MODELLING TEACHER EFFICACY CHANGE DURING A TEACHER PROFESSIONAL DEVELOPMENT PROGRAMME IN TRINIDAD AND TOBAGO

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This phenomenological case study explored the professional development experiences of three secondary school mathematics teachers who were enrolled in an in-service teacher professional development programme in Trinidad and Tobago from August 2013 to May 2014. The primary goal of the study was to understand how their programme experiences influenced their teacher efficacy beliefs. Data captured through semi-structured participant interviews, focused observation of participants' teaching, participants' reflective journals, and teaching philosophy, were analysed using Hyncer's (1985) data explication process. Participants attributed changes in their teacher efficacy to information they perceived from their mastery experiences with critical analysis and social persuasion, vicarious experiences with critical analysis, school embedded learning experiences, interactions in a professional learning community of practitioners, and engaging in critical self-reflection. Changes in their teaching were initiated by this information they perceived, and led to improved classroom interactions and student engagement in learning. Positive students' responses to changes in their teaching boosted their teacher efficacy and incentivised further changes in teaching and teacher efficacy. This study directly addressed the paucity of teacher efficacy research in Trinidad and Tobago, and provides directions for future research about the sustainability of these beliefs beyond the period of professional development.

Introduction

The most important school-related factor that affects student outcomes and school improvement is the teacher (Chong et al., 2010; Stronge et al., 2011). Borg (2003) described teachers as "active, thinking decision-maker[s] who make instructional choices by drawing on complex, practically-oriented, personalised and context-sensitive networks of knowledge, thoughts and beliefs" (p. 81). Teachers' beliefs affect their classroom practices, because they

influence how teachers "feel, think … [and] motivate themselves" (Bandura, 1993, p. 118), their behaviours and decisions (Hart et al., 2007), and the quality of the educational experiences they create for students. Consequently, it is theoretically and practically important to understand the sources of information that affect teachers' beliefs, particularly those that influence how teachers judge their teaching capability (Tschannen-Moran & Woolfolk Hoy, 2001).

Teacher efficacy is a set of beliefs teachers hold about their capability to perform specific tasks associated with a given situation, at a specified degree of attainment (Dellinger et al., 2008). These beliefs are significant predictors of teachers' behaviours, effort on the job, persistence with students, resilience after difficulties, stress they experience during demanding classroom situations, and teacher effectiveness (Tschannen-Moran & Woolfolk Hoy, 2001). Tschannen-Moran et al. (1998) noted that teacher efficacy changes with teaching experience, context, and time. One way to improve teachers' effectiveness is to strengthen their teacher efficacy. Klassen and Tze (2014) opined that although the effect size between teacher efficacy and teacher effectiveness is small, it is significant and may critically affect student outcomes. Further, Fackler and Malmberg (2016) reported correlations between teacher efficacy and student achievement across fourteen Organisation for Economic Co-operation and Development (OECD) countries. Consequently, addressing teacher efficacy should be a crucial component of any teacher professional development programme (Loucks-Horsley et al., 2003).

Klassen and Chiu (2010) advocated for careful study of how teachers' experiences on the job, including professional development, affect their teacher efficacy. The Ministry of Education of Trinidad and Tobago (MoETT) continues to improve teaching and learning by strengthening teacher professional development "to create a cadre of professionals to act as competent, dynamic and knowledgeable resources in schools" (Ministry of Education, 2012, p. iv); yet, there has been little published research focused on understanding how teacher efficacy changes during teachers' exposure to continuous professional development (CPD) programmes, particularly from their perspectives and reflections on their experiences in the learning environment.

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Research Purpose and Questions

This paper reports on a qualitative case study of how mathematics teachers in three secondary schools in Trinidad and Tobago perceived changes in their teacher efficacy, during an in-service Postgraduate Diploma in Education programme (PGDEP), from July 2013 to May 2014. It presents a model of the change process. Model development required identifying experiences that provide sources of efficacy-strengthening information (SESI) that facilitated these changes during the PGDEP. The study was guided by the following research questions:

1. What evidence supported perceived changes in participants' teacher efficacy?
2. What experiences were sources of efficacy-strengthening information for participants?
3. How did efficacy-strengthening information influence participants' teacher efficacy?

Literature Review

Teacher efficacy is a future-oriented belief teachers hold about what they *can* do rather than what they actually *will* do (Bandura, 2006). It filters teachers' evaluation of their immediate circumstances and resulting plans and actions (Pajares, 1992). It develops through a process Bandura (1986) labelled reciprocal determinism. The underlying theory purports reciprocal (bi-directional) transactional interactions among three factors: information individuals perceive from their environment; their cognitive processing of this information; and their resulting behaviours. In short, behaviour both influences and is influenced by an individual's social environment and personal characteristics. With respect to teachers, their expectations, perceptions, beliefs, and intentions direct their behaviour. Additionally, their behaviour shapes their thoughts, emotional reactions and future expectations. Their behaviours and cognitive processes influence the roles they adopt and social status they acquire in their immediate environment, which influence their social interactions and behaviours.

Sources of Efficacy Strengthening Information

Bandura (1997) proposed four SESI upon which teachers judge their working environment: their success or failure of their previous teaching experiences (mastery experiences); the observed success or failure of other teachers (vicarious experiences); their social interactions with others who support their development (social persuasion); and their emotional and physiological responses to outcomes of teaching (emotional and physiological responses). Therefore, SESI are not related only to personal assessment of competence. I sought to determine whether participants associated these or other SESI with their PGDEP experiences, and how they influenced their teacher efficacy.

Teachers with strong teacher efficacy are more effective and create learning-oriented classrooms that improve students' motivation, learning, self-efficacy, and achievement (Tschannen-Moran and McMaster, 2009). They maximise instructional time, constantly monitoring student learning and transitioning between a range of instructional strategies during instruction. They expend more effort persevering with challenging students, and maintain classroom discipline. They perceive difficult tasks as challenges rather than as threats, and work towards mastering them rather than avoiding them. Teachers can learn these behaviours through quality professional development that initiates and supports changes in their knowledge, skills, attitudes and beliefs. This idea finds support in research in Indonesia (Basikin, 2008), Canada (Beauchamp et al., 2014; Klopfer, 2014; Ross & Bruce, 2007), and the United States of America (Powers et al., 2016; Yoo, 2016).

Professional Development and Teacher Efficacy

Effective professional development is sustained over time and coheres with national educational goals (Desimone, 2009, 2011; Hunzinker, 2010). It focuses on developing teacher knowledge of subject, pedagogy and student learning, actively engaging teachers in learning through practical and authentic experiences, and collective participation through collaboration with others. It encourages school-based research, and actively evaluates the impact of CPD activities on teachers. Focusing on critical self-reflection facilitates the development of a reflective disposition (Thornton,

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2006), which has transformative effects on teachers' beliefs and practices (Mezirow, 2009). Teachers need a responsive disposition to improve their confidence, autonomy and teacher efficacy through thoughtful reflection on applying their learning in their classrooms (Schön, 1993), and on how contextual variables influence teaching outcomes there (Sergiovanni, 2005). Teachers gain insights into their own practices when they reflect on the outcomes of mastery and vicarious experiences, and observe, critically analyse and discuss their teaching experiences with colleagues (Tschannen-Moran & McMaster, 2009). They get clear and consistent feedback that helps them adapt new ideas to their unique school contexts. Shulman (2005) cautioned that even masterful teachers with the right knowledge and beliefs, in the best school, might be ineffective without the right disposition for teaching.

Changes in Teacher Efficacy

Teacher change, as an outcome of professional development, is described as a linear process by Guskey (2002). Teachers who engage in CPD first change elements of their practice (for example, teaching strategies and resources) that produce tangible evidence of improved student outcomes (for example, achievement, attendance, engagement, motivation and attitudes). This, then changes teachers' beliefs about teaching and learning. Teachers repeat successful strategies and abandon those that do not produce tangible evidence of success. Guskey's model presents changes in teacher efficacy as an outcome of changes in teachers' practice that were influenced by professional development activities.

A different change model was offered by Rogers (2007), who adapted Guskey's (2002) model. He added a feedback mechanism through teacher reflection, occurring at various points in a teaching episode. Rogers highlighted the need for CPD that is supported by consistent reflection on practice, because changes in teachers' beliefs are not necessarily concomitant with professional development. Prior to Rogers, Schön (1993) highlighted the importance of reflective practice to professional learning. Reflection-in-action, also dubbed "thinking on your feet" (Schön,

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1993, p. 61), requires teachers to consciously examine events as they occur, connect with their tacit understanding of the context and personal theories to derive a course of action, and then reflect on the outcome of their deliberate response to derive new understanding and future actions. Rogers' model highlighted the important role of reflection-in-action to teacher change.

Rogers (2007) noted that teachers needed to inculcate and reflect on changes in student learning outcomes that they associate with changes in their practice during CPD. This aligns with what Schön (1993) described as reflection-on-action, which is thinking back about events to explore what occurred and the actions of parties involved. This is where documenting or discussing the events and personal insights with others helps develop teachers' insights into their understandings and behaviours, and future responses to similar events. Both reflective approaches are critical to developing teachers' understanding about their work, changing their beliefs and practices, and transforming them through deeper self-awareness. According to Rogers, when teachers take time to reflect on positive changes in student learning outcomes, they experience changes in their beliefs and attitudes. However, when changes in student learning outcomes do not meet teachers' expectations, they engage in further professional learning, with reflection on practice, until their expectations are realised. Rogers concluded that teachers learn from their mastery and vicarious experiences that are supported by reflective discussions during professional development. Together, these experiences catalyse changes in teachers' practices, student outcomes, and ultimately their beliefs.

Desimone (2009) proposed another linear process of teacher change. Her model credited effective CPD with increasing teachers' knowledge and skills and changing their attitudes and beliefs, which preceded changes in their classroom practices, and subsequent changes in student outcomes. She emphasised the critical role of teachers' context in mediating and moderating the implementation of their learning from CPD in their classrooms. Elements of teachers' contexts include student achievement, teachers' prior experience, subject-content knowledge, beliefs and attitudes, school and classroom cultures, principals' support for professional development, and educational and curriculum policies. Desimone

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acknowledged that her model did not include the reflective element that Rogers' (2007) model captured.

Teachers engaged in CPD become a community of practice (CoP) through their social interactions with other teachers (Wenger, 2000), and a professional learning community (PLC) that shares values and goals, a focus on learning and collaborative learning, deprivatised practise, and reflective dialogue (Tschannen-Moran & McMaster, 2009). CoPs and PLCs bring together learning-teachers who exchange and explore ideas, beliefs and attitudes about teaching, as well as their practices, under the guidance of a competent facilitator. They engage in collective and collaborative inquiry, experiment with novel approaches that expand their teaching repertoire, and receive feedback from others on mastery experiences. Such sharing and collaboration become transformative through participation in school-based events that allow them to "discover, create, and negotiate new meanings that improve their practice" (Skerrett, 2010, p. 648). They experience and demonstrate mutual trust and caring, promote shared understandings and values, and consciously work to develop their teacher efficacy (Mitchell, 2001). They take risks with new approaches and discuss them within the community (Flynn et al., 2009), suspending judgment until they have tried to see from others' perspectives, and voice their personal theories (Mitchell & Sackney, 2000). They take ownership of their development by reflecting on their challenges and actively engaging in resolving them (Kline, 2008). Change becomes easier when they understand their learning (Borko, 2004).

Context of the Study

The Trinidad and Tobago education system is examination-driven and segregates students on meritocratic performance in high-stakes public examinations (De Lisle et al., 2010). It governs students' transition from primary to secondary school and affects their pathways to careers and higher education. Notwithstanding this achievement focus, novice secondary school teachers *learn to teach* on the job because a degree in education, and professional teacher

certification are not a pre-requisite for employment as a teacher in Trinidad and Tobago (Jaggernauth & Jameson-Charles, 2015a). The MoETT recognises that both academic qualification and professional certification are fundamental to effective teaching, and are committed to improving the quality of schooling by strengthening teacher education (Ministry of Education, 2012), through programmes like the PGDEP.

The PGDEP is a 10-month CPD initial teacher-training programme facilitated by The University of the West Indies, Trinidad and Tobago. The MoETT sponsors teachers at public secondary schools who qualify for entry. The PGDEP aims to improve teaching and teacher effectiveness using a school-based approach. Its constructivist underpinnings highlight the deeply personal process of learning about teaching by encouraging teachers to critically reflect on school-embedded learning experiences. Teachers explore topics in educational philosophy, psychology, sociology, language, and health and family life education, within the local school context. They conduct action research on a specific teaching intervention under the supervision of a faculty member. They experiment with content-specific pedagogies in their classrooms through praxis, and engage in faculty-supervised teaching at their schools and observe, critically analyse and discuss their peers' teaching as well. The PGDEP provides experiences and opportunities established as critical for strengthening teacher efficacy.

It has been suggested that "student achievement is the product of formal study by educators" (Joyce, 2002, p. 3). Research in Trinidad and Tobago suggests that teachers' professional identity is partly contingent on their teacher efficacy and professional learning (Yamin-Ali & Pooma, 2012). However, there is a paucity of research in Trinidad and Tobago about how teacher learning influences teacher efficacy, which creates an opportunity for investigations into the potential of meaningful and active interventions that influence teacher efficacy. In response, this paper reports on specific elements of the documented journeys of three mathematics teachers who were enrolled in the PGDEP 2013-2014 cohort. The results provide an in-depth understanding of their experiences through qualitative investigations that Tschannen-

Moran et al. (1998) recommended. As a faculty supervisor in the PGDEP, I was naturally inclined towards this investigation, because previous research ranked mathematics teachers' overall teacher efficacy lowest among the eight curriculum specialisations offered in the 2011 and 2012 cohorts (Jameson-Charles & Jaggernauth, 2015b). It should also be noted that mathematics teachers in these cohorts reported the lowest teacher efficacy for classroom management, instructional strategies and student engagement.

Methods

Design

This qualitative case study was designed to determine the SESI that participants associated with changing their teacher efficacy based on their experience during the PGDEP programme, and to elucidate the change process. Case studies investigate contemporary phenomena in their actual contexts, using multiple evidential sources (Yin, 2014), to gather "comprehensive, systematic, and in-depth information" (Patton, 2002, p. 447) for creating "rich, 'thick' description[s]" (Merriam & Tisdell, 2016, p. 192). I adopted a phenomenological approach to facilitate the examination of participants' perceptions, decisions and actions in context. The recording of of activities facilitated the unravelling of complex factors and relationships with few cases (Easton, 2010). The *case* was the PGDEP 2013–2014 cohort, and the *phenomenon* was changing teacher efficacy during the PGDEP. Unravelling the intricacies of participants' first-hand lived experiences elucidated the essence of the phenomenon (Merriam, 2009).

Sampling and Participants

I approached six mathematics teachers, of the 21 who were enrolled in that cohort, to participate in this study, using their scores on the long form of the self-report *Teacher Sense of Efficacy Scale* (TSES, see extended discussion in Tschannen-Moran & Hoy, 2001) in August 2013. The TSES was found to be a reliable and valid

measure of teacher efficacy in Turkey (Çapa et al, 2005), Greece (Tsiglis et al., 2010), Canada, Korea, Cyprus, Singapore and the United States (Klassen et al. 2009), and Trinidad and Tobago among in-service secondary school teachers (Jameson-Charles & Jaggernauth, 2015b) and pre-service primary teachers (Gowrie & Ramdass, 2014). Three participants withdrew between October 2013 and February 2014, leaving three participants: Anna, Bobby and Tessa (*pseudonyms*). They were in their mid-thirties, had mathematics degrees, and were teaching mathematics at public secondary schools for at least six years. Their initial TSES scores are presented in Table 1.

Table 1. *Participants Teacher Efficacy Scores at the Start and End of the PGDEP.*

Teacher Efficacy Score	Anna	Bobby	Tessa
Total (maximum 216)	128	150	175

Anna was teaching at a rural, co-educational government school that she described as low performing academically but excelling in sports and performing arts. The school climate was generally unsettled, and students were unfocused and uninterested in learning mathematics. Student absenteeism and tardiness to school were problematic. Anna's lessons were often chaotic; she struggled to keep students on task and spent time managing student indiscipline. At the start of the PGDEP, Anna often appeared anxious in the classroom.

Bobby was teaching at a rural, co-educational faith-based school that he described as a high-performing, academics-focused school that excelled in sports. The school day began and ended with worship. His calm, soft-spoken nature reflected the atmosphere of his school. Students were usually on task and focused but were passive learners. He thought himself an "OK" teacher. Bobby believed his classroom management strong, but he envied teachers who varied instruction and used resources. He was serious during teaching, and students spoke when called upon.

Tessa was teaching at a girls' faith-based school. Her school focused on academics and community life. The school day began and ended with worship. Tessa described herself as confident about teaching. Most of her students were passive learners. She believed

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her teaching was student-centred, but she intervened immediately when students struggled with problem solving. She acknowledged that teaching became routine, and her approach was poorly aligned with students' needs. Tessa struggled with instructional planning and actively engaging students.

Participants reported that when they began teaching, they were not well prepared, and lacked confidence in their ability to teach. As a consequence, they modelled their own teachers. They enrolled in the PGDEP to improve their teaching so students would enjoy learning mathematics and become mathematically competent. Anna, especially, hoped to become more confident. They looked forward to meeting, collaborating and exchanging ideas about teaching and learning with other teachers.

Data Collection

Qualitative research is rare in teacher efficacy research (Loughran et al., 2012). Using multiple qualitative methods allowed scrutinising contexts and recording details of activities for deeper understanding of phenomena, regardless of particularities and complexities that distinguished participants (Creswell, 2013). Qualitative case studies may utilise interviews, observation during fieldwork, analysis of text, and researchers' perceptions and reactions during the research process (Myers, 2009). I collected data through focused observation of teaching and follow-up interviews, field notes, semi-structured interviews after the PGDEP, and documents including participants' teaching philosophy and reflective journals. Data were de-identified and labelled with pseudonyms.

Focused Classroom Observation and Recording

I designed and used an observation checklist to observed participants' classroom teaching from September 2013 to April 2014, for six 35-minute and four 40-minute lessons. I compared teaching plans to enacted lessons and recorded frequencies of behaviours of efficacious teachers, including selecting activities and resources selected for student engagement, and organising the

classroom for classroom management and adequate teacher-student and student-student interactions, and appropriate formative assessment. I jotted notes about events not captured in the observation checklist, and elaborated on these in field notes for analysis.

Participant Interviews

I conducted 20-minute post-observation interviews guided by my jottings to probe their decision-making before and during teaching, and how lesson outcomes could inform subsequent lessons. I conducted 45-minute semi-structured individual exit interviews in my office in August 2014. I designed an interview protocol comprising open-ended questions aligned with the research purpose and sequenced to elicit meaningful responses from participants' perspectives (Patton, 2015). Questions focused on participants' PGDEP experiences, evidence of change in teacher efficacy, learnings from their experiences and how they influenced their practice and teacher efficacy over time. I probed participants for clarification and elaboration (Morse & Richards, 2002) and deeper understanding of their personal contexts, locating their perspectives within their personal histories and experiences, and exploring meanings they attached to these experiences. During interviews, I jotted about their nonverbal communication and my impressions. All jottings were transcribed to judgement-free digital field notes immediately after interviews to capture as many details as possible from memory, and to clarify the interview process and setting (Miles & Huberman, 1984). All interviews were audiotaped with participants' consent and saved on compact discs labelled with pseudonyms and interview dates. Exit interviews were professionally transcribed.

Documents

Participants wrote a personal teaching philosophy statement in August 2013, after reflecting on their values and beliefs about teaching, and analysing the effectiveness of their teaching approaches and how they influenced their classrooms and relationships with students. They revised their philosophy statement at the end of the PGDEP (Kearns & Sullivan, 2011). They

documented thoughts, feelings and insights about meaningful experiences with teaching and learning (Yinger & Clark, 1981, as cited in Yaacob et al., 2014) during the PGDEP. They used the DIEP reflective model to move from insight to transfer of learning (RMIT University, 2010). They **D**escribed a critical incident, **I**nterpreted its meaning, **E**valuated the contribution of the experience to their learning, and then **P**lanned how the learning could be applied in the future. Both artefacts were part of a developmental portfolio they compiled during the PGDEP.

I digitised print data artefacts, creating a separate folder for each participant, and stored all data artefacts in a fireproof filing cabinet in my home and used a password-protected cloud storage accessible only to me.

Data Explication

Interpretive researchers obtain data by personally engaging with phenomena under study, interacting with participants, searching for meaning in interpretations of personal observations and experiences and those participants' report, and then explicating results (Hycner, 1985). Hycner distinguished explicating and analysing data on the grounds that 'analysis' refers to "'breaking into parts' and, therefore, often means a loss of the whole phenomenon … [whereas 'explication' implies an] …investigation of the constituents of a phenomenon while keeping the context of the whole" (p. 49). I adapted Hycner's explication process for interview transcripts to generate themes related to SESI, and then deductive coded other text using themes generated.

Interview transcripts. Data explication began with bracketing (Hyncer, 1985) to suppress personal perceptions, beliefs and preconceptions, and minimise possible influences of their interpretations on participants, procedures and outcomes. As Wall et al. (2004) recommended researchers do, I dedicated a notebook to documenting preconceptions, assumptions and thoughts related to personal experiences with the PGDEP (as a programme graduate and subsequent university supervisor), the participants and changes in teacher efficacy based on the research literature and personal

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experience. I repeatedly listened to interview recordings to understand participants' verbal and paralinguistic communication, allowing their voices and meanings to emerge.

Next, I repeatedly read transcripts line by line and examined paragraphs, jottings and field notes to cognise their essence and delineate relevant units of meaning to ascribe general codes (Hycner, 1985). General codes were juxtaposed with research questions to yield a code list for each interview transcript. Similar codes were distinguished based on their chronology, frequency, contextual occurrence, and associated verbal or nonverbal cues. Non-overlapping clusters of codes were derived, and their meanings clarified through comparison with the final code list and transcripts. Themes were determined from distinct clusters or groups of clusters and collapsed into central themes that represented the essence of the data. My field notes provided contextual details not captured in interview transcripts. Participants reviewed interview transcripts, transcript summaries and themes and offered feedback for refining them. Comparing themes across interviews generated general themes by clustering comparable ones and assigning unique themes where peculiarities or differences among individuals necessitated. Themes were explicated using evidence across interviews rather than individual interviews, noting similarities and differences among them.

Documents

I used codes and themes from interview transcripts to deductively code field notes, participants' teaching philosophies and reflective journals, integrating new codes and themes that emerged. All data sources from each participant were exhausted before moving on to the next participant. Multiple evidential data sources facilitated data triangulation, description, explanation, evaluation and prediction (Yin, 2014) to identify SESI and provided in-depth understandings of how SESI influenced their teacher efficacy.

Ethical Considerations

I adhered to ethical practices recommended by Creswell (2013) and Miles and Huberman (1994), by doing the following:

(i)   obtaining informed consent from participants after introducing the study.

(ii)   informing participants that voluntary participation, and withdrawal or non-participation were without negative consequences.

(iii) assuring confidentiality and privacy of information by using pseudonyms for participants and destroying potential identifying information.

(iv) storing data in fireproof containers and password-protected spaces.

(v)   reporting results in publications without references to identifying information.

Methodological Rigour

Interpretive research requires simultaneous reliance on subjective interpretations of participants' experiences and perspectives while in their social contexts and mediating the effects of personal values and beliefs on handling data and reporting results. Thus, as the researcher I had to adopt a reflexive disposition that focused on reflection-for-action, by reflecting on the research process, and adding the critical dimension of "informed and intentional internal dialogue [that] leads to changes in educational practices, expectations, and belief" (Feucht et al., 2017 p. 234). Reflexivity was important because of my personal involvement in this research (former student and current faculty advisor), which positioned me as an insider-researcher. I functioned in multiple roles, and held multiple perspectives. I shared a cultural identity and academic background with the participants, understood participants' needs as students, and had personal expectations as their faculty advisor and academic researcher, which could potentially influence the research process (Cortazzi & Jin, 2006). My perspective as former-student-turned-faculty-advisor could have filtered my understanding of participants' experiences and influenced my expectations of them. My status also introduced a power differential that could have influenced advisor-student interactions and participants' willingness

to share information with me openly and honestly. I had to accept that I may have only attained partial-insider-researcher status with them.

I, therefore, actively engaged in bracketing – setting aside my prior knowledge, experiences, understanding and interpretations – to allow participants' voices to emerge from the data rather than my own. I had to conscientise, examine and document my personal beliefs, biases and thoughts about teachers, teaching and learning throughout the research process, from designing the study, selecting methods of data collection and analysis, and selecting participants, to acknowledging how my insider-researcher status could affect how I collect, analyse and report the research findings. I had to repeatedly listen to recorded interviews and read interview transcripts, separately and simultaneously, and make decisions about which bits of information were relevant to the research questions, and which could be set aside. I often temporarily stepped away from data analysis to reflect on how my experiences were shaping my understandings,and discuss my thoughts with a friend who provided critical feedback. This trusted colleague understood the PGDEP and the purpose of my research; she critiqued my work, probing my research analysis, findings and interpretations, and offered a different lens through which to analyse the data (Costa & Kallick, 1993).

The context-specific nature of the study reduced the generalisability of results to other social contexts, a touted weakness in methodological rigour in qualitative research. However, generalisability was not the goal of this research. Further, I adhered to guidelines provided by Lincoln and Guba (1985), Miles and Huberman (1994), and Shamoo and Resnik (2009) for judging rigour in interpretive research: dependability, credibility, confirmability and transferability. The dependability of the research was improved through the details I provided about the research purpose, methods, and research context for other researchers to independently judge stated conclusions and inferences. The credibility of the research was improved through articulation of theoretical and methodological decisions regarding collecting, managing and analysing data, triangulating data across methods, and verbatim reporting of participants' words and expressions. I

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attended to confirmability by engaging participants in member checking. In providing detailed descriptions of the research design, assumptions, methods, participants and the research context, I ensured that others could independently judge the transferability of these results to other contexts.

Results

Although participants shared similar professional learning experiences, each responded uniquely to them. Identifying how SESI influenced participants' teacher efficacy required determining whether their teacher efficacy changed.

Inferred Changes in Teacher Efficacy

Participants' scores on the TSES (Tschannen-Moran & Woolfolk Hoy, 2001) provided initial evidence of changes in their teacher efficacy (see Table 2).

Table 2. *Participants' Teacher Efficacy Scores at the Start and End of the PGDEP.*

Teacher Efficacy Score	Anna	Bobby	Tessa
Initial	128	150	175
Terminal	193	191	191

Evidence from participants' words during interviews and changes in their behaviour during the PGDEP also supported changes in teacher efficacy. Anna, who struggled with classroom management at the start of the PGDEP, reported:

I have more organised class sessions, less chaos. Walking around more, making sure that students on task and not disrupting the classroom. So sometimes students who you know you realise that when they're together, you'll get a chaotic class I'll just reassign them [seating]. (Anna, personal communication, August 8, 2014)

She reportedly struggled to engage students in learning and keep them on-task:

I really like to have children work together … they're more engaged as well, rather than you just having them take down notes on the board … children love that. And I've done that a lot now, and now you could gauge whether you getting them. (Anna, personal communication, August 8, 2014)

Anna had struggled to create meaningful learning experiences for her students:

First thing I make sure the students are ready … I'll introduce the objectives and have a nice set induction, and recap things, helping to see what they understand ... I use a lot more questioning in my lessons because sometimes you not sure whether they really with you… Also, sectionalise [sic] the lesson into prerequisites, other aspects, sectional review. Recap that to see if we could move on. (Anna, personal communication, August 8, 2014)

Anna ended her interview, by saying:

I always tell people … [PGDEP] will help you improve your practice in a particular area. … because for me, you feel a greater sense of purpose going to school than before. (Anna, personal communication, August 8, 2014)

Her words and actions during the PGDEP and feedback from her peers over time suggested that Anna had become Teacher-Anna. Anna appeared more confident, appearing less stressed during teaching and was actively working to resolve her emotional arousal. She experimented more readily with novel approaches to teaching, even making her own resources for some lessons. She was more resilient when students were disruptive, or a lesson was not proceeding as planned. Anna was more open to change and embraced feedback from students. She planned lessons that were aligned with the curriculum goals and more appropriate to her students learning needs.

Though Bobby considered his classroom management to be good, he noted his increased willingness to allow students to be more active and vocal in class:

I never gave them a chance to give trouble … I continued to be the loudest voice in the class … but I use more resources and give

them group work and discussions …they sometimes get rowdy but in a good way. (Bobby, personal communication, August 11, 2014)

Bobby felt better equipped to engage students in learning:

I'm better able to … get students to talk, the quiet ones. ... Your class have [sic] 40 children and one teacher and the student thinks "[teacher] probably don't [sic] even know me, he don't [sic] even know my name," especially when you now start to teach them in September, so when you meet them outside class and you talk to them and … you ask them a question in class, they might answer. (Bobby, personal communication, August 11, 2014)

Bobby wrote about his instructional planning in his last journal entries:

Prior to the [PGDEP] I considered myself to be a competent teacher … [but] I yearned to enhance my teaching approach. … However, my growth as a teaching professional is undeniable … and my expectations have been overwhelmingly surpassed. … I now have a deeper understanding regarding effective questioning … to promote mathematical thinking and to increase classroom participation among students … keeping students on task, proper sequencing of my lessons and maintaining a high level of [engagement] for the entire duration of my lessons.

Bobby's words, actions and feedback from his peers supported his transformation. He was more curious about and was willing to experiment with novel teaching strategies and resources. He spent more time planning lessons, reflecting his developing mastery of teaching. His lessons were better aligned with curriculum goals. He demonstrated better understanding of learners and learning, and his lesson plans and teaching reflected this. Bobby was more flexible and relaxed with his students and evidently enjoyed better relationships with them.

Tessa, who initially struggled to actively engage her students, reported:

> I [now] always like to integrate a group activity, whether it is something to do on their own and present or show them a clip or do something on the board technology-oriented. … you keep things active and don't just have them sit down. (Tessa, personal communication, August 14, 2014)

She also believed that her instructional decisions at the end allowed her to plan lessons that meaningfully engage students in learning:

> The lesson planning is clear now ... Now I spend a little more time on closure so you tie that in and to not rush too many things, although, there are so many things to do in so little time and so many distractions. Now I take my time to plan because I want to do something more interactive … now that I know the structure, I can plan lessons differently, to keep it alive and fun for all of them to learn. (Tessa, personal communication, August 14, 2014)

I also noted that Tessa's classrooms became more learner-oriented and students were more engaged during teaching. She became more creative and organised in lesson planning and used resources much more readily. Her lessons were much better organised and better aligned with curriculum goals. She demonstrated a better understanding of learners and learning, as evident in lesson plans and student interactions during teaching. Tessa, although initially confident about her teaching ability, was even more confident. Her self-report teacher efficacy was stronger at the end of the PGDEP, though the change was smaller than that for Anna and Bobby.

Sources of Efficacy-Strengthening Information

This study focused on identifying SESI participants associated with their PGDEP experiences. Open coding generated 66 types of experiences that collapsed into five SESI: mastery experiences with critical analysis and social persuasion; vicarious experiences with critical analysis; school-embedded experiences; learning in a professional learning community of practitioners (PLCoP); and critical self-reflection (see Table 3). SESI aligned with the four Bandura (1997) proposed and included other aspects of teacher learning often overlooked: learning in a professional community of

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their peers, developing a reflective disposition through critical self-reflection, and learning that is embedded in teachers' classrooms in their schools.

Table 3. *Summary of Five Sources of Efficacy-Strengthening Information Emerging from the Data.*

Sources of Efficacy-Strengthening Information	Categories of Experiences	Specific Experiences
Mastery experiences with critical analysis and social persuasion	Self-appraisal of unsupervised teaching at their schools	-Examining instructional planning, decision making, practice based on students' behaviours during teaching, perceptions of success, what went right or wrong. -Repeating novel strategies with adjustments.
	Post-teaching feedback from Faculty supervisor and peers on supervised teaching	-Examining planning, decision making, practice. -Identifying areas for refinement with insights into improving aspects of lesson and encouraging experimenting new strategies. -Critiquing your lesson -Identifying areas of strengths, weaknesses, interest, value, learning in aspects of lesson -Supporting and encouraging development
	Feedback from students during supervised and unsupervised teaching	-Examining instructional planning, decision making, practice based on students' behaviours during teaching: ▪ level of participation, enthusiasm, engagement, responsiveness ▪ receptivity to new ideas and strategies, developing intrinsic motivation to learn ▪ developing conceptual understanding, on-task behaviour, help-seeking behaviours, developing competencies, strengthening confidence, improved academic achievement ▪ student-student and teacher-student interaction, demonstrating respect

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Sources of Efficacy-Strengthening Information	Categories of Experiences	Specific Experiences
		for others during group work
		-Examining instructional planning, decision making, practice based on students' behaviours after teaching:
		▪ developing teacher-student relationships
		▪ help-seeking behaviours outside
		▪ verbal communication about teaching
Vicarious experiences with critical analysis	Focused observation of peers (*equals*) teaching	-Ideas for new strategies in own context
		-Novel approaches modelled
		-Exemplary practices of *equals*
		-Attention to students' classroom behaviours
		-Different perspectives on a concept
	Analysis and critique of peers (*equals*) instructional planning/design/ strategies during post-teaching conferences	-Comparing own teaching to that of *equals* – confirming or disconfirming one's own instructional practices
		-Impetus for attempting new strategies
		-Evaluating instructional planning/decision making
		-Identifying what worked and did not work
		-Adapting strategies for improved delivery
		-Identifying strategies for improving student engagement
		-Strengthening lesson planning
		-Identifying strategies for classroom management
		-Building confidence from observing an *equal* succeed
	Modelling exemplary teaching practices	-Exemplary practices of group members (*equals*) and Teacher educators

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Sources of Efficacy-Strengthening Information	Categories of Experiences	Specific Experiences
School-embedded experiences	Teaching at each other's schools where they were not familiar with the teaching environment	-Perceptions about different school contexts -Experimenting with new strategies -Initial anxiety about teaching due to uncertainty about students mitigated by mastery experiences -Connecting with students
	Teaching at their own schools' environments where there were already established routines	-Parental involvement/support -Coping with mixed-ability classrooms -Supporting student learning -Focus on academics -Support from teaching/non-teaching/ administrative staff
Interactions in a professional learning community of practitioners	Community of teacher-learners formed with the other members of their workgroup	-Teachers coming together with mutual respect -Teaching community of *equals* -Teachers supporting and learning from each other -Community for exchange of ideas and collaboration -Community for strengthening conceptual understanding -Community for strengthening teaching competencies -Unthreatening environment for feedback and learning -Common purpose of improving practice -Analysing how non-content related topics fit into practice (electives, arts in action, professional identity, classroom management, curriculum integration, assessment) -Learning to appreciate different perspectives

Sources of Efficacy-Strengthening Information	Categories of Experiences	Specific Experiences
	Different roles within the community	-Teacher as role model -Teacher as learner

Engaging in critical self-reflection	Critical reflection on mastery and vicarious experiences	-Daily reflection on:
		  ▪ strengths and weaknesses in practice for improvement
		  ▪ student responses to teaching
		  ▪ instructional decision-making

	Acknowledging beliefs, feelings, perceptions, emotions	-Reflection on:
		  ▪ evolving beliefs about students and learning
		  ▪ evolving beliefs about teacher learning
		  ▪ evolving efficacy beliefs
		  ▪ conflicts between past/ present practices

	Reflection on the need for reflection	-Reflection on the ability to be reflective and reflexive -Reflection on personal and professional growth

Mastery Experiences with Critical Analysis and Social Persuasion

These experiences involved experimenting with novel instructional strategies, enriched through critical self-analysis and feedback from others. Participants' language reflected a focus on their individual teaching experiences and their self-appraisal, along with feedback from their PGDEP supervisor, peers and students during their teaching (social persuasion). They recalled the importance of trying novel teaching strategies and resources:

> Sometimes children really have textbooky [sic] way of looking at Maths … I was able to incorporate drama and the children liked that. (Anna, personal communication, August 8, 2014)

> I had never started a class in my career like this before – a short dramatic skit. … With the help of [Teacher] … to 'act' in the short dramatic skit with me, the set induction engaged the students as thoroughly as I had hoped. (Bobby, Journal Entry 8)

> The think-pair-share … sometimes presents opportunities for erratic responses which need to be carefully directed; however, the discovery method may be far more beneficial not only for the grasping of the topic, but also the involvement and shared interest of all the students. Hence, this teaching strategy has proven to be one of interest. (Tessa, Journal Entry 5)

Mastery experiences with feedback from their PGDEP supervisor (perceived coach) encouraged them to continue trying new strategies, highlighted areas for refinement and provided insights into improving teaching:

> You always wonder as a Math teacher … if you're doing the right thing, and I mean even sometimes when I have lessons that to me not a hit, and [supervisor] recognise that they have good things in the lessons. So those are … encouraging … sometimes you feel it so bad. (Anna, personal communication, August 8, 2014)

> Well, I think [supervisor] opinion is the one that would matter most … [supervisor] would have seen many teachers teach over

the years … and just as I looking to establish patterns with mistakes I make, [supervisor] might see … common things about the way I teach. (Bobby, personal communication, August 11, 2014)

I always remember the time when we did a lesson in Form 2 … and then [supervisor] was like … "It was a good lesson" and I think that scared me because ... the encouragement, the reinforcement, you know, the questioning skills, you know, the little specific things [supervisor] would have told us to work on ... it impacted who you eventually became. (Tessa, personal communication, August 14, 2014)

Participants considered peers' feedback critical to their development, because they highlighted strengths and offered suggestions for improvement:

Teachers like yourself … seeing things in your lesson that were important, that they benefitted from … really helped you to think about what you're doing. … [They] bring out good things in your lesson that you never think about, you know; it's motivating … hearing people who teaching just like you, different environments … It helped to guide what I doing currently. (Anna, personal communication, August 8, 2014)

You could think that you teach the best lesson … but when you hear other people talk about your strengths and weaknesses, if two or three people say the same thing, then, you know, maybe there's something there, you know that you could work on … especially when those opinions are Maths teachers. (Bobby, personal communication, August 11, 2014)

It made you check to see where you needed to work. If it is I'm not seeing it ... and somebody else is seeing it, then … re-evaluate, self-evaluate ... It just reinforced your good habits … so you welcome constructive [criticism] to help you be more reflective of your practice. (Tessa, personal communication, August 14, 2014)

For Bobby, feedback from peers was important for additional reasons:

As I wrote more [lesson plans] and as other persons in my group wrote more and we discussed them, because three persons teach in every field day, so ... you'd get 3 lesson plans, right, and as we discussed them, I started to get familiar with what we wanted, right, and then people started to make errors in their lesson plan, I found myself picking up on these errors ... the critiquing part that we did afterwards ... was a very helpful component of the programme. (Bobby, personal communication, August 11, 2014)

Feedback from students' participation, enthusiasm, responsiveness, receptivity to new strategies, and motivation to learn was integral to participants' learning:

I have to comment on the high level of enthusiasm that my students showed. ... who would not normally volunteer were fully involved. The feedback from the students really changed my views of the students and motivated me to want to teach them. (Anna, Journal Entry 9)

Students were quite responsive and engaging, which provided significant encouragement to me. (Bobby, Journal Entry 8)

Students [wrote] a reflective paragraph or two on their first Math class with me, anonymously or otherwise. Some words used were fun, awesome, interesting, enthusiastic, respectable, relatable, bubbly but strict and a good experience. To see myself from the eyes of the students was quite insightful ... positive feedback was definitely a boost to my teacher efficacy. (Tessa, Journal Entry 2)

Vicarious Experiences with Critical Analysis

Participants prioritised the focused observations of each other's teaching during field days in different schools. They valued observing new teaching strategies being modelled and how students responded to them, followed by the critical analysis and discussions about these observations during post-teaching conferences. These discussions allowed them to compare themselves to peers, albeit in teaching contexts somewhat different from their own.

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Participants considered each other as "equals" since they were close in age and teaching experience, which made their interactions more meaningful to their practice:

I really benefitted from seeing other Maths teachers teach … you see different ways you could do certain topics … and you also get to see what you don't do and you see they try to do it and you have something to follow as a model. (Anna, personal communication, August 8, 2014)

Well, if they have a successful lesson, obviously you want to try and incorporate what the aspects of the lesson are successful into your teaching … I felt as though that if they could do that, then I could do that too. (Bobby, personal communication, August 11, 2014)

I was like "[Teacher] should have done that," but sometimes when you in there, you don't really see "Yeh I should have done..." … "Wow! I wouldn't have seen it that way". (Tessa, personal communication, August 14, 2014)

Participants were attentive to students' behaviour during teaching. These observations provided confirming or disconfirming information about instructional decisions. Anna's response echoed Bobby's sentiments:

You also get to see how students respond to other Maths teachers' strategies so you know what could work and what might not work. (Anna, personal communication, August 8, 2014)

Every now and then I find myself just pulling things that pique my interest ... from different field days … how the students react to the teaching, like if they were active and taking part, then you know that what [Teacher] was doing worked well. (Tessa, personal communication, August 14, 2014)

School-Embedded Experiences
Participants' language reflected the importance of experiences that allowed them to cognise and interpret teaching in specific teaching contexts, whether those experiences involved supervised teaching at

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their own school or on field days. These experiences reduced the abstract nature of learning about teaching by emphasising a practical and school-focused approach. Teaching at a school that was different from their own initially aroused some nervousness, but their prior teaching experience allowed them to overcome these feelings:

> When I was at Tessa's school I think that was the first time I was teaching children from a [good] school … I wasn't too confident … once I started teaching, I was comfortable. … (Anna, personal communication, August 8, 2014)

> On a field day … inwardly, you're nervous … you're going to teach to students that you don't know, in an environment you're unfamiliar with … [but] once you get the lesson started it all flows. (Bobby, personal communication, August 11, 2014)

> I kept in my mind that this is what I do … every day … if I am going in any way wrong, correct me, because … I have to learn. (Tessa, personal communication, August 14, 2014)

Participants commented on the level of collegiality and administrative support they received at their schools that facilitated (or hindered) their participation in the PGDEP. Anna's school administration reduced her teaching load and did not assign her examination classes. She had access to the multimedia room and multimedia equipment, but there were no technical support personnel to assist with preparation, so colleagues and students helped. Her school possessed mathematics manipulatives that were accessible, and Anna used them during concept lessons with the lower forms. Her colleagues, especially recent graduates of the PGDEP, provided moral support. However, Anna's involvement in co-curricular and extra-curricular activities competed with her course of study, and Anna shared that other teachers were not interested in assisting her in this area.

Bobby's school administration reduced his teaching load and relieved him of examination supervision. They allowed him to leave school earlier on days that he had to attend PGDEP classes. He felt supported by his colleagues at his school. Recent PGDEP graduates allowed him to observe them teach and observed his

lessons and provided him with feedback. His school did not possess any manipulatives, so he made or sourced his own. Bobby reported:

> "the excitement among students when I used manipulatives in my lesson delivery (e.g., dice games) was pleasing. Students enjoying a lesson brings me joy" (Bobby, journal entry 4).

Bobby's school was equipped with multimedia equipment and had technical support staff, and though he seldom used it prior to the PGDEP, he began to use it more regularly during the PGDEP.

Tessa often lamented about the lack of administrative support during the PGDEP, which she inferred from not being relieved of any responsibilities. However, she felt supported by her colleagues at school. Her school was equipped with limited resources other than technology, so teachers had to source their own. The use of technology was encouraged, and the school possessed multimedia equipment and support staff. Tessa attributed the ease of access to technology to the administration's support of "creative experimenting and technological advancement … to promote an exciting & interactive classroom environment" (Tessa, post-PGDEP philosophy statement).

Interactions in a Professional Community of Practitioners

As participants spent more time together and learned more about each other, they developed relationships that extended beyond the PGDEP. They learned more together than on their own and shared their knowledge, understanding, insights, and resources with each other. Participants appeared to have formed a professional learning community of practitioners (PLCoP) in which discussion, collaboration and emotional support were paramount.

Participants welcomed feedback from each other, because it was offered in an unthreatening environment that facilitated learning about themselves and teaching to improve their ability to meet their students' needs. They derived support from each other and realised that they could learn more together than on their own. They found it easier to exchange ideas and critique one another's work, and to be open to and welcoming of feedback on their ideas

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and teaching. They considered themselves as learners and role models for each other. They shared:

> When people point out some things, I'd be like "What? OK." and I didn't even think about that before ... it helped me to think about myself, as a teacher-guide … who is able to help a next [sic] teacher improve in their lesson and over the different sessions they helped [me] to improve. (Anna, personal communication, August 8, 2014)

> It was probably the most intimidating things initially to go and teach in front these people who you don't really know but when you get to know the persons, the feedback, I think that it's different. I think that my peers were always honest and … made valid points … to have [other mathematics teachers] critique your lesson; that is not something that you could organise easily. (Bobby, personal communication, August 11, 2014)

> I accept corrective comments from colleagues who were in clear need of the same corrections during feedback sessions … somewhat weird at first, only to realise that it was easier to critique what you see, rather than what you fail to see. The care and camaraderie developed amongst members of our group soon became obvious, and everyone was showing signs of significant growth in classroom presence, teaching styles and creative lessons. (Tessa, journal entry 8)

Engaging in Critical Self-Reflection

Participants referred to the importance of critical reflection on professional growth. Their introspection and critical reflection on the teacher-self within the context of their PGDEP experiences stimulated and supported their developing a reflective teacher disposition. Their dispositions influence how they interpret and make meaning of their experiences within their own teaching context. It was evident among the participants that they began to understand the importance of honest and critical examination of their developing teacher-self and even linking that to their teaching and perceptions of students. Their words below demonstrate how they began to think about reflection.

There are always patterns there, things that you're doing right, things that you're not doing right and things that you didn't even know was [sic] right ... I always sat down and analysed that … so when you go and you execute again you bearing all these things in mind. (Bobby, personal communication, August 11, 2014)

I quickly realised that journal writing captures thoughts, feelings and experiences from which we can learn and grow. Reflective journals … assist us in bridging gaps between teacher-students and materials and responses. (Tessa, Journal entry 3)

An Integrated Model of Change in Teacher Efficacy

To gain a deeper understanding of how the five SESI facilitated changes in teacher efficacy, I revisited Bandura's (1986) triadic reciprocal determinism model and considered the relationships among the three elements. I agree with Bandura that for each teacher (individual), their teaching practices and social relationships (behaviour), and teaching context (environment) are intimately related and may not influence each other to the same degree or simultaneously. The three teachers' teacher efficacy scores differed at the end of the PGDEP from their initial scores. Quite likely, their individual characteristics (for example, values, beliefs, attitudes, ways of information processing) and interactions with others within the PGDEP and their schools mediated and moderated the PGDEP experiences and their learnings, thereby facilitating changes in teaching.

The sequence of events in the change process during CPD appears to align with Rogers' (2007) model of teacher change that integrates the critical element of teacher reflection that Schön (1993) purported. Rogers (2007) suggested that changes in teachers' knowledge, skills and beliefs followed changes in their practices and student outcomes, which appear to reflect the change process for the three teachers in the present study. The change process is also influenced by critical events within school-embedded experiences, which elevate the role of the teaching context to teacher change that

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Desimone (2009) proffered. Teacher learning and change also appeared to have been influenced by feedback within the learning environment. For example, positive feedback from students and other teachers about changes in teaching confirmed these changes as successful and boosted participants' teacher efficacy. If students responded negatively, then they sought new information from the PLCoP to refine their teaching further, and further reflection on practice, outcomes and feedback sustained their efforts in the PGDEP.

These results point to a model of change in teacher efficacy during the PGDEP that integrates the sequence of events in Rogers' (2007) model of teacher change, the importance of the school context in Desimone's (2009) models of teacher change, Schön's (1993) emphasis on teacher reflection at various points of instruction, and the interaction of teachers' cognitive processes and their external manifestations of behaviour within their environment in Bandura's (1986) triadic reciprocal determinism model. Figure 1 illustrates the interaction of these aspects of teacher learning in the proposed integrated model of change in teacher efficacy during school based CPD of the three in-service teachers.

Figure 1. An Integrated Model of Change in Teacher Efficacy during CPD.
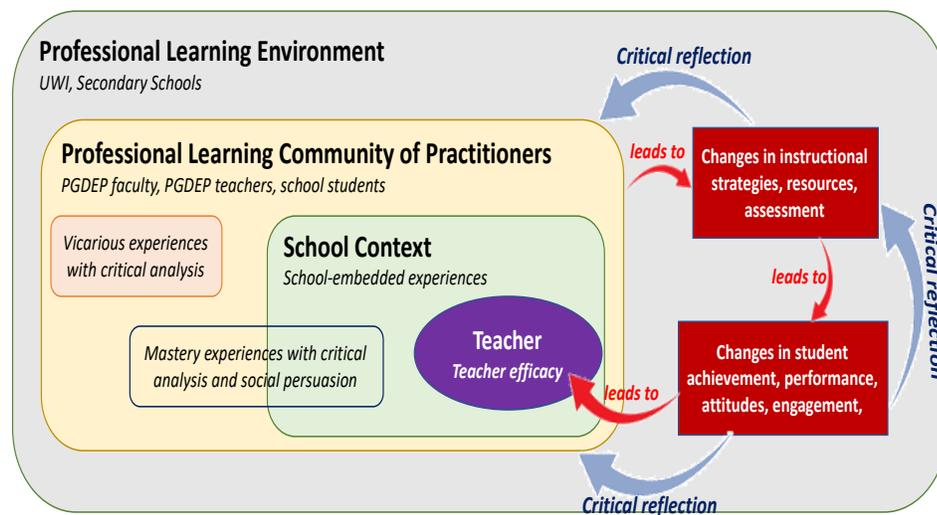
Changes in the participants' practice were associated with critical features of PGDEP and the mediating and moderating role of their teaching context and individual characteristics. Participants functioned within a professional learning environment (PLE), encompassing professional learning experiences in schools that are similar or different from theirs, and the university that facilitated the PGDEP. There, they talked, collaborated, worked, and learned with each other as members of a PLCoP. They negotiated multiple roles as established members of their school communities where they fulfil certain expectations, as well as expectations of them within the PLE. Therefore, the reciprocal interactions between them and the PLE were immediate and gradually strengthened with continued interactions.

Within the PLE, participants' PGDEP experiences allowed them to critically examine schools, classrooms and classroom activities, and acquire new pedagogical-content knowledge (theoretical and practical) and skills related to teaching their curriculum subject. They developed, implemented and evaluated educational interventions at their schools and engaged in praxis. Their experiences were sources of the five SESI that encouraged them to modify their teaching and social interactions in their immediate school environment. They focused on others' responses to changes in their teaching and interactions, which stimulated metacognitive processes that encouraged further changes in their behaviour. They also analysed and interpreted feedback from others in the PLE and formulated future behavioural responses – either maintaining or modifying aspects of their teaching and social interactions, an external response to internal cognitive processes. They assessed their capabilities and made evaluative judgments about what they could do in the future, which either reinforced their teacher efficacy for the specific task or caused them to revise their teacher efficacy. They formulated courses of action and acted deliberately accordingly regarding planning instruction, engaging students and managing classrooms.

How teachers internally process the information is complex and linked to their personal history, past teaching experiences,

disposition, motivation, metacognitive regulation, cognitive processing, and already established teacher efficacy. However, as they considered their experiences and SESI from them, within their teaching context, each new experience stimulated reflection and modification of practices and revision of teacher efficacy. Over time, and with continued success with their mastery experiences and positive feedback from students and others, their teacher efficacy changed. I propose that the change in teacher efficacy occurs like an upward spiralling cyclic process that scaffolds their development through consistent teacher reflection – teacher learning initiates modified behaviour and internal processing of experiences and information that changes teacher efficacy, which then fuels further changes in behaviour, beginning a new cycle. This model is not without limitations and does not capture all factors associated with teacher change or accounts for human cognition, but it satisfactorily represents information provided by these research participants and offers a plausible explanation of the changes in their teacher efficacy and overall practice.

Discussion

Strengthening of participants' teacher efficacy was supported by changes in their TSES score and information from artefacts, interviews and feedback from their tutor and peers on observations of teaching. This outcome aligned with those of researchers across contexts, including Basikin (2008), Beauchamp et al. (2014), Klopfer (2014), Powers et al. (2016), Ross and Bruce (2007) and Yoo (2016). These studies also support the notion that CPD, supported by successful outcomes of teaching, critical reflection and discussion about teaching and learning during CPD, can initiate changes in teachers' beliefs.

The importance of mastery and vicarious experiences and social persuasion cannot be overlooked. From participants' perspectives, the combination of each mastery teaching experience coupled with critical analysis of it and social persuasion from their students and colleagues was considered a single experience from which they derived efficacy-strengthening information. A significant aspect of mastery experiences was experimenting with

novel teaching strategies to engage students in learning and reflecting-in-action on instantaneous feedback from students to adjust their practice immediately. This sequence of events (change in teaching – change in student outcome – immediate feedback – reflection on outcome – belief change) provided information during teaching that collectively influenced further action; this process is consistent with Rogers' (2007) model of teacher change. Feedback on their mastery experiences from their PGDEP supervisor and peers provided information for reflection-on-action and refining their teaching and augmented their repertoire of strategies for classroom management and student engagement through reflection-for-action. Reflection throughout instructional planning, enactment and after the teaching episode supported the critical role of teacher reflection that Schön (1993) emphasised. Repeated exposure to such experiences over time boosted their confidence in their teaching ability and strengthened their teacher efficacy.

From participants' perspective, vicarious experiences that were coupled with critical analysis appeared as a singular experience that was considered among the prioritised SESI. Observing peers teach on field days facilitated both self-assessment and peer-assessment through social comparison (if my *equal* could do it, then so could I) and social modelling (that's how it's done, or not done). They observed exemplars to aspire towards, deriving some assurance that they could attain the same level of competence; observing poor examples of teaching highlighted what they should avoid. Subsequent critical analysis and reflection on their own practice initiated changes in their perspectives and transformation of their conceptions of teaching and learning, of teachers and learners, and their frames of reference as teachers, which support the writings of Mezirow (2009) on transformative learning.

Critical analysis also helped participants develop reflective dispositions that Thornton (2006) proposed as a characteristic of effective teachers. Evidence of this became increasingly noticeable in the quality of their journal entries. They wrote about their evolving beliefs and values, their mastery and vicarious experiences, their successes and failures, and their relationships with others,

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which facilitated changes in their teaching. Reflection helped them cognise what undergirded their decisions about teaching in their classrooms, and by re-evaluating and revising their teaching, there began the transformation in their beliefs about teaching and contributed to their critical analysis and discussions about teaching and learning. These outcomes confirm Rogers' (2007) and Mezirow's (2009) assertions that critical reflection is essential to change and transformation.

As they spent time together, participants developed relationships built on mutual trust and shared goals, and a sense of community emerged. They increasingly felt safe and supported within their PLCoP; they could teach in each other's presence without fear of judgment, and openly critique their teaching, an outcome observed by other researchers. These discussions became more meaningful over time as their self-awareness and openness to change increased, and they engaged more regularly in deep critical self-reflection in their private journals. Mezirow (2009) claimed that such changes were evidence of transformative learning, which not only changed their ways of thinking about themselves, but also their thinking about how to adapt their learning to their own schools. Ultimately, they felt empowered to change their practices to effect positive outcomes for their students.

Conclusions

The integrated model that I propose here illustrates how SESI from participants' professional development experiences influenced their teaching and teacher efficacy. During the PGDEP, participants engaged in social and collaborative learning about teaching that was embedded in their school experiences. They prioritised mastery experiences, because they obtained feedback on their teaching that confirmed or disconfirmed their pedagogical decisions, which boosted their teacher efficacy or sent them in search of more information to refine their teaching further. They credited the cyclic nature of teaching and feedback within the PCLoP with enhancing their practice and strengthened teacher efficacy. Their vicarious experiences with subsequent critical analysis and discussion facilitated social modelling and social

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comparison that prompted re-evaluation and transformation of their perspectives and conceptions of teaching and learning as they engaged with other learning–teachers. It is important to note that I assumed that indicators of increased teaching effectiveness were associated with concomitant changes in their teacher efficacy, a notion supported by researchers such as Fackler and Malmberg (2016), Klassen and Tze (2014), and Tschannen-Moran and Woolfolk Hoy (2001). I support this assumption with evidence of how participants engaged in more effective teaching practices over time.

This study highlighted how school-based CPD could influence teachers' teacher efficacy, and suggests the need for research into the sustainability of teacher efficacy beyond the period of CPD. The need for exploring context-related factors that could influence participants' teacher efficacy arises from how participants described their schools and experiences within the school contexts which are theoretical determinants of what teachers can do there. Follow up research with these participants seem warranted to determine the sustainability of changes in their practices and teacher efficacy after the PGDEP. These insights can be of benefit to other teachers who are currently enrolled in or considering pursuing the PGDEP on how they can maximise the influence of CPD on their teacher efficacy and teaching practices even beyond the programme's duration.

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