Professional Growth Through Reflection and an Approximation of Practice:

Experiences of Pre-Service Teachers as Teaching Assistants in a Secondary Mathematics Teaching Methods Course

In this paper, we describe the experiences of two pre-service teachers (PSTs) who served as teaching assistants (TAs) in a secondary mathematics teaching methods course. As TAs, the PSTs approximated practice by being independently responsible for a learning environment and leading discussions with groups of students. Although the PSTs felt stress and pressure in their new role, findings suggest that this experience, coupled with opportunities for reflection, contributed to their growth. Given both these findings and the impetus to increase opportunities for authentic learning, we encourage teacher educators to think more broadly about ways of contributing to PSTs’ learning.

Keywords: pre-service teachers; teacher education; reflective practice; approximation of practice; practice-based pedagogy
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For decades, researchers and educators have been making an earnest effort to explore what teachers have to know to be prepared for effective instruction that will motivate and foster deep learning for their students (Korthagen, Loughran, & Russell, 2006; Shulman & Shulman, 2004). This effort is based on a widely accepted premise that the quality of teachers plays a decisive role in students’ learning. Many have described high-quality teachers as those who have some combination of the following attributes: deep understanding of human growth and child development, subject area content knowledge, pedagogical knowledge, strong sense of ethics, and attitudes necessary for effective teaching and ongoing learning (e.g., Cobb, Darling-Hammond, & Murangi, 1995; Grossman, Compton, Igra, Ronfeldt, Shahan, & Williamson, 2009). Nonetheless, the process of developing high-quality teachers is complex. Much attention has thus been given to investigating what kinds of teacher education programs can support pre-service teachers (PSTs) in learning these attributes (Darling-Hammond, Hammerness, Grossman, Rust, & Shulman, 2005; Zeichner, 2012). Researchers have shown that approximations of practice (i.e. supportive opportunities for PSTs to enact teaching practices) are one such approach in positively supporting PSTs’ development (Grossman, Hammerness, & McDonald, 2009). There is also evidence that indicates the positive benefits of providing opportunities for PSTs to engage in reflective practices, so they can experience and examine why certain choices are made in the classroom (Houston & Warner, 2000). Yet, teacher education programs are traditionally university-based and course-centred. Consequently, opportunities to engage with approximations of practice and subsequent reflection are limited to field experiences and Jao, L., Sahmbi, G., & Huang, Y.-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. The Teacher Educator, 55(1), 47-65.
occasionally, during coursework (e.g., Grossman et al., 2009; Zeichner, 2010). We thus contend that it is valuable for teacher education programs to explore alternative opportunities in university settings to support the development of high-quality teachers.

This study addressed the need for developing such opportunities for approximating practice and for critical reflection for PSTs in teacher education programs. Specifically, we explore the lived experiences of two undergraduate Canadian PSTs in the role of teaching assistants (TAs) of a course they previously took on teaching methods for secondary mathematics teachers. Within the course, the TAs were tasked with facilitating an instructional activity in which students in the course rehearsed teaching practices that support the development of high-quality teachers. Throughout their experience, TAs engaged in reflective practice individually and collaboratively. This context provided an opening to explore alternative opportunities for PSTs’ approximations of practice and professional development more generally. The objectives of this study were two-fold: 1) To describe PSTs’ experiences in their role as TAs; and 2) To investigate how this experience acted as a professional development opportunity for PST growth, through the lens of critical reflection.

Pre-Service Teacher Education: A Practice-Based Approach

Traditionally, pre-service teacher education programs are comprised of field experiences (practica) and coursework. School-based practica provide an opportunity for PSTs to observe

1 In Canada, teacher education programs can take many forms. For example (as is the case for this study), the program may be a four-year, undergraduate degree (i.e., Bachelor of Education). In other instances, PSTs first complete a different undergraduate degree (e.g., Bachelor of Science) then gain teacher certification through a shorter (often between 1-2 years) undergraduate, graduate, or certificate program.

and learn from the teaching routine of experienced teachers. Research indicates that many in-service teachers believe that practica are the most important and valuable aspect of their professional education because these field experiences were the closest approximation to practice that they experienced as PSTs (Skilbeck & Connell, 2004; Valencia, Martin, Place & Grossman, 2009). Although they provide an authentic teaching context, the practicum experience is not standardized, and a number of factors can influence the quality of practica (Caparo, Caparo, & Helfeldt, 2010). The actual practicum experience can vary considerably, depending, for example, on how cooperating teachers (the in-service teachers who supervise the PSTs during their practica) are recruited, and what expected outcomes are for both the PSTs and cooperating teachers (Ball & Cohen, 1999; Darling-Hammond et al., 2005). While university-based teacher educators have relatively little control over what the PSTs observe and learn in practica, they also have limited opportunities to see and study the actual performance of the PSTs in these settings. Thus, PSTs’ practica remains “a relatively individual and idiosyncratic endeavor for both [PSTs] and teacher educators” (Hatch & Grossman, 2009, p. 73). Indeed, PSTs are often left alone to integrate university-based theories with field-based knowledge of teaching and learning (Zeichner, 2010). The challenge for teacher educators is then to create ample and authentic learning experiences for PSTs within these university-based spaces that aid with the bridging of theory and practice within teaching.

Many researchers have advocated for the incorporation of practice-based pedagogies (e.g., Borko, Koellner, Jacobs, & Seago, 2010; Wilson & Berne, 1999), and increased opportunities for approximations of practice (Ghousseini & Herbst, 2016; Lampert et al., 2013). Aitken, Sinnema, and Meyer (2013) argue that teacher education programs must “emphasize the context-dependent nature of effective teaching and, therefore, adaptive expertise as the hallmark Jao, L., Sahmbi, G., & Huang, Y.-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. The Teacher Educator, 55(1), 47-65.
of a professional teacher” (p. 4). Ball and Cohen (1999) defined practice-based professional training as “education for professional practice” (p. 12), meaning that throughout the process of professional training, PSTs are exposed to various tasks that they will encounter in the workplace. The aim of practice-based pedagogy is to engage PSTs in teaching contexts akin to what they will experience as in-service teachers. In many cases, teacher educators simulate a classroom environment in an attempt to design a more controlled and safe setting for PSTs to practice specific pedagogy (Grossman et al., 2009; Lampert et al., 2013).

Researchers have also advocated for increased opportunities for PSTs to do teaching, rather than exclusively focusing on learning about teaching (Ball, Sleep, Boerst, & Bass, 2009). These researchers have made evident that high-quality teaching must be at the core of professional programs, and thus, many have sought to identify high-leverage practices to impress upon PSTs (e.g., Grossman, 2011; Sleep, Boerst, & Ball, 2007). High-leverage practices are pedagogical moves that have been shown to not only improve student learning and develop their appreciation for a subject (Grossman et al., 2009b; Manz, 2012), but are also accessible to PSTs in terms of learning to teach (Ball, Sleep, Boerst, & Bass, 2009; Windschitl, Thompson, Braaten, & Stroupe, 2012). Strong evidence suggests that high-leverage practices can support PSTs in developing the vision, practices, and dispositions for high-quality teaching (Lampert, Beasley, Ghouseini, Kazemi, & Franke, 2009). Examples of high-leverage practices include teaching towards an instructional goal, positioning students competently, and establishing and maintaining expectations for students’ participation (see Table 1 for additional information). However, developing high-leverage practices does not come without challenges. PSTs must learn to manage the contributions of individual students while simultaneously moving the entire class towards some collective understanding (Boerst, Sleep, Ball, & Bass, 2011; Lampert, 2001). Jao, L., Sahmbi, G., & Huang, Y.-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. The Teacher Educator, 55(1), 47-65.
Some teacher educators have conceptualized ways for PSTs to approximate practice while using high-leverage practices during professional programs, through an instructional activity called rehearsals (Lampert et al., 2013). Generally, in a rehearsal, a PST acts as a “teacher” by giving a lesson to a group of his/her peers who play the role of “students” at the targeted grade level reflecting the context of the lesson. Rehearsals are typically facilitated by a teacher educator who, along with the “teacher” (PST), may “pause” to allow for immediate feedback, suggestions, and reflections. Discussions that ensue during a “pause” or at the end of the rehearsal focus on the enacted pedagogy or missed opportunities to use high-leverage practices. It is the role of the facilitator to engage PSTs (“teacher” and “students”) in these conversations and have them critically reflect on when and how to use high-leverage practices (Davis, Kloser, Wells, Windschitl, Carlson, & Marino, 2017). During the rehearsals, PSTs are encouraged to experiment with different discourse moves within the framework of high-leverage practices. At the same time, facilitators attempt to break down teaching routines and make specific practices visible to the PSTs. We consider the facilitation of rehearsals to be parallel to key responsibilities of classroom teachers: managing interactions of groups of students and leading discussions. We thus see rehearsals as a context for PSTs to approximate practice, not only as “teachers” but also as facilitators. In our study, we explore this idea by placing PSTs in the role of TAs tasked with facilitating rehearsals.

While there exists research to describe different ways in which PSTs can approximate practice outside of practicum such as microteaching (e.g., Harding, Hbaci, Loyd, & Hamilton, 2017) and role playing (e.g., Zazkis, Sinclair, & Liljedahl, 2013), in these cases, PSTs are approximating practice that are authentic in both teaching processes and the content to which Jao, L., Sahmbi, G., & Huang, Y-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. *The Teacher Educator, 55*(1), 47-65.
they will teach in the future (e.g., secondary-level mathematics PSTs leading class discussions about algebra). Yet, there lacks research exploring contexts through which PSTs can solely focus on teaching processes (irrespective of content matter), as in our case of PSTs facilitating rehearsals. Our study begins to address this gap and opens the door for teacher educators to broaden their thinking on ways that PSTs can learn and grow.

**Reflection for Pre-Service Teacher Professional Development**

While practice-based pedagogies hold promise in helping PSTs develop and hone their skills as educators, another key component of teacher development is critical reflection. Bullough and Gitlin (2001) explain critical reflection as “being actively engaged in the study of one’s practice and the intersection of belief, action, and outcome so that in the future wiser decisions can be made while teaching” (p.14). Reflection is not a passive, cursory look at one’s practice, but rather an active, ongoing consideration of pedagogical decision making and all of the factors that influence the making of those decisions. Indeed, critical reflection encourages educators to look inwards and be conscious of implicit and explicit biases they hold that influence their teaching (Banks & McGee Banks, 2016) and to use that information to transform their own practices (Osterman & Kottkamp, 2004).

Despite the pervasiveness of reflection in teacher education programs, it is not clear what pedagogical strategies best support the teaching and learning of reflective practices (Clarà, 2015; Mena-Marcos, Sanchez, & Tillema, 2011). Further, some scholars (e.g., Mena-Marcos, Garcia-Rodriguez, & Tillema, 2013; Shoffner, 2008) question whether PSTs have the capacity to learn and cultivate the appropriate skills needed to become critical and reflective of their own practices so early in their careers and suggest that perhaps efforts to promote reflective practices should be targeted towards more experienced in-service teachers. Nevertheless, reflective practices Jao, L., Sahmbi, G., & Huang, Y-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. *The Teacher Educator, 55*(1), 47-65.
continue to be encouraged in teacher education programs (Jones & Jones, 2013; Stevenson & Cain, 2013), and research indicates that the development of this practice is a crucial part of teacher development (Griffiths, 2000; Ryken & Hammel, 2016). Houston and Warner (2000) argue that PSTs should be taught to engage in reflective practices so that they better understand their own biases and motivations prior to entering a classroom. Reflective practice allows PSTs to better understand their own capabilities and perspectives, thereby encouraging personal growth and development that can facilitate meaningful pedagogical moves in the classroom. Thus, “reflective practice can and should be taught – explicitly, directly, thoughtfully and patiently – using personal reflection-in-action to interpret and improve one’s teaching of reflective practice to others” (Russell, 2005, p. 203-204).

There are many ways to encourage reflective practices in teacher education programs. Two such approaches include: self- and collaborative reflection. Self-reflection is a practice that promotes the development of a metacognition and professional practice and is typically done individually. Self-reflecting gives PSTs the opportunity to pause and consider not only what they are doing in the classroom, but what motivates their actions (Larrivee, 2000). The act of reflecting allows PSTs to have a better understanding of how their personal and professional selves influence their pedagogical choices (Farrell & Ives, 2015). While there are a variety of ways that self-reflection can occur, journaling has been widely used to develop this practice (Boud, 2001; Janssen, de Hullu, & Tigelaar, 2008). Pavlovich (2007) argues that “the act of writing facilitates deeper analysis of the experience through assessing and articulating it. This activity assists the writers to stand outside the experience, to see it more objectively, and to become detached from the emotional outcomes” (p. 284). Journal writing must be facilitated with guidelines (Walker, 2006) or prompts, rather than framed as an open-ended free-write so Jao, L., Sahmbi, G., & Huang, Y.-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. The Teacher Educator, 55(1), 47-65.
that students are encouraged to critically analyze events, rather than simply describe them as they occurred (Bain et al., 2002). Journaling can also provide a space for teachers to engage in productive struggle, and resolve issues in a meaningful way (Larrivee, 2000). One of the affordances of self-reflection is the ability of being able to do it at the PSTs’ convenience, thereby requiring limited resources. Yet, it is our belief that learning is also a social endeavor (Vygotsky, 1978); thus, we offer collaborative reflection as another valuable format for PST development.

Collaborative reflection is predicated on the assumption that learners help each other build meaning centred around shared experiences. However, simply asking a group of people to reflect together without consideration of social dynamics is unlikely to promote fruitful dialogue (Gelfuso & Dennis, 2014). As with self-reflection, intentionality is crucial towards promoting deep reflection, particularly in teacher education contexts in which PSTs are in the early stages of development (Korthagen, 2010). Mauri, Clara, Colomina, and Onrubia (2017) offer a framework to promote successful collaborative reflective practices. Applied to the context of teacher education, their framework includes: keeping PSTs focused on the situation at hand and their personal experiences with that situation, and creating an environment where PSTs feel they can engage in discourse about these situations without stigma. Opportunities within teacher education programs for collaborative reflection not only improve PSTs’ learning, but also help the PSTs to develop a level of comfort with feedback for, and from, their colleagues (Daniel, Auhl, & Hastin, 2013). Promoting collaborative reflection during teacher education contrasts – and perhaps, responds to – the “traditional culture of teaching in which colleagues do not tell each other what to do” (Carver & Katz, 2004, p. 460), and encourages PSTs to break down the “individualistic cultures” and the isolation of the professional lives many in-service teachers lead Jao, L., Sahmbi, G., & Huang, Y-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. The Teacher Educator, 55(1), 47-65.
(Le Cornu & Ewing, 2008, p. 1805). While isolationism is rampant in in-service teaching, the capacity to provide and receive critical and constructive feedback – which can come about through collaborative reflection – is fundamental to the growth of the teaching profession, thus rendering pre-service teacher education an ideal time to have future educators develop these practices (Daniel, Auhl, & Hastings, 2013).

Some researchers have explored the use of vignettes (descriptive accounts of a teaching situation) to prompt PSTs’ reflection (e.g., Jeffries & Maeder, 2009; Wilkerson, Kerschen, & Shelton, 2018). Research suggests that these opportunities are helpful for PSTs to be able to grapple with and later reflect upon various teaching events within the confines of a teacher education program. However, vignettes remain detached from PSTs’ lived experiences in that these are descriptive events and conflicts that the PSTs themselves are not taking part in. Thus, we contend that our study presents an alternative opportunity for PSTs to engage with real-life teaching situations and reflect upon these events.

**Research Context and Methods**

This study took place within the context of a secondary mathematics teacher education course\(^2\) at a Canadian university. Mindy and Kimmy (pseudonyms) were third-year secondary mathematics PSTs in a four-year Bachelor of Education program\(^3\) and served as TAs for the mandatory mathematics teaching methods course that they had taken one year earlier. It was as students in this course that Mindy and Kimmy were introduced to high-leverage practices.

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\(^2\) This was a 39-hour course consisting of 13 three-hour long classes. There were 18 students enrolled in the course.

\(^3\) The program consists of coursework and in-school practica. Courses include: mathematics content courses, mathematics teaching methods courses, and general education courses (e.g., assessment, educational psychology). PSTs have one practicum per academic year.

Before taking the course, Mindy and Kimmy had limited practice teaching experience, having only completed a two-week observational practicum during which they became familiar with a secondary mathematics classroom. After completing the mathematics teaching methods course, and prior to becoming TAs, Mindy and Kimmy completed two additional practica in which they had teaching responsibilities. Both shared that these experiences allowed them to explore high-leverage practices in a different context, as they were able to apply them in a classroom setting. Mindy and Kimmy were selected as TAs based on: their academic performance in the course the previous year, knowledge that they felt comfortable working with each other (as they had volunteered to complete a course assignment together), and their interest in being TAs.

Drawing on practice-based curriculum, teaching rehearsals (Lampert et al., 2013) are incorporated into the mathematics teaching methods course. When Mindy and Kimmy were students in the course, they engaged in the rehearsal process as “teachers” (once each) and “students” for their 18 classmates’ rehearsals while Limin (the course instructor) served as the facilitator for all rehearsals. In their role as TAs the following year, Mindy and Kimmy were the facilitators for the majority of the class’ rehearsals. The rehearsals occurred over three classes, held once a week. The breakdown of rehearsals is presented in Table 2.

| TABLE 2 GOES HERE |

Each rehearsal was recorded, spanned approximately 20 minutes in length and the class was divided into two groups during the weeks where Mindy and Kimmy each served as facilitator such that multiple rehearsals could be completed simultaneously. The three weeks of rehearsal were a constraint imposed by the nature of the course and program, the limitations of which we will discuss later in the paper.

**Data Collection and Analysis**
Data for this study were collected from three sources: 1) team meetings, 2) TA journals, and 3) TA interviews. The TAs and Limin met twice a week, once immediately before class and once during the week following class, for team meetings for the duration of the three weeks of rehearsals. All team meetings provided an opportunity to discuss rehearsal logistics, facilitation practices and debrief rehearsals. Meetings before class had an additional focus on the rehearsals taking place that week by reviewing protocols (a written document in which the “teacher” describes the lesson to be rehearsed and how they intend to incorporate high-leverage practices), brainstorming possible points of discussion and troubleshooting potential areas of concern. In preparation for the other meetings, TAs were asked to select one rehearsal to re-watch as a group and explain why they chose this particular rehearsal. Limin’s primary role during these meetings was to clarify assignment expectations, answer logistical questions, and provide a space for Mindy and Kimmy to discuss their facilitation practices with each other. The length of team meetings varied depending on scheduling constraints and the foci of the meeting. Typically, meetings before class were one hour in length, whereas meetings after class that included time to re-watch rehearsals were two hours.

TAs were asked to keep a personal journal throughout the study. The TAs were provided with writing prompts (e.g., “One idea from today’s rehearsals that I will take into my own teaching is…”) and encouraged to journal at regular intervals (e.g., prior to, and after each class with a rehearsal). Journal length was not specified. All journal entries were electronically submitted to Limin at the end of the study. TAs were individually interviewed twice during the study. Interviews were semi-structured, allowing for targeted questioning, but with the flexibility of delving deeper into participant answers (DiCicco-Bloom & Crabtree, 2006). The first interview took place prior to the start of the course and TAs were asked questions related to their Jao, L., Sahmbi, G., & Huang, Y-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. The Teacher Educator, 55(1), 47-65.
educational background, general ideas about mathematics teaching, and those more specific to high-leverage practices. The second interview occurred after the course was complete and focused on the participants’ experiences as TAs as well as to revisit their ideas about mathematics teaching and high-leverage practices.

Team meetings and interviews were audio recorded and transcribed verbatim. All of the transcripts and TA journals were coded using NVivo 11, a software used to efficiently organize and perform multi-faceted qualitative data analysis. Data was coded through the constant comparison analysis method (Miles, Huberman, & Saldaña, 2013) and with the intention of seeking and grouping emerging patterns and themes (Saldaña, 2009). While the use of NVivo 11 necessitated the use of a priori codes, a “living” codebook was developed to allow for unexpected themes to be included in the analysis (Creswell, 2017). The development of the a priori codes was guided by the pre- and post-interview questions, as well as brainstorming between the research team. There were broad categories of codes (e.g., supports, challenges, changes), and more specific sub-codes that were oftentimes created as a result of unanticipated themes in the data (e.g., self-pressure, TA stress). Data analysis was done by a research team comprised of the co-authors of the paper (a mathematics teacher educator and researcher, and two graduate students) and two recent graduates of the mathematics teacher education program. Further, codes were cross-checked by members of the research team for consistency and validity.

Findings

In this section, we present Mindy and Kimmy’s perceptions of their experiences as TAs in two parts. First, we share the TAs’ initial response to their roles and responsibilities, and how they responded to this approximation of practice. Second, we describe the professional learning they experienced through individual and collaborative reflection.

PSTs’ Experiences as TAs

Mindy and Kimmy described their initial experiences as TAs to be stressful. In this section, we present two themes in this regard: 1) self-imposed pressure, and 2) responses to stress and pressure.

Self-imposed pressure. At the beginning of the term, both TAs felt immense pressure to be experts as well as authority figures to the students (who were also PSTs) in the course. Mindy wrote in her journal:

I know education is a field where there are no “experts” per say [sic], since everyone can reflect and improve no matter how long you’ve been teaching, but in taking a lot of math courses...where the TA’s [sic] almost seem to be all-knowing, I feel like I should be an expert and [I] feel like the other students...expect the same.

As an undergraduate student simultaneously taking mathematics and teacher preparation courses, Mindy felt a sense of inadequacy in comparison to the mathematics TAs she had encountered before. At this university, mathematics TAs are generally graduate students who have completed an undergraduate degree, suggesting a level of expertise in the subject that they teach. In spite of Mindy’s role as a mathematics education TA, and her acknowledgement that there is always more to learn and improve upon in education, she compared herself to the mathematics TAs. Mindy worried that the students in the mathematics teaching methods course would have the same expectations of disciplinary knowledge of her as they do of their mathematics TAs. She compared herself to Limin, as well, proclaiming a lack of authoritative positioning compared to the course instructor. Mindy shared that, “they have a certain respect for you because you’re the [course instructor] and you know what’s happening” and that as the instructor, Limin had “so much experience to back up what [she is] saying [so] that there’s no
way for them to really contradict [her]”. Mindy’s perception of her limited expertise in educational research and practical experience in the secondary classroom, as compared to Limin, had convinced her that the students in the course would challenge her credibility. Kimmy felt similar tensions to Mindy regarding a lack of experience, saying that many students are “only, like, a year younger than me. I don’t have that much experience…what am I gonna [sic] do?” The small age gap between Kimmy and the students (and in some cases, the students were the same age or older) made her further question her presence and authority in the classroom.

Concern about lack of authority and expertise – at least relative to the students in the course – came up several times and appeared to induce feelings of insecurity and self-imposed pressure. Both TAs felt that they shouldered a big responsibility in making the rehearsal experience positive and meaningful for the students. Early on, Kimmy said, “I feel like as a facilitator, there is a major pressure to make sure that the students have specific items to reflect upon and that I am the one that has to get them there.” She wrote in her journal that she, “feel[s] that there is a pressure to be a facilitator and [I] feel like I may not be able to express the appropriate words for the students to understand.” Mindy was also mindful of her perceived influence on the students, saying that, “Everything I said had to be perfect” so as not to offend or appear to be “attack[ing] on their ability as a teacher.” Mindy worried on a number of occasions about how her ability (or inability) to facilitate would be interpreted by the students. She expressed concern that the students would think that she thought that she “know[s] more than they do”, suggesting that she does not actually believe that she does know more than they do.

Both TAs’ insecurities around their limited expertise in the fields of teacher education, mathematics education, and classroom teaching, as well as the nexus of all three, caused significant worry, and pressure to perform.

This pressure to create an environment similar to what the TAs had experienced the year prior manifested as stress on the TAs. In one instance during the first week facilitating rehearsals, Mindy felt paralyzed with fear saying that, “I was so scared of saying something bad or wrong or like, useless…I froze and said nothing.” Kimmy did not experience the same sense of immobilization during the rehearsals she facilitated, but instead, worried that she “said way too much” and in one scenario, “felt bad because then I was like ‘I’ve screwed [the student] up completely’.” The stark language used by the TAs was emblematic of the pressure they put on themselves to do their jobs well for the students, but also to give the same positive and rewarding experience to the students that they got from the course instructor.

**Responses to Stress and Pressure.** To combat the pressure and stress that they felt, Mindy and Kimmy prepared for rehearsals in their own way. As Mindy wrote in her journal:

In preparation for facilitating my first rehearsals, I have read both protocols and taken notes on what they plan to rehearse as well as teaching practices that will most likely appear or be missing from their presentation. I also prepared two cue cards...The first has reminders for how to run the rehearsals, like how long to set the timer for and not to interrupt for the first few minutes. The second cue card has the practices of high-quality teaching and common phrases that accompany each.

Similarly, Kimmy attempted to use a type of “checklist” that she felt she could not stray from when facilitating. She even went so far as to create “a breakdown of ‘typical’ rehearsal notes” that she used as a guide at the beginning of her facilitation process. After the first set of rehearsals, both TAs were inclined to ask Limin for direct guidance, including explicit directions on how much time they should spend on specific parts of the rehearsal, and how many discussion points to include. The systematic breakdown of the rehearsal and facilitation process appeared to Jao, L., Sahmbi, G., & Huang, Y-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. *The Teacher Educator, 55*(1), 47-65.
provide some calm to the TAs, and appeal to, for example, Kimmy’s desire to “control the classroom in a new manner without technically having control.” As the TAs continued to facilitate rehearsals, Kimmy realized that her facilitation approach had become prescriptive. During a team meeting, Kimmy admitted that she followed a similar structure in her rehearsals stating that it has “become my habit”. Through further discussion, it became clear that the TAs found it reassuring to create structure for themselves, and this often meant that their facilitation practice fell into a routine. In the next section, we will address the professional growth that the TAs concurrently experienced, through reflective practice.

**Individual and Collaborative Reflection for Professional Development**

Mindy and Kimmy shared that the opportunity to reflect on their experiences as TA contributed to their professional development. In this section, we present two themes in this regard: 1) professional development via individual reflective practices, and 2) professional development via collaborative reflective practices.

**Professional development via individual reflective practices.** Both Mindy and Kimmy had the opportunity to reflect individually in pre- and post-interviews, and in journal entries throughout their experience as TAs. Professional learning seemed to begin early during their approximation of practice; after their first week as facilitators, both TAs began to critically reflect on their experiences as facilitators and consider the implications of their role. Kimmy spoke about her style of facilitation and how it may have impacted the students in the course:

> I feel like when I say something, and if it takes them the time to think about it, I’m thinking that they are not understanding what I’m saying, so I’ll say something else. But now that I think of that, I’m like, “Hmmm…maybe I should have used wait time.”

Kimmy also considered the strategies she used to generate classroom discussion, and how “if [she] asked them a question rather than giving them a statement, then they’re going to learn more from that.” Kimmy became increasingly reflective about hers and others’ pedagogical practices throughout the term; she stated that she gained “more insight…to how the different teachers teach” and felt better able to “analyze[e] the teaching rather than just mimic the teaching.”

Reflecting on her journey, Mindy recognized that she “was not comfortable enough pausing and giving feedback” at the beginning, and that she found it challenging to use high-leverage practices as she facilitated. Indeed, Mindy realized that the “ultimate facilitator” would be one who “could use (high-leverage) practices to teach [the students] about the (high-leverage) practices” but felt that this was not something that she did. While this was a disappointing realization for Mindy, she wrote in her journal that “everything is clear in hindsight…but it’s ok. I actually think this was a great opportunity to feel what teaching will be like.” Being a facilitator still allowed Mindy to explore the complexities of teaching, including things that she had previously seen as being straightforward. She found that being a TA allowed her “to learn to lead a discussion”, though she realized that “it’s a skill that takes a lot of practice to be able to predict [where] the conversation is going to go and be prepared for that”, indicating that she persisted with a structured approach to facilitating.

Kimmy also acknowledged that it was an opportunity to learn from those in the “teacher” role. Specifically, she shared that the responsibilities of a facilitator allowed her to hone her observation skills – skills she was able to apply upon returning to a former field experience host school. While sitting in the classroom of her former cooperating teacher, Kimmy found herself observing his teaching practice. Kimmy wrote:

I was looking for opportunities to pause [my cooperating teacher] or have him see how he could apply the practices of high-quality teaching. [Observing another teacher] taught me to have the students do more work than you and give concise feedback. I have noticed that my own style of teaching has adapted by having this experience because I focus on the students controlling the outcome of their learning journey.

This reflection indicated that Kimmy was transferring the skills she learned as a facilitator – pausing and being critical of teaching practices, having feedback for the teacher – to the real world as she observed her cooperating teacher.

Both Mindy and Kimmy saw the relevance of their TA experience to their future role as classroom teachers. Mindy described how being a TA served as an additional “context” to further her learning of the high-leverage practices that she knew were valuable in the context of traditional classroom context. She shared that facilitating rehearsals gave the high-leverage practices “more meaning” and continued by saying that she could “imagine implementing [them] in a real classroom”. Similarly, Kimmy was grateful for the TA experience writing the following in her final journal entry:

Being a TA gave me the opportunity to see a new side of education, which has given me a new motivation for what I want to do in the future (as a classroom teacher). It was really interesting to see how I developed in such a short period of time, that I am excited...to apply what I have learned.

The TAs experienced growth in variable ways, and it was clear that Mindy’s reflections do not necessarily mirror Kimmy’s, suggesting that both began to understand their role as TAs and PSTs differently. Rather than emphasizing expertise and authority, they both started to see
connections in their roles as TAs to their roles as teachers, and these connections came to them through self-reflection.

**Professional development via collaborative reflective practices.** During their experience as TAs, Mindy and Kimmy had opportunities to engage in collaborative reflection in team meetings. As described earlier, they felt insecure regarding their credibility as TAs towards the beginning of the semester. During team meetings, Mindy and Kimmy shared the challenges they faced while facilitating rehearsals, consistently encouraged each other, and provided mutual support for one another. In a moment when Mindy was feeling particularly anxious about her limited classroom experience, the following exchange occurred:

Mindy: You don’t know what it’s going to turn into, and at some point, if [the students] turn around and they’re like, “Well, I disagree with you and I don’t think you really know what you’re talking about”, it’s not like I’ve so much [experience] that I can be like, “Actually, I do know what I’m talking about.” Whereas you (Limin) can be like, “Actually, I do. I do research in this field…” You have stuff to back it up.

Kimmy: But I think we do have a good understanding and a good knowledge of what the [high-leverage] practices are and I know our experience of applying the theory to practice is not as…it’s limited. But I think a lot of the students did see us as a good resource.

In this instance, while Mindy has lamented her own inexperience, this collaborative space became a place for reassurance, and support. Kimmy, who has a similar background to Mindy, acknowledges the TAs’ limitations, but makes a point of assuring Mindy that they are still valuable in their roles and that the students appreciated their contributions.

Team meetings were opportunities for the TAs to not only learn from each other, but from Limin as well. In the first week of rehearsals, TAs had observed Limin facilitate. Later, Jao, L., Sahmbi, G., & Huang, Y.-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. *The Teacher Educator, 55*(1), 47-65.
TAs also had the opportunity to watch videos of each other facilitating rehearsals. Subsequently, in team meetings, the TAs could debrief both Limin and each other’s facilitation practice. Kimmy found that, “watching someone else facilitate was helpful to me because I got to re-experience the rehearsal process through the eyes of a potential facilitator rather than a student.” Seeing rehearsals through another lens helped assuage some of Kimmy’s nervousness about facilitating, and the re-experience gave Kimmy the opportunity to get into the mindset of rehearsals again, in spite of the year gap since she had done one herself. However, it was not simply watching the videos that helped the TAs, but discussing them as a collective that alleviated some insecurities and provided new learnings. Mindy noted in her journal that when she watched what was considered to be a fairly successful rehearsal that Kimmy facilitated, she and Limin were still able to provide feedback, and was reminded that “everyone sees teaching and teachable moments differently.”

Both Mindy and Kimmy emphasized that the team meetings and the resulting dialogue were an integral part of their learning process. Regarding the team meeting following the first set of rehearsals facilitated by the TAs, Mindy wrote the following in her journal:

Yesterday I met with Limin and the other TA to watch a video for one of each of our rehearsals so we could discuss and reflect about our facilitation. I chose to watch the video from the first facilitation since I hadn’t found anything to comment on at the time and wanted the opinion of both Limin and the other TA. After watching the video and getting feedback about some of the moments where I could have paused, I felt a lot better. I think it gave me some ideas of what to say if something like that were to happen again next week.

Mindy valued the feedback from Limin and Kimmy and their comments on different ways of approaching her rehearsal. This feedback provided Mindy with strategies that she could implement into her facilitation practice.

Similarly, Kimmy described a moment in a team meeting where she made a connection between what she was teaching the students to do, and her pedagogical approach as a facilitator:

I think it was a [team meeting] we had...I might’ve said something and Mindy was like, “Well, why?” or something and pressed me on it and then I was like, “Hey, it’s like you’re using [high-leverage] practice[s]” and I think we got into a discussion of like, well, you can use the practices in whichever way you want to and everyone’s different interpretation of them…and then we talked about it and then it was like, “Hey you can actually use the [high-leverage] practices as a facilitator”, and that was like, our Eureka moment.

From this conversation that Kimmy describes, we see Mindy pushing Kimmy to reflect on her practice, and consequently, both of them reflecting and connecting their work as TAs to their work as teachers.

The value of speaking to each other, and to Limin, did not go unnoticed by the TAs. Kimmy indicated that she “would’ve been a lost puppy” without the team meetings and the opportunity to collaborate with Mindy, and Limin. Kimmy’s personal development as a PST hinged on the reflective process that the three of them engaged in before, during, and after the rehearsals. Mindy similarly acknowledged that “any time that [she] had the chance to talk about the practices and the rehearsals…with [Limin] and Kimmy…was really the most valuable.” The interactions the TAs had with each other and Limin provoked critical reflections of their own and each other’s teaching. Mindy realized that, “teachers improve when they share ideas and talk Jao, L., Sahmbi, G., & Huang, Y.-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. *The Teacher Educator, 55*(1), 47-65.
about different things” and that she, too, improved when dialogue and diversity of thought were included in her practice.

Discussion

Typically, in teacher education programs, opportunities to approximate practice occur in the form of school-based practica. While university-based opportunities exist (e.g., teaching rehearsals, microteaching), these are rare and situated within coursework. In this paper, we described the experiences of two PSTs serving as TAs in a mathematics teaching methods course. Mindy and Kimmy’s journeys shed light on the positive potential of PSTs as TAs – or a similar context – for professional growth, particularly given that in the short time period, findings suggest that critical reflection took place. As facilitators of rehearsals in the mathematics teaching methods course, the PSTs approximated practice by being independently responsible for a learning environment and leading discussions with groups of students. The PSTs’ initial experiences as TAs resulted in feelings of immense pressure and stress. While this was an unexpected finding, the PSTs' feelings and subsequent actions to their new roles as TAs were similar to novice teachers in the field (Feiman-Nemser, 2001). The PSTs responded to their feelings through the need for control and by creating a regimented rehearsal environment, also mirroring common concerns and practices of novice educators (Ingersoll & Strong, 2011). While there was no evidence in a change in PSTs’ facilitation practice as TAs, we humbly suggest that this may have been due to the brief timeline of this experience – three weeks, with only two weeks where the TAs facilitated rehearsals. Nonetheless, the experience provided the PSTs with the opportunity to reflect individually and in collaboration with others (including the other TA and Limin) on their experiences which contributed to the PSTs’ learning.

Findings suggest that opportunities for critical reflection during their experience as TAs were crucial to the PSTs’ development. Specifically, interviews and journal entries were periods of individual reflection for the PSTs. It was in these moments that the PSTs considered what they learned and what this new learning has done for them. Their self-perceptions as facilitators and future classroom teachers appeared to shift from the pre- to post-interview, and the journal entries suggested change even over three short weeks. The PSTs were able to acknowledge that their current facilitation practice did not reflect best practices and described missed opportunities to use high-leverage practices, suggesting that they will be able to make “wiser decisions…while teaching” in the future (Bullough & Gitlin, 2001, p.14). We argue that this is but one example of critical reflection that occurred. Indeed, opportunities for individual reflection in the form of journal entries and interviews gave PSTs the guidance necessary to provoke actual introspection (Walker, 2006). Kimmy, for example, noted that her perspectives on teaching shifted as a result of her experiences as a TA. Specifically, she saw the value of giving students “control” over their learning and shared that she was beginning to put this student-centered pedagogy into practice. This suggests that Kimmy was not only aware of her pedagogical choices before and after being a TA, but that her own practices were beginning to transform as a result of what she had learned, a crucial tenet of critical reflection (Osterman & Kottkamp, 2004). Indeed, self-reflection plays a powerful role in changing teaching practices, often through the acknowledgement of what a teacher has done and why, and the impact of these actions on students (Larrivee, 2000).

specifically, to keep conversations focused, team meetings before rehearsals centered around planning for the upcoming rehearsals and the intricacies of being a facilitator (e.g., logistics, best practices, discussing possible challenging moments). Team meetings following rehearsals involved re-watching of rehearsal videos, both ensuring focus on facilitation practices and on the PSTs’ personal experiences. While Limin’s role was largely to provide the time and physical space to discuss the rehearsals, and as previously mentioned, clarify logistics of the rehearsal process and their role as facilitators, Limin endeavored to create an open and safe space for collaborative reflection. Understanding that the PSTs saw her as an “expert”, by asking the PSTs to critically reflect on her practice after serving as the facilitator in the first week of rehearsals, Limin set the tone that team meetings would be a space for learning where all members should feel comfortable being both critical and critiqued.

Additionally, Mindy and Kimmy were already comfortable with each other outside of the context of being TAs (as friends and classmates who often study together and collaborate on assignments), thus positively contributing to the safe nature of this collaborative space. As such, the team meetings became a place for collaboration and support, both of which led to meaningful reflection on the PSTs’ teaching practices, points of success and struggle, and overall learning. The products of their learning were largely expressed as reflections, given that the PSTs did not specifically discuss if and how they changed their practices as TAs. Nevertheless, both PSTs reflected on conversations they had with each other during these team meetings that pushed their thinking by forcing each other to reflect on the decisions they made as facilitators. Indeed, having these opportunities led to Kimmy’s realization of the connection between the high-leverage practices she was taught as a PST and how she could use them as a facilitator, suggesting that crucial connections were made possible because of the chance to reflect. These Jao, L., Sahmbi, G., & Huang, Y-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. *The Teacher Educator, 55*(1), 47-65.
findings are supported by the extensive research on learning as a social act (e.g., Vygostsky, 1978), as well as literature that suggests reflecting with others promotes deeper reflection (Boud, Keogh, & Walker, 2013).

Mindy and Kimmy’s self-described growth suggests the great potential of providing more opportunities to approximate practice and promote professional learning in teacher education programs. Moreover, the TAs also saw their experience as valuable to their development as future classroom teachers, highlighting the strength of their experience and its obvious application to their future practice. Significant research suggests that constant reflection on pedagogy and instruction are critical components of becoming successful teachers (Farrell & Ives, 2015; Ryken & Hammel, 2016), and it was evident that the PSTs in this study were able to reflect on their practices in meaningful ways. We argue that this deep reflection was able to occur because of intentional opportunities to reflect individually, and in collaboration with the other PST and Limin.

We suggest that these findings propose a way that teacher education programs can be reimagined, such that opportunities for more approximations of practice and professional learning through doing and reflecting can occur. Though we acknowledge that there were several factors, including previously established relationships, that contributed to the feelings of safety and openness to vulnerability that the PSTs had, we argue that having a regular space for PSTs to dialogue throughout a long-term process can facilitate reflexive teaching, and teacher growth, even if the fruits of their mental labour are not immediately evident. Indeed, modeling critical reflection and openness to feedback as Limin did is one way instructors in other contexts can begin to develop a culture of individual and collaborative reflection. Adopting a cohort model of teacher education (Beck & Kosnik, 2001; Mandzuk, Hasinoff, & Seifert, 2005) may facilitate the Jao, L., Sahmbi, G., & Huang, Y-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. The Teacher Educator, 55(1), 47-65.
development of spaces conducive to community building that encourage collaborative reflection for PSTs, but we suggest that within these cohorts, more opportunities to approximate practice and then reflect is a key component to this process of professional growth. Additionally, future studies exploring targeted community building exercises in courses and other means of developing relationships amongst PSTs is crucial for teacher educators aiming to facilitate these experiences.

This study suggests that there are ways for PSTs’ professional learning to occur over a short period of time in settings that approximate practice with ample opportunity for individual and collaborative reflection. As in-service teachers “do not have the inclination to sit down and reflect on the reasons that underlie their classroom decision making” (Senior, 2006, p. 247), we suggest that the intentional structure of reflective practice in our context helped these PSTs to start the habit of reflective practice early in their career. We believe that the earlier these future teachers start this practice, the better they will be able to maintain (or at least know the importance of, first hand) their reflective practices.

This study acts as a modest starting point for exploring alternate opportunities for PSTs to approximate practice. However, we acknowledge that there are limitations to this study. Additional research is required to explore PST growth over a more prolonged timeframe, particularly given that our study took place over three weeks. To understand the impact of such learning opportunities on practice, future research to explore the PSTs’ practices as facilitators in rehearsals and as teachers in practica is needed. Crucially, we did not observe the PSTs when they facilitated rehearsals, nor was there a follow-up with Mindy and Kimmy upon completion of the study, thus we are unable to comment explicitly on any long-term growth. Our findings are based on the PSTs’ conversations in team meetings and reflections in journals and interviews. Jao, L., Sahmbi, G., & Huang, Y-S. (2020). Professional growth through reflection and an approximation of practice: Experiences of pre-service teachers as teaching assistants in a secondary mathematics teaching methods course. The Teacher Educator, 55(1), 47-65.
Though we believe that teacher change in terms of personal growth is a critical part of PSTs’ learning, future studies focused on longitudinal observation of PSTs’ practice will illuminate whether or not there was a change in pedagogy over time in actual K-12 classrooms. Further, while this study suggests the positive potential of such an opportunity on PSTs’ growth, the efficacy and impact of the PSTs’ facilitation as TAs on the students’ experience in the courses should be additionally explored. We contend that this experience was helpful for the PSTs who acted as TAs, but the students they taught are also implicated in this context, and as such, their voices should be highlighted, as well.

Nonetheless, Mindy and Kimmy’s journey, characterized by changes in stress and pressure, and the critical reflection they engaged in, illustrate the positive potential of a professional learning opportunity and collaborative structure to contribute to the PSTs’ perspectives on themselves as educators. While we recognize that it would not be logistically feasible for all PSTs to become TAs in teaching methods course, we encourage teacher educators to think broadly about alternative ways to create collaborative and authentic learning opportunities within their teacher education programs resulting in a new generation of high-quality teachers.
References


Table 1.

An Overview of Some High-Leverage Practices

<table>
<thead>
<tr>
<th>Examples of high-leverage practices</th>
<th>Description of the high-leverage practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching towards an instructional goal</td>
<td>Setting long- and short-term learning goals for students, designing the sequence of lessons, and choosing and modifying the teaching activities based on the specific learning goals.</td>
</tr>
<tr>
<td>Positioning students competently</td>
<td>Valuing students’ contributions to the process of knowledge construction by acknowledging their ideas, and creating opportunities for students to develop a deep understanding of the topics.</td>
</tr>
<tr>
<td>Establishing and maintaining expectations for students’ participation</td>
<td>Establishing norms and routines for students to participate in whole-class discussion. Teachers may use explicit explanation, gestures, and repeated practice to maintain the norms and routines during the lesson.</td>
</tr>
</tbody>
</table>
Table 2.

Rehearsal Schedule

<table>
<thead>
<tr>
<th>Rehearsal Week</th>
<th>Facilitator</th>
<th>Number of Rehearsals Facilitated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limin (Course instructor)</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Mindy</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Kimmy</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Mindy</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Kimmy</td>
<td>5</td>
</tr>
</tbody>
</table>