and not many may be exposed to the different methods, teacher training on student-centric teaching methods is necessary.

Acceptance of student-centred teaching methods

The second research question was whether graduate students were more receptive to student-centric teaching methods by the end of the course. The result from the pre-post Teaching Orientation surveys was interesting in that students still held on to the values of teacher-centred teaching (their scores did not change significantly between pre- and post-), and yet there was a significant change in their acceptance and move towards more student-centred teaching ideas. Even though this was hoped for, the possibility of graduate students "disowning" or discrediting" direct teaching methods cannot be ruled out. Interestingly, this was not the case—they valued both teaching methods. The discussions during class, and the microteaching activities showed that students had a good idea of when to adopt which method.

This could be attributed partly to the course design. The course recommends that the choice of teaching methods and assessment need to be aligned with the learning outcomes discussed in Bloom's taxonomy (Krathwohl, 2002) as per the constructive alignment (Biggs, 1996) and encourages students to start with backward design (Wiggins & McTighe, 1998). This was the main activity in Lesson 2. The suggested approach in the course is to use student-centric methods for higher-order learning outcomes and teacher-centric methods for lower-order learning outcomes (Krathwohl, 2002).

While some universities go for either lectures or student-centric methods (French & Kennedy, 2017), this paper proposes that it is possible to take the best of both. This could be done by comparing the advantages and disadvantages of both teacher-centric and student-centric teaching methods during teacher training to get the learners to evaluate and make a choice of their combination of teaching methods as suggested by Van Berkel and Schmidt (2005) to include lectures with problem-based learning. Bidabadi et al. (2016) investigated teaching methods in the Iranian context of higher education and found that the best teaching approach is the mixed method (student-centred together with teacher-centred) when implemented with proper educational planning and readiness.

Students' perceptions of the course

The third research question was what can we learn from the graduate students' reflections and experience of this course for wider application? Participants' post-course reflections provided more insights on the value addition of the course and shed light on what can be improved. Students seemed to be most aware of student-centred teaching methods (71% mention) and the next most frequently mentioned was microteaching (50%). In addition, they reported valuing new aspects such as reflective writing and using technology tools in teaching and learning to facilitate. Training elements on facilitation skills and providing feedback can be further strengthened in the current course.

Although we have not included the analysis of the microteaching data, our own observation of the microteaching lesson and students' feedback indicated that most of the students were able to demonstrate student-centric teaching methods in their first attempt of microteaching. Less than 5% of the students had to reattempt their microteaching and passed the first time. The microteaching activity was the summative

component, with 30% weightage and students were required to pass the microteaching activity in order to pass the course. The microteaching activity was assessed by a guest instructor or the author (and it includes some external validation). We could potentially record and analyse microteaching in subsequent studies.

A similar structure of teacher training is also used for a more concise 3-hour teacher-training programme for our early career faculty members and has also been received positively, validating the wider adaptation of the teaching model and course structure. The approach taken in this study in graduate student-teacher training looks promising for it to be attempted in similar contexts.

Implications for designing similar teacher training courses for international GTAs

Taken together, this course experience offers some suggestions for the design of similar teacher training courses for international graduate students.

- This study shows that it is important to understand the **student profile** in designing teacher training courses (Moore, 2005). Graduate students are typically international students, and there is wide diversity in their backgrounds. This study has only explored the students' understanding of teaching methods. Language issues were not a main concern for us as all students were competent in English. However, it may be useful to also consider student preparedness in terms of cultural fit and language readiness (Collins et al., 2022), in addition to exposure to teaching methods, depending on the educational context.

- This study also suggests that teacher training courses as an intervention to educate students on teaching methods can be useful and that **Guskey's (2002) traditional approach** to teacher training of starting with building awareness, knowledge acquisition, and experiencing is still useful.

- Triangulating the results with my own reflection as an instructor, the observed outcomes can possibly be attributed to the structured, metacognitive, practice-oriented nature of the course (although if this is the reason is to be proven). For instance, **delivering the course through student-centric learning pedagogies** allowed graduate students to model what they experience (Yiend et al., 2014). Modeling the teaching methods in teacher training is essential.

- The positive outcomes can also be attributed to **multiple stakeholder contributions** at various stages in terms of preparing course materials such as the guide notes, video interviews by past-GTAs on their experience, during the course through faculty members sharing their teaching experiences and faculty members serving as guest instructors of the microteaching lessons to provide additional perspectives on teaching practices. Multi-stakeholder participation in teaching is a common practice in today's world of teaching practices, and this can also be an aspect of teacher training. Guo-Brennan, et al. (2016) also advocate such multi-stakeholder participation in international teacher preparation courses.

- The teaching inventory allowed the graduate students to be aware of their own orientation, and this **self-awareness** is an important first step for helping students to be receptive to additional or alternative views on teaching and learning. Brenner (2022) discusses the importance of providing scaffolds for self-awareness and self-regulated learning in developing teaching practices, and the inventory is one such tool.

- The **microteaching experience** allowed students to put into practice what they have learned and to learn from others as well. Microteaching has been an established practice in teacher training and this

practice session was valued by the students in our study. Inclusion of microteaching sessions is highly recommended to motivate students and build self-efficacy.

- The value of **reflection** is noted in the student feedback. Fong, et. al., (2019) also recommend the use of reflections in teacher training, and reflection is an important aspect of student-centered learning. However, not all graduate students are aware of reflective writing, and they need to be supported through proper scaffolding. Scaffolding in this course was provided in the form of short lectures, online resources, and rubrics.

- The coursework involved **structured**, **scaffolded**, and **sequenced activities** (Hammonds & Gibbons, 2005) over the six lessons. For instance, the reflection question on Lesson 2 was:

  "*Suppose you are asked to design a teaching activity on an academic topic (relevant to SUTD context), and you are only given 5 minutes. What would be your proposal? Explain.*"

  Subsequently, the question for Lesson 3 was:

  "*Close-ended questions are generally not recommended for generating discussion. Here is a challenge. How could you use close-ended questions effectively to stimulate discussion in class?*"

  Such developmental scaffolding of the entire teaching activity can help the students to go through the cycle of planning and implementation with an integrated understanding.

- The principles of **constructive alignment** (Biggs, 1996) were applied throughout the course in a cyclical, repetitive manner. **Repetition of concepts** is useful in imparting fundamental concepts.

- Just as the lessons were structured on constructive alignment (L1-L4), the **evaluation rubrics for various activities reflected this**. For instance, the microteaching rubric assessed on (i) demonstrating student-centred teaching methods, (ii)engaging students and getting students to interact, (iii) using appropriate assessment to assess student learning, and (iv) providing constructive feedback. This repetition and consistency helped to reinforce learning in my view. Repetitive and consistent instructions can help to solidify the expectations of the course.

- The course also provided **multiple opportunities of feedback** (Kourgiantakis et al., 2019) to the students in shaping their conceptions, design, and delivery of microteaching using student-centred teaching methods, from peers, teachers, and other stakeholders.

- To some extent, this **study on the teaching course piqued the students' interest and made them aware of the scholarly approach to teaching**. This was not an intended outcome of the course but can potentially be included as a Scholarship of Teaching and Learning (SoTL) for teaching assistants. Camarao and Din (2023) report one such approach to use SoTL and communities of practice for teacher assistant training. This can be included in future iterations of the course.

In other words, the **holistic approach to the course design** (metacognitive-practice oriented), development (multi-stakeholder), and implementation (structured and sequential) can be said to be critical for the successful implementation of the course to prepare diverse/international graduate students as teaching assistants; and the experience offers some directions for improvements (including SOTL). This contrasts with studies that only focus mainly on specific elements such as peer learning and reflection in GTA training. (e.g., Di Benedetti et al., 2022).

Limitations

Even though the study results are encouraging, there are limitations, and the findings need to be contextualised. First, this study does not study the behavioural change in students' ability to deliver student-centric *teaching in-depth* even though they are able to explain it conceptually (Guskey, 2002). Second, the study does not look at the impact of the teacher training course on the longitudinal teaching performance of the GTAs in actual classrooms and the impact of the teaching on their students. The plan is to explore these elements in our subsequent study.

CONCLUSION

This study adds to the current literature that it is important to understand the student profile, and teaching experience, especially when engaging international students. It also adds that we could get them to be receptive towards adopting suitable combinations of teaching methods by getting them to be self-aware of their own teaching orientation, introducing them to relevant knowledge and skills (e.g., both types of teacher and student-centric teaching methods), and getting them to design, to peer learn, practice (e.g. through micro-teaching, SoTL) and to reflect. This could help stimulate intrinsic motivation rather than just extrinsic motivation. Although one size may not fit all contexts, these general principles can help us tailor such teacher training courses to our context.

[APPENDIX. APPROACHES TO TEACHING INVENTORY](#)

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