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Understanding Identity Development as a Science Teacher Educator Through Shifts in Pedagogical Equilibrium

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This article reports research investigating the identity development of a science teacher educator (STE) (Author 1) through the lens of pedagogical equilibrium. Despite previous experience as a secondary science teacher and STE, Jennifer found herself questioning her feelings of legitimacy and relevance when teaching pre-service primary science teachers. Identifying moments of disturbance in her pedagogical equilibrium, and working with a critical friend to analyze her ideas and experiences, she began to develop her professional self-understanding, contributing to improved feelings of credibility, and professional identity development. Emerging from this study, Jennifer experienced two important shifts in her perspective and understanding of her role. The first shift concerned recognizing the different sources that comprised her "authority of experience" as a STE, while the second shift involved learning to see pre-service teachers in her classes as future teachers, rather than students. These shifts in perspective were facilitated through applying self-study as the research methodology. The study provides insights into the identity formation processes of an early career teacher educator, as well as the value of pedagogical equilibrium and self-study for exploring teacher educator identity.

Keywords: science teacher educator, pedagogical equilibrium, teacher educator identity, self-study, critical friendship

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INTRODUCTION

This study explores the identity development of Jennifer (Author 1), a science teacher educator (STE). In her sixth year as a tenured academic working in a large research-intensive university, Jennifer found herself questioning her feelings of credibility in her role, especially when working with pre-service primary teachers, as her formal qualification and classroom teaching experience was in secondary science education. The need to be perceived as credible by one's students is an experience that other teacher educators share (see for example, Dinkelman et al., 2006; Simpson, 2019; Cross Francis et al., 2022). These feelings

can be heightened when teacher educators lack experience in the theory or practice of the courses they are required to teach (Santau, 2012; Logan and Butler, 2013). Exploring situations where credibility is felt to be threatened offers potential insight into teacher educators' professional identity development. Learning to recognize and manage one's own and others' expectations of the role is central to the process of constructing a professional identity as a teacher educator, because there is a close connection between identity and practice (Davey, 2013; Izadinia, 2014).

Pedagogical equilibrium (Mansfield, 2019) refers to the notion that teachers (at all levels) regularly encounter dilemmas in their classroom practice which can lead to feelings of destabilization and pedagogical discontentment (Southerland et al., 2011). Pedagogical equilibrium becomes noticeable when a dilemma arises and unsettles existing routine practice; therefore, it challenges the existing state of equilibrium. Pedagogical equilibrium offers a frame for identifying and articulating these situations and how they play out in teacher educators' professional identity development. The study reported in this article focuses on Jennifer's attempts at identifying, analyzing and addressing challenges to her pedagogical equilibrium in terms of her identity and role as a science teacher educator (STE).

Over the course of three semesters, Jennifer met regularly with a critical friend, Meredith (Author 2) who is also a STE, and together they worked on identifying instances and uncovering possible reasons for the challenges to Jennifer's pedagogical equilibrium. Two main concerns preoccupied Jennifer's feelings of legitimacy and credibility as she began this study; how long it had been since she taught in a secondary science classroom and the fact that she was not qualified in, nor had she ever taught, primary level science. As a STE who had not taught in a primary classroom, how could she be considered credible for preparing primary pre-service teachers?

LITERATURE REVIEW

The literature framing this study consists of two sections: research on STEs and their development, and teacher educator professional identity.

Science Teacher Educators

One of the challenges that is particular to science education, and by implication for STEs, is that the disciplines of science are often seen as a quest for 'right answers' typically promulgated through the way in which science is taught and experienced in school. This means that pre-service science teachers are often expecting to be provided with 'right answers' not only about what science to teach, but how to teach it. However, as Bullock (2012, p. 1) stated, "[s]cience teaching and science teacher education are complex endeavors that require far more than. . .technical rationality." The education of pre-service science teachers therefore, often involves shifting their prior expectations about science as applying a correct, prescriptive method, to learning to teach science as a complex task of sense-making through argumentation. As Russell (2012, p. 194) points out, this is what makes "the shift from student and teacher of science to educator of science teachers . . . particularly complex and difficult." STEs typically experience forms of discomfort or unease as they come to recognize and learn to manage: (a) the complexities of a situation in which their students expect to be told how to teach, (b) their own expectations of being viewed as competent in the eyes of their students, and (c) understanding there is no formula for how to teach science.

Professional Identity of Teacher Educators

In general, a person's identity is understood to form from the self-perceptions that a person has of their own role performance in particular groups or contexts (Stets and Burke, 2000). Zembylas (2003 p. 221) reminds us that identity formation is a "non-linear, unstable process. . .by which an individual confirms or problematizes who she/he is/becomes." The perception that one is satisfactorily fulfilling a role heightens feelings of self-esteem and self-worth, whereas perceptions of poor performance raises doubts about one's self-worth and can cause distress (Stryker and Serpe, 1982; Hoelter, 1986). Burke and Stets (1999) suggest that identity activation includes self-verification, where individuals look to the responses of others to confirm their own self views.

Izadinia (2014) conducted a literature review focusing on teacher educators' professional identity, in particular the tensions they experience during their induction into the role and the impact of these tensions on the formation of their professional identities. She classified the tensions into two types: external challenges (e.g., organizational knowledge, research skills, making professional connections) and internal tensions (e.g., feeling uncertain, deskilled, having self-doubts, failure in establishing academic credibility). According to Izadinia (2014), teacher educator identity formation is "slowed down" through negative self-views about one's confidence and competence to fulfill the requirements of the role. Other factors which limit teacher educator identity development are negative self-views about vulnerability, being disempowered, marginalized or de-skilled (Murray and Male, 2005; Field, 2012).

Dinkelman studied his own teacher educator formation and described it as an active process that occurs "in context, in practice and over time" (2011, p. 314). From this study, he described teacher educator identities as complex. He noted that similar to other forms of identity,

> *Teacher educator identities reflect an unstable and ever-shifting weave of personal and professional phenomena. They are both claimed by teacher educators and given to them via the roles and institutions that frame the profession* (Dinkelman, 2011, p. 309).

Self-studies, such as the one reported here, offer insight into the challenges experienced by teacher educators when establishing their identities and defining their roles. As Dinkelman (2011) suggests, the context in which teacher educators work matters and is highly influential on their identity formation. Therefore, reporting self-studies, like this one, enables greater understanding of the challenges and tensions experienced by teacher educators within specific contexts. When shared, these studies are valuable

for supporting the professional development of others and contributing to the scholarship of teacher education.

THEORETICAL FRAMEWORK

Pedagogical Equilibrium

This study employs the theoretical frame of Pedagogical Equilibrium (Mansfield, 2019) as a means to uncover and articulate aspects of Jennifer's (Author 1) developing identity as a STE. The notion of pedagogical equilibrium builds on Southerland et al.'s (2011) theory of pedagogical discontentment and Piaget's (1959) theory of cognitive disequilibrium, to describe what happens to teachers when they encounter pedagogical situations which lead them to stop and think. When a teacher's actions for teaching do not align with their intentions, they can feel a sense of unease or unrest (Southerland et al., 2011). The construct of pedagogical equilibrium expands on this premise, and recognizes that not all moments which demand a teacher's attention are negative or engender feelings of dis-content. The process need not be described through value labels such as negative or positive, but can be considered as a catalyst for recognizing the limits of one's routine knowledge and skills. In this paper, routine knowledge refers to smoothness of practice through the use of well-practiced routines and the mastery of procedures that enables high levels of efficiency and accuracy (Hatano and Inagaki, 1986).

Challenges to pedagogical equilibrium can be framed by identifying situations that highlight a teacher's inability "to enact their goals and intentions for teaching, or when they are surprised by the way they have implemented a lesson above and beyond what they had expected" (Mansfield, 2019, p. 191). These situations occur when routine knowledge is unable to help the teacher make sense of, and manage, a new situation which arises in their teaching. Such situations challenge routine knowledge, demanding the teacher's attention through feelings of unrest, curiosity, uncertainty and perplexity.

Teachers can respond to challenges to equilibrium in various ways; on one hand, by seeing the feelings as inconvenient and choosing to ignore or not to respond, and on the other hand, a teacher can actively listen to these feelings, critically analyze the situation and generate a plan for action to actively seek a way to return to a steady state. The process of action can be described as the search for pedagogical equilibrium (Mansfield, 2019). To find a steady state or state of balance, requires the teacher to invest additional thinking about the situation and engage with alternative actions.

A challenge to pedagogical equilibrium signals an opportunity for learning. When challenges to equilibrium are recognized as an opportunity to examine beyond the boundaries of routine knowledge, the moment offers teachers a chance to engage with real and relevant professional learning, thus offering insight into a teacher's self-knowledge and self-understanding. Similar to cognitive dissonance theory (Festinger, 1957), the search for equilibrium may provoke meaning making, facilitating transformative learning. However, for such learning to occur the teacher must be willing to, (a) see their practice as problematic; and (b) perceive the situation as a transformative learning opportunity, and (c) be willing to manage feelings of uncertainty and discomfort as they develop new insights through the process of critical interrogation of their practice.

In this study, pedagogical equilibrium was utilized both as a tool for noticing Jennifer's practice, to identify situations which gave rise to feelings of unrest, surprise or uncertainty, and as a language for discussing and analyzing practice with her critical friend.

AIM OF THIS STUDY

The motivation for this self-study was for Jennifer to critically reflect, in collaboration with a critical friend, on her developing identity as a STE of pre-service primary teachers. Through participation in this critical friendship, Jennifer aimed to better understand how she was positioning herself, that is, what she valued and saw as important for her pre-service teachers to experience in her class as she prepared them to teach science to young children. From this process she aimed to better understand and develop her practice, and in so doing, alleviate feelings of doubt about her legitimacy and credibility as a primary STE.

Challenges to pedagogical equilibrium (Mansfield, 2019) was used as a guiding theme to journal about unrestful situations which were relevant to Jennifer's context and stage of professional development. Through a continuous cycle of data collection, analysis, planning, testing and reflecting, Jennifer was able to expose elements of her views on, and assumptions about teaching and learning that may be contributing to her sense of legitimacy and put into action some strategies to manage her unrestful feelings. Critical friend conversations between Jennifer and Meredith (Author 2) became an essential aspect of this process for surfacing Jennifer's views and challenging her assumptions. Considering the framing of this study and the iterative and collaborative process of reflection with the critical friendship, the following questions guided this study:

- What are the major sources of challenge to Jennifer's pedagogical equilibrium as she learned to position herself as a primary STE?
- What are the implications of recognizing these challenges on Jennifer's developing identity, and as a consequence her teaching practices, as a STE?

MATERIALS AND METHODS

This research employed self-study methodology (Bullock, 2009; Bullock and Ritter, 2011) to examine the evolution of Jennifer's identity development when teaching about teaching science to pre-service primary teachers. Self-study involves "intentional and systematic inquiry" (Dinkelman, 2003, p. 8) into one's own teaching practice, "to develop [one's] basis for knowing about teaching teachers" (Bullock, 2009, p. 291). Samaras (2002) proposes that self-study researchers examine their practice critically to develop consciously driven modes of pedagogical activity. Through raising practice from habit or routine into

conscious awareness, self-study researchers can begin to make explicit and question their tacit knowledge of practice. Through the study of their practice, self-study researchers seek not only to improve their own practice but also "to make explicit and validate their professional expertise with the explicit intent of advancing the public knowledge base of teacher education" (Vanassche and Kelchtermans, 2015, p. 509). In this way self-study is a form of personal critical reflection that is made public.

Role of Critical Friendships in Self-Study

The inclusion of a critical friend in self-study research is something that has gained traction over the past 10 years, as many researchers have viewed it as an important step for ensuring trustworthiness in the data (Stolle and Frambaugh-Kritzer, 2022). Despite an increase in the use of critical friendships in the design of self-study, little attention tends to be given to explaining the actual role of critical friendships in the design of the study with respect to supporting the participants' professional growth (Stump and Gannon, 2022). However, if researchers are to rely on critical friendships as a critical part of self-study, and we agree they should, then it is important for researchers to clearly note how a critical friendship is employed within the framing of self-study, so that it can be understood as a source of data and/or means of analysis in addressing the aim of the study (Stolle and Frambaugh-Kritzer, 2022).

For the purpose of our study, we draw on the critical friend definition continuum that Stolle and Frambaugh-Kritzer (2022) first introduced in 2018 and recently elaborated on with further analysis of additional self-studies from 2018 to 2020. Specifically, the dichotomy of terms close friend/stranger; insider/outsider; fully involved/loosely involved; and reciprocal in nature/one way, pertain to our application of a critical friendship. With respect to friend vs. stranger, Jennifer and Meredith first met at the Castle[1] Conference 2018 and quickly became friends, but in the definition continuum of these two terms, they would be classified as being strangers entering the work of self-study. This perhaps limited some of the vulnerability Jennifer felt in sharing her experiences with Meredith early in the study, but over time, as Meredith shared instances of not feeling credible in her position as a teacher educator, it opened the door for Jennifer to share more, and the friendship started to move along the continuum of this dichotomy toward "close friend."

The questions being explored in this study focus on Jennifer's understanding of and attempts to address challenges she felt existed because of a lack of credibility she believed she had in teaching primary preservice teachers. As a former primary teacher herself, and a teacher educator who mainly prepares primary teachers, Meredith served more as an "outsider" to the study, as it was the basis of her knowledge and expertise that provided Jennifer with an opportunity to bounce around ideas and seek some feedback from a knowledgeable other, before implementing with her primary pre-service teachers.

[1]The Castle conference is a bi-yearly professional gathering of self-study researchers sharing about their research and pedagogy toward self-reflection, understanding, and improvement of teacher educator pedagogy. The reference to a castle in the name of the conference is because it is held at a castle in England.

With respect to the "level of involvement" dichotomy, Meredith was fully involved in supporting Jennifer with studying her teaching. Due to distance (opposite hemispheres) Jennifer and Meredith connected through video conference and kept an interactive journal, which each contributed to by responding to each other's thoughts and questions. From these conversations, Jennifer often made pedagogical decisions about how to approach challenges with her students.

Although the critical friendship began more with a focus on understanding Jennifer's issues with credibility, and thus suggesting a one-way friendship, Meredith realized by the end that her extensive involvement in Jennifer's process of seeking pedagogical equilibrium resulted in more of a reciprocal relationship. As such, the critical friendship used in this study illustrates the dynamic nature of this component of self-study work and researchers should be encouraged to let their roles in the friendship evolve as the study requires.

The critical friendship employed in this study purposefully stimulated challenges to Jennifer's pedagogical equilibrium by drawing attention to any taken for granted assumptions. This enabled problem setting and, in some cases, planning of actions which she could initiate to address the situation. Testing of the actions included assessment of perceived impact on student learning and engagement, which were considered in subsequent critical friend conversations.

Context and Data Sources

To bring the narrative to life, from this point onward, the text will be written in first person, from the perspective of the 1st author, Jennifer.

Although I had a background in science and secondary science education both as a teacher and as an academic, I had not taught young children and I had limited knowledge of young children's science learning and development. I was conscious of this lack of experience as I noticed that many of the pre-service teachers in my primary science methods class had little background in science and/or were fearful of their own perceived science content inadequacies. I felt unsure of how to respond when these pre-service teachers asked about how to translate ideas from university-based workshops into practice in the primary classroom. These instances created pressure on me to tell the pre-service primary teachers what to teach and how to teach it. This, in turn, prompted me to grapple with my feelings of adequacy as their STE.

At the time of the study, I had been teaching for 6 years in a university setting; including 3 years as a sessional academic before becoming tenured as a STE. The study took place over two teaching semesters [Semester 1 (S1): July–November 2018 and Semester 2 (S2): March–June 2019]. Data collection and analysis consisted of two levels. Level 1 data collection related to the immediacy of teaching and Level 2 involved reviewing and analyzing this data with a critical friend, Meredith (Author 2).

Level 1 data consisted of 4 different types that I produced alone (emboldened terms are used to identify data sets in the results):

- Pre-semester journaling of 1–2 pages (approx. 500–1,000 words) (x3 semesters) using a free-write approach. This

data source captured my aims and philosophy for teaching in the primary units, along with what I was hoping to achieve and why. I also included my concerns and apprehensions about teaching (i.e., what was challenging my sense of pedagogical equilibrium) and things I was going to be doing differently because of previous experiences (**Pre-SJ**).

- Weekly pre- and post-teaching reflections (250–500 words) during the semester (S1 × 6 weeks; S2 × 7 weeks) for the primary science teacher education units (**Pre-w or Post-w [workshop] RJ**) which were framed using the following questions:
    - What have I planned and why?
    - What went well?
    - What has challenged my sense of pedagogical equilibrium?
    - What am I learning from this experience?
- End of semester reflections of 1–2 pages (approx. 500–1,000 words) (×3) that captured my overall impressions about challenges to pedagogical equilibrium and my learning from thinking about my challenges to pedagogical equilibrium. I used the frame of "challenges to pedagogical equilibrium" to stimulate reflective writing using a free-write format (**Post-SJ**).
- In semester 1 only, I audio recorded my teaching in the primary science workshops to use for personal reflection (4× audio recordings ranging from 12 to 25 min). I listened to the recordings, extracted excerpts and added them to my reflective journal to illustrate examples of practice for my CF (**Workshop audio**).

All of my written data sources were uploaded to a shared and password secured Box folder to facilitate access and communication between the first two authors.

Level 2 data consisted of two types, produced through interactions with my Critical Friend:

- Critical friend reading and responding to my journal entries during semesters 1–2 (**CFFeedback**). Based on her responses to my journal entries and other written data, CF posed a question/s for me that we discussed during our CF conversations.
- 8 × CF conversations (**CFC**) across the 2 semesters with 3 additional conversations in the 3 months after semester 2 had concluded to further discuss the data collected in S1 and S2. The audio recorded conversations were designed to facilitate critical reflection on my practice to unpack and potentially reframe the issues (Loughran and Northfield, 1996) which were challenging my sense of pedagogical equilibrium. This process manifested initially as informal suggestions for me to "notice" (Mason, 2002) or try in my classroom and reflect on in our subsequent meetings.

Data Analysis

Data analysis was iterative and ongoing during data collection consistent with a self-study approach to researching practice (LaBoskey, 2004). To recognize and examine the major sources of challenge to my pedagogical equilibrium, I regularly read through my journals looking for recurring patterns or themes. My critical friend also read my journals and analyzed them for common themes which she highlighted with different colors. As described above, when my critical friend read the journals, she would pose written questions to me, to seek clarification, stimulate reflection and probe any apparent taken-for-granted assumptions. I would respond to her comments in writing and then we would discuss the journals and our impressions of them in our online (zoom) conversations. In these conversations we would also identify emerging themes, particularly with respect to changes in my pedagogical equilibrium, which addressed the second research question related to recognition of the challenges to pedagogical equilibrium on my developing identity as a STE. This ongoing cycle of data collection, analysis and testing continued across the two semesters.

RESULTS

Two key themes emerged from analysis of the data. Initially, feelings of identity and legitimacy permeated the S1 data sets, as I positioned and repositioned myself (Theme 1) as a teacher educator, seeking to clarify my identity. As I processed these feelings and found a sense of pedagogical equilibrium with relation to my identity, I started to notice new challenges to equilibrium related to my role and how I was positioning and repositioning my students (Theme 2). The challenges to equilibrium which led to the development of these themes are described below and brought to life through data extracts.

Theme 1—Positioning and Repositioning Myself

This self-study was initiated because of unrest I was experiencing in relation to my developing identity related to teaching primary science. My self-questioning and unrest about identity were obvious in the initial research questions I created for the self-study. The questions highlighted concerns about how I felt I was being perceived by my students and what past experiences and knowledge was I drawing on to help me feel confident in my role as teacher educator. Some questions I asked myself at the beginning of S1 were:

> *I am a secondary trained teacher but I work in primary units. This is about my developing identity as a primary teacher educator. How do I perceive and position myself as a primary and secondary teacher educator?*
>
> *Feeling like a fraud. Which prior experiences am I drawing on and how am I linking these prior teaching identities when teaching primary and secondary science?* (S1, Pre-SJ).

I felt uncertain about my teaching because if I was identifying as a secondary science teacher, teaching in primary science teacher education units, would my students listen to what I had to say and trust me as an educator if they knew I didn't have any primary teaching experience? It was evident from my lesson

recordings that I was so conscious of this, that I made a point of telling my students about my self-study:

> Workshop audio: *Part of my identity as a science teacher educator is I taught in secondary schools, so I am a secondary science teacher. But since I transitioned into tertiary, I have been teaching in primary science units. And so it's interesting to see how I draw on experiences when I don't have a lot of experiences in primary schools. That's something that over time I have had to become comfortable with sharing because how can I teach in ways that do not make me feel like a fraud. And, so, over time I have had to confront my identity in certain ways. That is why I am going to be recording myself* (S1, W1, Workshop audio).

My students responded remarkably positively to this positioning of my vulnerability, which made me feel comfortable to share my concerns. However, what I didn't realize at the time was that I had positioned myself as a secondary teacher; someone who was different to these students. It was not until the end of the unit when I was conversing with my CF that she highlighted this contradiction.

In reviewing my journal, I noticed moments where I was drawing on experiences and knowledge outside the primary unit to help me feel more confident when teaching in the primary unit. For example, using other people's stories and anecdotes or drawing on my knowledge about teaching in secondary schools.

> Journal entry: *Today I drew heavily on my learned knowledge of the Victorian science curriculum—rather than my understanding of how to enact the curriculum in primary schooling. My knowledge of the progression of concrete to abstract ideas was knowledge I gained through doing the unit. . . But I did not draw on my direct knowledge of how to plan for teaching, as for primary, as I don't have this. I know what I might do, but I would not know or be confident about how it would go* (S1, W2, Pre-w RJ).

> CF comment: *Perhaps not officially, but how many times have you taught this class? How many times have you been out in primary schools observing your students teaching? Perhaps you are not as "new" to this as you think?* (S1, W2, RJ)

My CF's comment about identifying as "new" was interesting. Was I considering myself new, so that my lack of experience would be more acceptable to my students? By holding on to my "new" identity, perhaps that gave me permission to make mistakes and not need to 'know all the answers'? It became clear to me, as illustrated in the next journal excerpt, that I was placing a great deal of emphasis on 'knowing things' and 'having experience' as a source of authority, compounding my sense of challenge to pedagogical equilibrium. In hindsight, perhaps my background in science and secondary education, both of which are disciplines which promote the guise of certainty, prompted me to feel there must be a 'right' way of doing things in primary science teacher education?

> Journal entry: *I find this [my] lack of knowledge a little debilitating/limiting. I feel that I am talking about what "could be" rather than what I know "has been." I know that I still have something of worth to give, but I am still conscious of my feelings of not really knowing (for sure) how what I suggest would work in reality. I feel apprehensive about this, and so I think I sometimes avoid really digging down into the specifics of practice as I don't feel I have the capacity to bring prior experience to bear. I think in these cases I tend to keep the conversation more theoretical and general* (S1, W2, Pre-w RJ).

> CF comment: *This almost sounds to me like you think the value of a teacher educator resides only in their past official classroom teaching experience. Do we not improve with our experiences as educators of teachers and as researchers of teacher education?. . . So many of my comments above so far have dealt with this notion of apprehension you are conveying. I'd really like to dig into this more. Why you feel this—what is contributing to it — how you are responding to it in your practice—how your students are perceiving it (or do you think they perceive it), etc.* (S1, W2, RJ)

My CF helped me to recognize how my sense of identity seemed heavily relying on my "street cred" (Dinkelman et al., 2006) and feeling like I was straddling two identities simultaneously—as an experienced secondary teacher and beginning teacher educator. I felt I was trying to draw on experience in one context to help me feel legitimate in the other.

My challenge to pedagogical equilibrium was driven by assumptions I was making about how my students viewed me. However, in searching for a sense of equilibrium, I started questioning these feelings and began to recognize that my knowledge of pedagogy, developed through being a teacher educator, was also a source of knowledge and credibility. I started seeing glimpses in my journals of drawing on my experiences as a teacher educator, particularly in primary science units, but I was not necessarily recognizing them as sources of credibility or legitimacy, until my CF questioned them. She also began to question whether perhaps I had idealized my prior experiences as a teacher.

Later in the semester, I recognized that my confidence had increased after students in the primary unit had returned from their practicum experience, and I felt comfortable to lead discussions about their experiences. I could encourage them to think deeply about their teaching and learning, which did not depend on my feelings of needing to have direct primary teaching experience.

By the end of the unit, my sense of identity as a primary STE had changed. While I valued having relevant prior knowledge and experience, the nature of the experience that I valued was different, as illustrated in the excerpt below.

> Journal entry: *I am drawing identity from being a primary science educator. I see myself as having expertise in teacher professional learning. I would say that I am knowledgeable, but not an expert. I know you don't have to be an expert to teach in other units, but I invest a lot of time and effort*

> *making sure I know my stuff—I don't like to walk into classes unprepared. So identifying as someone who has some expertise in a subject is important to me. I am beginning to feel that with my primary science teaching. Although, I think, to make myself feel an even higher degree of expertise in primary science, I want to publish and research in primary science education. I think that would make me feel even more confident and comfortable with my expertise and identity* (S1, W11, Post-w RJ).

In the above reflection, I was less concerned with relevant classroom experience as a source of credibility and instead drew my identity from my role as a teacher educator academic, knowing relevant theory and seeing experience as transferable. The source of my credibility was now becoming aligned with the scholarly activities of conducting research and being published in the field of primary science education.

What Came Out of Recognizing and Learning to Manage These Challenges to Equilibrium?

An important shift in my identity perspective emerged as a result of examining the challenges to equilibrium throughout my self-study in S1. It had not occurred to me until my CF had pointed it out. I was using my 'beginning' teacher identity as a "cushion" to make excuses for my lack of primary teaching experience and pre-empt any mistakes I might have made in my teaching.

> Author: *I suppose that raises in me questions of, would I be seen as fraudulent if I. . .[did] not make that distinction. . .I haven't taught science in primary schools. Therefore, how much of an expert can I actually say that I am?* (S1, CFC end of semester).
>
> CF reply: *No, I do think identity is important. But I think that when I read the statements from your journal from the start to several weeks later, that part about positioning yourself as the secondary biology teacher almost seemed like you were using it as a cushion. Like, "if anything goes wrong, just keep in mind, I'm a secondary biology teacher and I don't have access to primary school." But as you were going along in your entry, you began to talk about the fact that you've taught this course other times. This wasn't new to you. You had been working with other people that had been in classrooms and primary grades. You've actually been out and seen people teaching science in primary grades. . . . So your experience with primary science does exist* (S1, CFC end of semester).

Later in the conversation, my CF said something which became the catalyst for a shift in my identity perspective.

> CF: *Okay. So I kind of wonder, going into next semester, if you kind of took your position as not, "I am a secondary science teacher," but "I am a teacher of science. I am a teacher educator, of science." Would positioning you in that way, begin to have your students take you up in different ways and look at you in different ways and take your ideas in different ways? Would you feel less like they're judging you? More like you have something of value to them. And then how would your identity begin to develop there, as a result of positioning yourself that way vs. positioning yourself by the grade levels that you formally taught?* (S1, CFC end of semester).

At the time, while I could hear what she was saying, it took time for me to process the meaning, through personal reflection over the following weeks. As I began to make sense of her comment, I came to realize that I was hanging on to my 'beginning' status and not recognizing the wealth of knowledge and competence through my identity as a teacher of teachers.

Journaling forced me to make thinking and questioning about my practice explicit and to mentally process what was causing my feelings of unrest. Analysis of my data, especially with the aid of my CF's questions, helped me appreciate alternate perspectives which I would not have had otherwise. The process of self-study helped me name and frame (Loughran, 2004) what was creating unrest, which formed a tangible basis from which I could purposefully inquire about my practice and re-imagine my developing identity. Even though some apprehension and uncertainty remained, my attention was no longer powerfully drawn to what had been causing my feelings of unrest during semester 1.

Theme 2—Positioning and Repositioning My Students

The second major challenge to my pedagogical equilibrium emerged between S1 and S2. Once I had established a sense of equilibrium with regards to my feelings of legitimacy and identity in my primary STE role, I was able to consider more deeply my role in relation to students' learning. To what extent was I responsible for their learning and therefore, how much control did or should I have over their learning? The notion of control was recognized by my CF during S1. In a primary science workshop, I had recorded myself saying:

> Workshop audio: *"Learning from experiences—we have to be learners to know how to adapt in the future. When I first started teaching my focus was very much on the 'teaching' because I could control the 'teaching.' I could not control these kids (i.e., their behavior). . . . It's easier to control what 'I' do, than it is to control what 'they' do"* (S1, W1, Workshop audio, added to RJ).
>
> CF response: *There is a lot of emphasis on this notion of having control. . .are you sharing this with your preservice teachers? Is that how you are wanting to position them in their roles in the classroom—as the controllers?* (S1, W1, PJ).

My uncertainties, and hence disequilibrium, related to planning effective pedagogies to support PSTs' learning about teaching and my role in the learning process. One example of how this manifested was through my noticing how much talking that I was doing in class:

> Journal entry: *The activities we did today went well, but my disequilibrium is about how much talking I do and how effective it is. How much talking is enough and when to move on. . . . What is it I am saying that is adding value and what*

> *is extra and not really necessary?. . .I love explaining—but I also know that it's not always effective and that I need to hold back and position learners as active learners. Often it's about asking the most effective questions that positions the learner in ways that help them construct ideas, not just telling them the answer. I know teaching is not telling and I feel the tension of this when I talk too much. Am I adding value??? Or is it just talking. How do I find out??* (S2, W4, Post-w RJ).

> CF response: *What is your talking all about? What is the purpose of it? When is it happening in the class? Is it both whole class and small group discussions? You seem to be focused on there being a 'right amount of time' for talking. . ..but really the talk should have purpose. . .does it? Different purposes take different amounts of time.*

My uncertainty about whether I was talking too much made me concerned that I was depriving students of the opportunity to learn for themselves. I had noted "talking too much" was something I had a habit of doing, from a previous self-study. I felt the contradiction of saying that positioning the learner as active in the learning process was an important goal of my teaching, yet, I did not seem to be "walking my talk."

My observations of the extent of my "teacher talk" led me to make a change to my practice in the primary science class to encourage more student interaction and engagement.

> Journal entry: *So this week we explored scientific literacy. As I was preparing the slides for this week I realized that. . . scientific literacy is not well defined. I also noticed from last year that we give a lot of "theory"—we position the students as passive. Therefore, in preparation for week 9 I changed the slides. Instead of just talking though the theoretical slides, which would be a bit blah, I said "The notion of scientific literacy is contentious. There is no fixed definition." I posted 5 big questions around the room and asked them to wander around the room, read the questions and leave a comment. They were then to go back. . .and read the comments and write something else—if they wanted to* (S2, W9, Post-w RJ).

Despite taking this action, I still struggled with positioning the students as active and responsible learners. My CF and I discussed this issue in our end of semester conversation:

> CF: *So one of the things you highlighted was "I know teaching is not telling and I feel the tension of this when I talk too much. Am I adding value or is it just talking? How do I find out?" And I wrote, this is an all very important question because there's a lot of this where you're having this conflict with yourself. About talking too much. And is talk not valued [by your students]?* (S2, CFC).

> *I'm asking questions throughout (your journal) about the purpose and the intention of the talk. You seem to be focusing on the quantity of the talk. And it's not perhaps the quantity that's the issue, so much as whether you feel that it's targeting the purpose or is it addressing the intention of what you want to get across? And if it's not doing that, that's ultimately the goal, right, is understanding what your objective is and then is the talk helping to get to that? Because maybe it seems like you're talking a lot, but maybe the talk is you really pushing ideas, questioning them to think about things or trying to pull students ideas together where you're facilitating that, talk across students more* (S2, CFC).

What Came Out of Recognizing and Learning to Manage These Challenges to Equilibrium?

My CFs comments pushed my thinking about how I was positioning my students and how they were also positioning me in this experience of learning to teach. I valued learners as actively responsible for their own learning and I set up workshop activities in ways that put them into an active role. However, at the same time, I tended to undermine my own actions. Although I wanted to position my students as active, when they didn't actively take up this role, I increased my "teacher talk" and then became frustrated with myself. How could I maintain a view of teaching that positioned students actively, when they didn't necessarily accept that role for themselves?

Grappling with these uncertainties and working with my CF throughout semester 2, led to a second significant shift in my thinking about my TE role. This shift was catalyzed when my CF suggested that my students' apparent passivity could be due to my positioning them as students, rather than future teachers. Realizing this led me to re-read my data sets to look for evidence of where I was reinforcing this point or missed opportunities to position them as teachers. Similar to my shift in Theme 1, I realized this was about *their* identity construction processes. It was not that they should become more actively responsible because I told them to do so, it was because they needed to prepare themselves, as future professionals.

I recognized that I was frequently positioning my PSTs as students and lamenting all of the behaviors we are disappointed in when students do not behave the way they want them to. But these were future teachers. They were not doing the work and completing the assignments just to go through the motions. They were developing knowledge as future professionals.

Shifting my thinking about our respective roles as student and teacher led to a change in my actions during my teaching—how I positioned my students and what role I was encouraging them to assume. Throughout my teaching units, I started using the language of "you as future teachers" instead of referring to them as "students." This manifested in responses to students such as, "what would you do in this situation?," identifying opportunities where there was no single generic way of responding to a teaching dilemma. Pre-service teachers readily took up this language and the final weeks of the unit, in the final assessment task and in notes of gratitude at the conclusion of the unit, students used the language and lens of "me as a future teacher" to talk about themselves as future teachers.

The second shift demonstrated to me that the way I was viewing my students and the assumptions I was making about what they valued, greatly influenced the role I assumed and how I was positioning them as learners. By processing these new challenges to my pedagogical equilibrium with my CF, I was able to appreciate that when I positioned my PSTs in similar ways to how I had positioned my secondary school students, my attention

was drawn to what appeared to me to be passivity on their part. I saw their apparent lack of engagement as a reflection of my capabilities as a TE. However, after critically reflecting on my practice, I came to realize that in positioning them as school students, they were behaving as school students. I needed to position them as future teachers and professionals, and encourage them to take responsibility for their own learning.

DISCUSSION

This study employed the frame of pedagogical equilibrium to reflect on and analyze, in collaboration with my CF, my developing identity as an early career STE. The first research question (RQ1) sought to identify the major sources of challenge to my sense of pedagogical equilibrium. In the previous sections I unpacked these sources of challenge as two major shifts, that in turn had implications (RQ2), for the way I was positioning myself, and the way I was positioning my students as future teachers.

The processes of critical reflection on my practice and with a CF, as an integral component of this self-study, have been highly influential on the development of my teacher educator identity. As described in the introduction to this study, Izadinia (2014) identified self-study as a meaningful way for teacher educators to develop their identity. She highlighted two kinds of activities which are influential on identity development: self-support and community support. Through "self-support" mechanisms such as personal journaling, I was able to examine my teaching approaches and critically reflect on my practice. Through community support with my CF and now, through the process of writing and editing this article with Authors 2 and 3, I have benefitted from working in a learning community (Izadinia, 2014).

The two shifts were powerful in terms of developing my identity and defining my role as a teacher educator. After the first shift, I discovered a new source of authority. Similar to Munby and Russell (1994), I learned how I was interpreting experience and from where I was drawing my authority. Initially, I was undermining my "authority of position" by stating to students that I did not have the kind of experience which I anticipated that they would expect me to have. Like the pre-service teachers in Munby and Russell's (1994) study, I was unable to see and trust my own experience as a teacher educator and as a former secondary teacher as an authoritative source of knowledge about teaching. Through examining my shift in pedagogical equilibrium, I came to realize that I didn't need specific experience in the disciplines or classrooms that the PSTs were going to be teaching in. In fact, the variety of contexts in which they would find themselves meant that I could never know exactly what their teaching experience would comprise. My previous experience of teaching in schools, and my experience as an academic teacher educator were valuable sources of experience and authority that I could draw on. By drawing on these sources, I felt more confident about how I could support PSTs to better understand their ideas about the nature of teaching and learning, and to help them to appreciate how they were developing their own identities as beginning teachers.

In the second shift, I came to appreciate my role as a professional who was "educating or cultivating future teachers" (Ping et al., 2018, p. 98) rather than simply teaching "students." This shift was important for helping me to develop my role as a teacher of teachers. As such, I repositioned my role as being one who would ideally put the onus of learning back on the PSTs by posing problems and encouraging the pre-service teachers to consider and find solutions themselves rather than feeling like I had to provide all the answers (Ping et al., 2018). My new mantra of "you as future teacher" is empowering, yet is taking time to fully develop. The continual pressure and desire for certainty from PSTs about "how to teach" is destabilizing at times, and still prompts me to drift back to feeling like I have to, or ought to, provide answers and certainty. It is difficult to overcome years of enculturation in education landscapes which demand certainty. Finding ways to shift teacher and student perceptions of teaching and learning as being simple and factual to the more realistic view of teaching and learning as being problematic and inherently uncertain, remains an ongoing challenge for teacher educators.

I realize I am always going to experience challenges to equilibrium as a TE, but I also realize that through these shifts, I am developing my pedagogy of teacher education (Korthagen, 2001; Loughran, 2006). My insights across the two shifts align with the findings of McKeon and Harrison (2010) who studied the developing teaching practices and professional learning of new teacher educators. They recognized a change in teacher educators' focus from their own teaching to pre-service teacher learning, similar to the changes that can be observed in pre-service teachers as they shift their focus during their teacher education from "their teaching" to the "pupils learning" (Fuller, 1969).

These experiences helped me appreciate parallel experiences with the PSTs in my classes. Just like me, the PSTs were also looking for certainties in an educational environment plagued with uncertainty. Teaching looks easy, but it is inherently problematic, sophisticated and complex (Loughran, 2011). Just like me, pre-service teachers need to have opportunities to make sense of experience in ways that help them appreciate that they have knowledge to offer and that they are simultaneously building their knowledge of practice. Helping them to develop their authority of experience is an important next step in my teacher education work.

CONCLUSION

This research provides insights into the identity development of an early career teacher educator. It responds to Izadinia (2014) call for more studies into teacher educator identity and has demonstrated the utility of pedagogical equilibrium (Mansfield, 2019) as a tool for exploring teacher educator identity and professional knowledge development through self-study. By viewing the uncertainties and disequilibrium associated with my practice as opportunities for learning, I was able to make explicit those aspects of my practice which were drawing my attention. This included micro challenges, such as moments in

class where I felt uncomfortable and perplexed, and larger scale, macro challenges such as my unsettled sense of identity. Viewing challenges to pedagogical equilibrium in this way recognizes that teaching is problematic and dilemma based. Teaching contexts are seldom identical and there is no 'one size fits all' approach to teaching and learning. Therefore, teachers are constantly searching for equilibrium more than they are experiencing feelings of equilibrium.

Viewing professional knowledge development through pedagogical equilibrium recognizes that when a "steady state" is reached, it is not long before a new challenge is identified. For example, during this study I felt a moment of being in a steady state with my identity development when I felt I had a wealth of knowledge as an experienced secondary teacher. However, working in the teacher education space, in particular teaching in primary science education units, my sense of pedagogical equilibrium was challenged. I realised the knowledge and expertise I had developed about teaching science in schools was not as useful for teaching about teaching as I had initially thought. The notion of searching for pedagogical equilibrium complements a self-study approach, and empowers the researcher to embrace the unsettling as an opportunity for learning and not a knowledge deficit.

By reporting on the findings from this self-study, the specific knowledge we have developed adds to the growing knowledge base related to how teachers transition into teacher education and how their identity develops over time. This valuable knowledge highlights the conditions which can influence identity development, and the nature of transformations which are necessary to ensure successful transitions for teachers to teacher educators. The powerful shifts I experienced studying my practice over two teaching semesters represent a transformation in my personal and professional identity. My journey to becoming a teacher educator, included transitioning from identifying as a "beginning" teacher educator to a "becoming" teacher educator (Hamilton and Pinnegar, 2015). In turn, I changed how I positioned myself as a TE to my pre-service teachers, and was sensitized to the ways in which I was positioning them, as students rather than future professionals. This enabled me to be more explicit and confident about the ongoing process of building my identity.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Monash University Human Ethics Committee. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

JM and MP collected and analyzed the data and co-wrote the manuscript. AB analyzed data and co-wrote the manuscript. All authors contributed to the article and approved the submitted version.

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