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"YOU JUST CAN'T SAVE THEM ALL": UNDERSTANDING MATHEMATICS

TEACHERS' TEACHING SELF-EFFICACY DEVELOPMENT THROUGH THE LENS OF

ATTRIBUTION BELIEFS

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"YOU JUST CAN'T SAVE THEM ALL": UNDERSTANDING MATHEMATICS

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ATTRIBUTION BELIEFS

A DISSERTATION APPROVED FOR THE DEPARTMENT OF EDUCATIONAL

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ABSTRACT

The purpose of this study was to explore how mathematics teachers in urban schools serving disadvantaged communities develop their teaching self-efficacy and how teachers' attribution beliefs were related to their interpretations of efficacy sources. Data from the semi-structured interviews indicated that mastery experiences and social persuasions paired with internal and controllable attributions were the most salient sources that positively influenced teachers' teaching self-efficacy. Failures undermined teachers' teaching self-efficacy only when they were attributed to internal and uncontrollable factors. When failures were attributed to internal and controllable factors, they did not undermine teaching self-efficacy. Considering social persuasions, when evaluative feedback was communicated in a hostile way and made teachers perceive uncontrollable attributions, it decreased mathematics teachers' teaching self-efficacy.

Vicarious experiences emerged as the third most influential source of teaching self-efficacy as vicarious experiences enabled struggling teachers to believe they could accomplish similar tasks. However, negative models lowered teachers' self-efficacy when teachers perceived little control over the situation.

The findings of the research revealed the processes and sources of teaching self-efficacy development as well as the intricate relationship between teaching self-efficacy and teachers' attribution beliefs. The results not only advanced our understanding of teaching self-efficacy but also provided meaningful insights and practical implications for preparing and supporting teachers in schools serving disadvantaged urban communities. It also has important implications for policymaking regarding teacher retention and educational equity.

ACKNOWLEDGEMENTS

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CHAPTER 1: OVERVIEW OF THE STUDY

This chapter begins with an overview of teaching self-efficacy, continues with the purpose of research and research questions, and ends with the delimitations.

Problem Statement

Over the past two decades, evidence has confirmed that teachers have substantial impacts on their students' academic and life-long success (Davis, 2003; Goddard et al., 2000; Greene et al., 2004; Perera & John, 2020; Roorda et al., 2011; Skinner & Belmont, 1993; Wentzel, 2002; Wigfield et al., 1998). Changes to education policy such as No Child Left Behind, have also underscored the significant roles that teachers play in contributing to students' learning. Teachers are critical resources for schools, and effective teachers are the most influential school-related factor affecting school and student success (Ames, 1992; Rice, 2003; Weisberg et al., 2009).

School districts are striving to enhance teacher quality and teaching effectiveness to improve students' achievement, but data from the most recent national report is a little disappointing. According to the National Assessment of Educational Progress (NAEP) report, known as the Nation's Report Card, 35% of fourth-graders, 34% eighth-grader, 31% twelfth-graders in public schools across the nation performed at or above the *proficient* level on reading. Only 41% of fourth graders, 34% of eighth graders, and 21% of twelfth graders performed at or above the *proficient* level on the mathematics assessment (National Center for Educational Statistics, 2020). Considering mathematics, students' achievement lags that of their peers in many other countries. Data from the 2015 Program for International Student Assessment (PISA), an international assessment that measures 15-year-old students' reading, mathematics, and science literacy, indicated that the U.S. ranked 30th in mathematics achievement among the 35 members of the organization that sponsors the PISA initiative (Kastberg et al., 2016). Although

there is a major national emphasis on students meeting performance standards in mathematics to maintain the U.S. competitive edge, the reality is that students did much worse in mathematics than in science and reading on the international assessment. Furthermore, it is concerning because as students advance to higher grade levels, their mathematics proficiency declines.

Attempting to reduce the mathematics achievement gap through effective instructions, research has explored factors that may affect mathematics teachers' effectiveness (Stronge, 2018). One of the contributors that were consistently found to be related to mathematics teachers' effectiveness is teaching self-efficacy (Klassen & Tze, 2014; Midgley et al., 1989). Teaching self-efficacy is defined as a "teacher's belief in his or her capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context" (Tschannen-Moran et al., 1998, p. 233). Teaching self-efficacy is positively linked to student motivation (Bolshakova et al., 2011; Usher, 2009; Zee & Koomen, 2016) and achievement (Anderson et al., 1988; Caprara et al., 2006; Perera & John, 2020). Additionally, teaching self-efficacy is a significant indicator of teachers' instructional practices (Gibson & Dembo, 1984; Holzberger et al., 2013; Klassen & Tze, 2014; Ryan et al., 2015), job satisfaction (Klassen et al., 2009; Skaalvik & Skaalvik, 2007; Wang et al., 2015), and commitment to the profession (Bruinsma & Jansen, 2010; Chester & Beaudin, 1996; Klassen & Chiu, 2011).

Despite the positive associations between teaching self-efficacy and various teacher and student outcomes, it remains unclear how teachers become efficacious (Klassen et al., 2011; Morris & Usher, 2011). This particular question is meaningful. Only when we understand how teaching self-efficacy develops are we able to help nurture efficacious mathematics teachers.

Bandura (1986) hypothesized that self-efficacy beliefs stem from four sources: mastery experiences, vicarious experiences, social persuasions, and physiological and affective states.

However, not all those four sources equally impact teachers' efficacy (Heppner 1994; Cheung, 2008; Milner, 2002). Additionally, those sources of information cannot be directly translated into judgments of capability (Bandura, 1997; Schunk & Gunn, 1986). Instead, it involves an inferential process in which people consider various personal, behavioral, and environmental factors that contribute to their judgments (Labone, 2004; Schunk, 1984). The processes governing the selection and interpretation of efficacy information are referred to as *cognitive appraisal* (Bandura, 1997).

Bandura (1997) argued that sources of efficacy information become instructive only through cognitive appraisal. Given the empirical support that cognitive appraisal is vital in self-efficacy evolvement (Ahn et al., 2017; Tschannen-Moran & McMaster, 2009), it is surprising that many studies have failed to acknowledge the role of inferential processes (e.g., Aydin et al., 2012; Moulding et al, 2014; Pas et al., 2012). Such a shortcoming illustrates the need for studies that seek to understand teachers' cognitive appraisal and the relationship between cognitive appraisal and teachers' self-efficacy.

Purpose of the Study

One of the cognitive appraisal processes involved in forming self-efficacy beliefs is attributional analysis (Gist & Mitchell, 1992). Thus, this study aims to understand mathematics teachers' teaching self-efficacy development through the lens of attribution beliefs. Mathematics teachers' experiences are studied because teaching self-efficacy is a context and subject-specific construct (Bandura, 1997; Chacon, 2005; Klassen & Chiu, 2010; Tschannen-Moran et al., 1998). Studying teachers' domain-specific efficacy beliefs would provide a clearer focus of the inquiry while suggesting more useful implications for practitioners and researchers (Wyatt, 2014). By focusing on the most impactful sources of self-efficacy information, the outcomes of this study

will contribute to future interventions that lead to increased teaching self-efficacy, thus positively impacting students and teachers.

Research Questions

1. How do mathematics teachers' attribution beliefs are related to their interpretations of mastery experiences and failures?

2. How do mathematics teachers' attribution beliefs are related to their interpretations of social persuasions?

3. How do mathematics teachers' attribution beliefs are related to their interpretations of vicarious experiences?

4. How do mathematics teachers' attribution beliefs are related to their interpretations of physiological and emotional states?

5. Which source(s) do teachers perceive to be most influential in shaping their teaching self-efficacy beliefs?

Delimitations

People need to have relatively accurate self-efficacy beliefs to function effectively (Pajares, 1997). However, this study is not going to delve into how mathematics teachers develop accurate or inaccurate teaching self-efficacy beliefs. There is a body of research on calibration that discusses the relationship between individuals' perceived competence and actual performance (e.g., Bembenutty, 2009; Peters-Burton et al., 2015; Klassen, 2002; Schraw et al., 2006; Winne & Jamieson-Noel, 2002). Based on the findings from the current research, it could be a potential future research direction. However, the first step is to figure how teachers' subjective teaching self-efficacy belief evolves, and what information they rely on most to

develop their teaching self-efficacy. In the next chapter, I will review research and literature on teaching self-efficacy.

DEFINITION OF TERMS

- Self-efficacy: "The beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1977, p. 3).

- Teaching self-efficacy: A teacher's "belief in her and his ability to organize and execute the courses of action required to successfully accomplish a specific teaching task in a particular context" (Tschannen-Moran et al., 1998, p. 233).

- (Enactive) Mastery experiences: Previous successes with a particular task or domain (Bandura, 1997).

- Vicarious experiences: Observations of models' successes and failures (Bandura, 1997).

- Social persuasions: Evaluative feedback or messages received from others that convey capability information (Bandura, 1997).

- Physiological and affective states: Moods and somatic indicators of personal capability (Bandura, 1997).

- Attribution: A causal explanation for an event or behavior (Weiner, 2010).

- Locus of causation: The belief whether a cause is perceived to be internal or external to the performer (Weiner, 1985).

- Stability (of the Cause): The belief whether a cause is perceived to be stable over time and occasions, or variable in its occurrence (Weiner, 1985).

- Controllability (of the Cause): The belief whether a cause is perceived to be something that an individual can control or influence, or not (Weiner, 1985).

- Urban Schools: Schools that are located in or near urban centers, primarily serving poor and ethnically diverse students (National Center for Education Statistics, 2020).

CHAPTER 2: LITERATURE REVIEW

This study examined how mathematics teachers in urban schools serving disadvantaged communities develop their teaching self-efficacy and how teachers' attribution beliefs were related to their interpretations of self-efficacy sources. This chapter presents relevant conceptual and empirical findings from educational psychology literature related to teaching self-efficacy development.

Theoretical Framework of Teaching Self-Efficacy

Teaching self-efficacy is grounded in Bandura's (1986) social cognitive theory, "the social portion of the terminology acknowledges the social origins of much human thought and action; the cognitive portion recognizes the influential causal contribution of thought processes to human motivation, affect, and action" (p. xii). Social cognitive theory embraces the idea that human functioning is influenced by the reciprocal interaction of environmental events, personal factors, and behavior determinants. Environmental events are external social influences that are outside of an individual, such as classrooms, friends, and social class.

Personal factors refer to internal cognitive, affective, and biological influences, such as thoughts, feelings, and motivations (Greene, 2018). Behavior determinants deal with human actions. Figure 1 depicts the interactive causal relations. The model demonstrates that people's beliefs about their abilities and characteristics guide their behaviors; behaviors, in turn, influence a person's thoughts. The social environment determines what kind of behaviors are developed and activated, and which environmental influences will shape a person's thoughts. For example, a 4th-grade teacher's belief about how well she can teach mathematics (personal factors) may be altered by the absence of critical resources in her school (environmental factors), which ultimately alters her teaching strategies (behavior) (Henson, 2002). In contrast, an experienced

teacher who has a stronger belief to provide the best learning opportunities possible for students (personal factors) may try to seek denotations (actions) to help solve the problem of lack of resources in school (environmental factors). The two examples demonstrate the capability of humans to take an active role in their own functioning, which is referred to as *human agency* a central belief in social cognitive theory (Bandura, 1986, 1997).
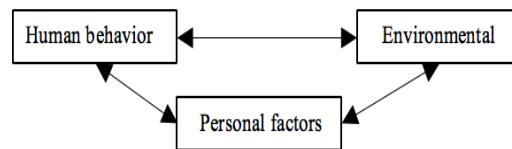
Figure 1. Triadic reciprocal relations between determinants.

A construct that is pivotal in the exercise of human agency in social cognitive theory is *self-efficacy*, defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p.3). Self-efficacy beliefs are more accurate in predicting an individual's behavior, motivation, and affective states than their previous achievements. Self-efficacy has been found to influence the choice of behavior, the effort people put forth, their persistence in the face of difficulties, and their thought patterns and emotional reactions (Bandura, 1997; Coffee et al., 2009; Schunk, 1983).

Teaching Self-Efficacy

Building on Bandura's self-efficacy theory, teaching self-efficacy is defined as a teacher's belief in their capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context (Tschannen-Moran et al., 1998). Teaching self-efficacy has been identified to be directly and indirectly related to students' motivation and achievement (Anderson et al., 1988; Ross, 1998; Tschannen-Moran & Hoy, 2001; Zee & Koomen, 2016) including student self-efficacy (Bolshakova et al., 2011), academic

expectations (Midgley et al., 1989), engagement (Reyes et al., 2012; Van et al., 2013), and students' performance (Caprara et al., 2006; Klassen & Tze, 2014; Woolfolk Hoy & Davis, 2006; Zee & Koomen, 2016).

Teachers' teaching self-efficacy has also been found to be associated with teachers' psychological well-being (e.g., Caprara et al., 2003; Pas et al., 2010) including greater job satisfaction (Klassen & Chiu, 2010; Klassen et al., 2009; Vieluf et al., 2013), stronger commitment (Wang 2015; Zee & Koomen, 2016), and lower levels of stress and emotional exhaustion (Aloe et al., 2014; Brouwers & Tomic, 2000), especially when their classroom management self-efficacy is higher.

Although higher self-efficacy beliefs tend to lead to positive outcomes, reasonably accurate self-efficacy judgments are needed for people to successfully function (Bandura, 1986; Pajares, 1997). Excessively high self-efficacy beliefs might lead students not to prepare for a task properly, and thereby impairing their performance and effort (Stone, 1994). Considering teachers, evidence suggests preservice teachers tend to have higher self-efficacy because of their idealistic perceptions of teaching and may experience a decrease when they enter student teaching and in their first year of teaching (Chester & Beaudin, 1996; Dicke et al., 2015; Hong, 2010; Woolfolk Hoy & Spero, 2005; Rushton, 2000).

Context and Domain Specific Teaching Self-Efficacy

Self-efficacy is a context-specific belief. It varies across activity domains, tasks, and situations (Bandura, 1986; Pajares, 1997). As it is explained in the seminal work of Tschannen-Moran et al. (1998), "Teachers feel efficacious for teaching particular subjects to certain students in specific settings, and they can be expected to feel more or less efficacious under different circumstances" (p. 227). Despite the consensus that teaching self-efficacy is a context-specific

construct, the three-factor model of teaching self-efficacy (i.e., instructional strategies, classroom management, and student engagement) has dominated the field (Zee et al., 2016). Empirical evidence also suggests teaching self-efficacy needs to be understood within the domains of functioning (Cervone, 2000; Chan, 2008; Haverback & McNary, 2015, Klassen et al., 2011; Tschannen-Moran & McMaster, 2009; Whittle et al., 2017; Woolfolk Hoy & Spero, 2005). An elementary teacher who has high self-efficacy in teaching mathematics may have low self-efficacy in teaching arts. Given the domain and context specificity of self-efficacy beliefs, I will focus on studying mathematics teachers' teaching self-efficacy.

Mathematics Teachers' Teaching Self-Efficacy

Mathematics is an essential element in K-12 education. Inadequate preparation in mathematics is a serious barrier for students because they will be limited in career choices related to the science, mathematics, and technology fields as well as nonprofessional jobs that require mathematics and reasoning skills (Bandura et al., 2001). Previous research has found that teachers with higher mathematics teaching self-efficacy may be able to positively influence students' mathematics motivation and achievement (Allinder, 1995; Lazarides et al., 2018; Rutherford et al., 2017). For example, Midgley et al. (1989) studied 1,329 students' beliefs in mathematics before and after their transition to junior high school. Students who shifted from having low efficacy mathematics teachers to high efficacy teachers reported higher expectations and perceived performance in mathematics, particularly for those low achieving students. Contrastingly, students who moved from having higher efficacy mathematics teachers to lower efficacy teachers during the transition ended the junior high school with the lowest expectancies and perceived performance. Their expectations and perceived performance were even lower than those of students who initially had a teacher with weaker self-efficacy beliefs.

When considering students' grade level, mathematics teachers' teaching self-efficacy is found to be predictive of students' mathematics motivation or achievement in elementary (Allinder, 1995), middle school (Midgley et al., 1989; Rutherford et al., 2017), and high school (Lazarides et al., 2018). One possible explanation is that teachers' mathematics teaching self-efficacy shapes their instructional practices (Holzberger et al., 2013), which ultimately impact their students. Although several studies have explored how mathematics teachers' teaching self-efficacy can benefit students, limited studies have analyzed how those teachers become efficacious, which leaves room for future research. If we are able to understand how mathematics teachers develop their self-efficacy, we can better prepare future teachers in their teacher education programs (O'Neill & Stephenson, 2012b) and support in-service teachers in their careers. In the current study, mathematics teachers who teach at urban schools serving disadvantaged communities are studied.

Urban Schools and Teaching Self-Efficacy

Despite efforts in attracting highly qualified and talented teachers, urban schools serving low-achieving, socio-economic disadvantaged, and minority students have struggled to retain teachers (Borman & Dowling, 2008; Howard, 2003; Papay et al., 2017). Evidence has continued to suggest that poor and minority students have less access to qualified teachers than do more affluent and nonminority children (Borman & Kimball, 2005; Jeong & Luschei, 2019), thus widening students' mathematics achievement gaps (Lee, 2012).

Several factors contribute to the challenge. Urban schools are characterized as being larger in size, heavily populated with students of color and English learners, having a large number of students from socioeconomically disadvantaged families, and including greater ethnic and cultural diversity (Ennis & McCauley, 2002; Jacob, 2007; Lippman et al., 1996).

Nonacademic tasks, such as keeping students safe, requires far more efforts resources in those schools (Weiner, 2003). Unfortunately, urban schools tend to be grossly underfunded (Jacob, 2007; Lee, 2012). Schools generally lack resources and adequate support, such as school supplies and personnel (Ingersoll, 2004; Milner, 2014). Compared to teachers working in other school contexts, teachers in urban and high poverty classrooms tend to have students who range widely in interests, abilities, backgrounds, acquired skills, learning needs, attitudes, and effort (Kraft et al., 2015). As a result, teachers face more challenges in meeting students' academic and behavioral needs (Milner, 2006; Weiner, 2003), and experience more stress and emotional exhaustion in urban classrooms (Abel & Sewell, 1999; Camacho et al., 2018), which contributes to an alarming teacher turnover rate (Borman & Dowling, 2008; Yost, 2006).

Research evidence has suggested that teachers with stronger self-efficacy beliefs tend to experience lower levels of stress and emotional exhaustion (Klassen & Chiu, 2010; Skaalvik & Skaalvik, 2010), and have stronger commitment (Klassen et al., 2009; Zee & Koomen, 2016). However, teachers in urban schools seem to have lower self-efficacy (Chester, & Beaudin, 1996). For example, Knoblauch and Chase (2015) investigated the impact of school settings (i.e., rural, suburban, and urban) on student teachers' teaching self-efficacy. They found that urban student teachers had lower self-efficacy for classroom management than the other two groups of teachers. Urban and rural student teachers had lower self-efficacy in student engagement. Similarly, Siwatu (2011) concluded that preservice teachers felt less efficacious and less prepared to teach in urban schools. Thus, studying how teachers in urban schools develop their teaching self-efficacy can provide meaningful insights into preparing and supporting teachers in disadvantaged communities, which is meaningful for improving teacher retention and educational equity.

Teaching Self-Efficacy Development

Bandura (1986) hypothesized that there were four sources of efficacy information: mastery experiences, vicarious experiences, social persuasions, and physiological and affective states. Each source constitutes a unique means for people to become efficacious. The most impactful are *mastery experiences,* which refer to perceived successes. Successful teaching experiences are powerful in raising teaching confidence (Cantrel et al., 2003; Knoblauch & Woolfolk Hoy, 2008). Although there was little shared understanding about what a mastery experience means to teachers, evidence suggested that teaching experiences or hands-on teaching opportunities in classrooms can boost teachers' self-efficacy (Al-Awidi & Alghazo, 2012; Aydin et al., 2012; Cheung, 2008; Liaw, 2009; Palmer, 2011; Pfitzner-Eden, 2016; Siwatu, 2011; Tschannen-Moran & Hoy, 2007). On the contrary, unsuccessful experiences lower teachers' self-efficacy (Phan & Locke, 2015; Yoo, 2016).

The second source of efficacy information is *vicarious experiences* (Bandura, 1986). Observing credible and admired teachers' teaching raises teachers' confidence to apply the same instructional strategies (Hagen et al., 1998; Johnson, 2010). For novice teachers, vicarious experiences help them learn effective practices from seasoned teachers and for seasoned teachers, they benefit from the opportunity to acquire new knowledge and skills from the new teachers (Chong & Kong, 2012).

Teachers not only benefit from positive models, but they also benefit from negative examples. In Mill (2011), five pre-service teachers mentioned anti-models and the unsuccessful approaches that professors used were crucial to their understanding of literature instruction. Most studies on vicarious experiences focused on face-to-face modeling experiences; however, some emerging evidence suggests that teachers could draw confidence from classic movies (Wang et al., 2017).

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Social persuasions also affect teachers' self-efficacy. Teachers developed teaching self-efficacy from evaluations from the administrators, colleagues, parents, and students (Burton et al., 2005; Devos et al., 2012; Phan & Locke, 2015). Praises generally raise teachers' self-efficacy (Cheung, 2008; Heppner, 1994; Klassen & Durksen, 2014; Milner, 2002; Milner & Woolfolk Hoy, 2003), while negative feedback lowers it (Mohamadi & Asadzadeh, 2012; Palmer, 2011; Tchannen-Moran & McMaster, 2009; Wang et al., 2017).

In addition to studying evaluative feedback, previous research has underscored the importance of considering the implicit messages, such as non-verbal information, that teachers receive in affecting their self-efficacy (Chong & Kong, 2012; Mottet et al., 2004). However, there is very limited research investigating the impact of implicit messages on teachers' self-efficacy (Morris et al., 2017).

Teachers may interpret their *physiological and emotional states* as indicators of their capabilities in teaching, although they are often studied as complementary or subordinate to other sources (e.g., Phan & Locke, 2015; Wang et al., 2017). Positive emotions are predicted to make teachers feel more efficacious, while negative feelings such as stress, anxiety, and depression, signal to the teacher a lack of ability, which can possibly lower their self-efficacy (Bandura, 1997). The research findings regarding the impact of physiological and affective states on teachers' self-efficacy are mixed. Some studies found that physiological and affective states did not appear as important as other sources of teaching self-efficacy (Cervon, 2000; Mohamadi & Asadzadeh, 2012). Other studies found that teachers with higher self-efficacy tend to feel less stressed and are more satisfied with their jobs (Wang et al., 2015). Most of the existing studies regarding teachers' physiological and emotions states have examined how teachers' self-efficacy was negatively related to teachers' perception of negative emotions, such as stress and burnout

(e.g., Skaalvik & Skaalvik, 2007, 2010; Yazdi et al., 2014), rather than how positive feelings have enhanced teachers' perceived capability in teaching. Admittedly, teachers' emotions or physiological states are also subject to their interpretations (Klassen & Durksen, 2014).

Given the literature review, it seems that not all the four sources of self-efficacy information equally affect teachers' perceived capability. Rather, mastery experiences and social persuasions seem to have been identified as more influential sources, followed by vicarious experiences and physiological states and emotional states. Therefore, this study aims to identify the sources that mathematics teachers use most to develop their teaching self-efficacy and explicate teachers' interpretations of the sources.

Cognitive Appraisal

As noted earlier, the processes governing the selection and interpretation of self-efficacy information are *cognitive appraisals* (Bandura, 1997; Labone, 2004). Findings from several studies indicated that cognitive appraisal might be critical to the formation of self-efficacy beliefs (Bandura, 1997; Goddard, 2001; Mulholland & Wallace, 2001). For example, Tschannen-Moran and McMaster (2009) conducted a quasi-experimental study to test four different models of professional development on teachers' self-efficacy in implementing a new teaching strategy. Teachers in the first condition learned the strategy and received social persuasions. They were persuaded that they would be more successful if they implement this new teaching strategy in their classrooms. Teachers in the second condition were provided with verbal persuasions as well as modeling experiences. A presenter demonstrated to teachers how to use the strategies. The demonstration took about twenty minutes in a 3-hour workshop. In addition to what teachers did in the previous two groups, teachers in the third group had a chance to practice using this strategy with their colleagues for one hour and a half within the 3-hour

workshop. Adding on to the third group, teachers in the fourth condition were coached in their own classrooms for 30 minutes in applying the new strategy. Results did not support the hypothesis that increasing self-efficacy information would produce steady increases in self-efficacy. This result demonstrated that new information had to go through cognitive appraisal to influence teachers' perceived capability.

Another study that highlighted the role of teachers' cognitive appraisal was by Morris and Usher (2011). The authors interviewed twelve professors from five research universities who had won excellent teaching awards to assess their sources of teaching efficacy. One of the findings of the study was that professors used students' body language to boost their self-efficacy. Some professors even interpreted students' negative body language in positive ways to provide a positive evaluation of their teaching. For example, when one of the professors was prompted to consider how they knew their class went well, he responded that he knew his class went well when students were "flushed" or ''sucking teeth.'' People suck their teeth when they are unhappy. This is a way to indicate they are annoyed or irritated. However, to that professor, "sucking teeth" indicated that students were paying attention (Morris & Usher, 2011). This study demonstrated the role that cognitive appraisal plays in affecting teachers' teaching self-efficacy.

A recent quantitative study with students also supported the consequences of cognitive appraisal. Ahn et al. (2017) investigated whether Korean high school students would distinguish between vicarious experience delivered by different social models (i.e., teachers, peers, and family members) and how each type of social model contributed to students' self-efficacy beliefs. Results from their first study proved that social persuasions from the teachers were a significant contributor to student self-efficacy in mathematics beyond the contributions of mastery experiences and physiological states, but not persuasions from peers or family members.

Empirical evidence has suggested that cognitive appraisal is vital in self-efficacy development; however, it has not been well studied. Some researchers chose not to consider it, such as Burton et al. (2005) and Singh et al. (2013) who were only concerned with demonstrating that interventions were able to raise teachers' teaching self-efficacy. Some studies neglected it (e.g., Aydin & Woolfolk Hoy 2005; Aydin et al., 2012). For example, mastery experiences were equal to all teaching experiences regardless of positive or negative (e.g., Cheung, 2008; DeChenne, 2015). Social persuasions were sometimes equaled to support received in school (e.g., Aydin & Woolfolk Hoy 2005; Moulding et al., 2014; Ruble et al., 2011). The influence of vicarious experiences was examined by assessing participants' level of education, quality of university preparation for instruction, and professional development experiences (e.g., Tschannen-Moran & Johnson, 2011). Although it seemed to be warranted, those authors neglected the role of inferential processes.

Even among researchers who attempted to understand cognitive processing, their approach might be too general and problematic. In two purely quantitative studies (O'Neill & Stephenson, 2012a; Poulou, 2007), the cognitive appraisal was studied by surveying participants to rate the value they assigned to each source of efficacy information on a Likert-type scale. For example, Poulou (2007) asked student teachers in Greece to consider where their confidence in teaching came from. An example of their questions was "I attribute my confidence in my classroom behavior management capabilities to my personal (idiosyncratic) style." Then the regression analysis was conducted to see which sources predicted student teachers' self-efficacy. However, the instrument used (Teacher Efficacy Sources Inventory, Poulou, 2007) combined mastery experiences and social persuasions together, which provided little information about teaching self-efficacy development (Usher & Parajes, 2008; Morris et al., 2017).

In qualitative and mixed methods studies (e.g., Mills, 2011; Morris & Usher, 2011; Wang et al., 2017) which attempted to understand the appraisal processes, participants were asked to reflect on things that impacted their teaching self-efficacy. They were asked questions such as "What have been your major sources of information about teaching literature?" (Mills, 2011, p. 80), "Which of the things you mentioned do you believe had the most powerful influence on your confidence?" (Morris & Usher, 2011, p. 236), and "What makes you feel that you are competent in teaching low-achieving students?" (Wang et al., 2017, p. 150). This approach was superior to the purely quantitative approach. However, teacher self-efficacy is subject to different tasks and domains of functioning (Bandura, 1997; Lee et al., 2013; Ross & Bruce, 2007; Tschannen-Moran et al., 1998). Teachers' self-efficacy for teaching mathematics or English may be different. Thus, interviewing teachers from diverse disciplines, school contexts, and grades may obscure the findings.

Another issue with the existing qualitative and mixed methods studies regarding cognitive appraisal was that the interview questions were somewhat directive. For example, participants in Palmer (2011) were asked "*Did the workshop/observations/teaching/feedback affect your confidence to teach science?*" and *"Has your science teaching changed as a result of the intervention?"* Patton (2015) suggested when interview questions and response categories are pre-determined, respondents must fit their experiences and feelings into the researcher's categories. By limiting the response choices, the researchers may distort what the respondents really mean. Thus, those interview questions might not provide an accurate picture of how teachers cognitively process information from diverse sources. Also, many interviews seem to focus on the quantity of participants' experiences rather than the quality of their experiences.

Furthermore, there is a dearth of research that explicitly asked participants questions

related to their teaching context (e.g., "How supported do you feel by the department and by the institution in your development as a future literature professor," Millis, 2011, p. 80). Other studies did not ask participants to think about their self-efficacy in relation to their teaching tasks and the context in which they teach. However, asking participants those contextual questions is informative in understanding teachers' self-efficacy because teaching self-efficacy is a context and domain-specific construct (Bandura, 1997; Tschannen-Moran et al., 1998; Wyatt, 2014). Appraisals of one's efficacy are primarily contingent on contextual factors (Bandura, 1997). When teachers are not asked to consider their teaching self-efficacy in relation to the teaching task and the resources they have, their self-efficacy might be higher and not accurate. Therefore, this study will focus on examining the experiences of mathematics teachers and considering their teaching contexts.

Attribution Theory

In order to understand how teachers' self-efficacy develops, it is crucial to explicate the relationship between cognitive appraisal and teachers' self-efficacy. One of the cognitive processes involved in forming self-efficacy judgments is attributional analysis (Gist & Mitchell, 1992; Tschannen- Moran et al. 1998). According to Weiner (1985, 2010, 2018), attributions are perceptions of causation. Three causal dimensions of attribution are the locus of causation, stability, and controllability (Weiner, 1985, 2010).

The locus of causation describes the internality or externality of an attribution. Internal attributions for success are more likely to enhance self-efficacy beliefs, whereas external attributions for failure do not affect self-efficacy beliefs (Coffee et al., 2009; Tolli & Schmidt, 2008). If teachers make external attributions following a successful event, their self-efficacy beliefs are not enhanced because the credit was given elsewhere, such as luck or the task was

perceived as easy (Bandura, 1997). Successfully teaching a lesson due to the support from colleagues did not affect teachers' self-efficacy much (Tschannen-Moran & McMaster, 2009; Woolfolk Hoy & Burke-Spero, 2005). Teachers who believed receiving a teaching award was because of luck or other contextual factors indicated that the award contributed little or no influence on their self-efficacy (Morris & Usher, 2011). Similarly, if teachers make external attributions following a failure, their self-efficacy beliefs are not diminished because the blame was placed outside of them. It was someone else's fault, or the task was perceived to be too difficult.

When individuals make an external attribution, the controllability dimension is invoked, meaning that the situation is not within the individual's control (Knoblauch & Chase, 2015; Weiner, 2010). However, developing a habit of making external attributions is dangerous because teachers may feel absolved of responsibility and therefore put forth less effort and persistence (Bandura, 1997; Knoblauch & Chase, 2015). Research regarding teaching self-efficacy and their attributions of locus of causation suggested that teachers with higher self-efficacy are more likely to attribute students' learning difficulties or behavior problems to external factors, such as students' characteristics, family-based factors, or school factors (Andreou, & Rapti, 2010; Brady & Woolfson, 2008; Yoo, 2016), thus preserving their self-efficacy.

Stability refers to how enduring the cause appears. Attributions of success to stable factors such as high ability have the most significant impact on the increases in subsequent self-efficacy (Gernigon & Delloye, 2003; Schunk, 1984; Weiner, 1985; Vasil, 1992). Changing students' attributions and encouraging them to attribute success to high ability exert the strongest influence on self-efficacy, and attributing success to high effort or luck undermine self-efficacy

(Luzzo et al., 1996; Schunk, 1983; Schunk & Gunn, 1986). The stability attributions have been less well researched with teachers (Brady & Woolfson, 2008). Although there is a scarcity of research on teachers' self-efficacy and their stability attributions, studies indicated that some teachers may hold a belief that students may not be able to change the learning difficulties they face in schoolwork (Brady & Woolfson, 2008; Woolfson et al., 2007), and therefore they may spend less time and effort in helping those students.

Controllability describes the degree of control an individual has over the cause of the behavior. Controllable attributions are more likely to be associated with higher subsequent self-efficacy, especially for less successful performances (Coffee et al., 2009). De Boer, Janssen, and Van Driel (2016) examined whether using an attribution support tool could increase student teachers' self-efficacy. The attribution support tool was designed to help student teachers to change their attributions of problematic experiences they found hard to teach. The tool could help them change their attribution from external, stable, and uncontrollable to more internal, unstable, and controllable attributions. Students scored their lessons and filled in a teacher efficacy questionnaire after each lesson. After five interventions, teacher efficacy increased and the number of failures during the lessons decreased; on average, the self-awarded scores of each teacher increased. Therefore, the researchers concluded the attribution tool was promising for student teachers to enhance self-efficacy and to support reflection on problematic teaching experiences. Although attributions played an important role in cognitive appraisals, the method of this study could not guarantee that the increases in self-efficacy beliefs were not due to teachers' natural growth. As teachers had more successful teaching experience in classrooms, their self-efficacy might have increased (Cheung, 2008).

Constantly making uncontrollable attributions may make feel teachers less efficacious and have learned helplessness as they perceived little control over the situation (Yoo, 2016). Since attributions concern how people analyze factors that determine the outcomes of their actions and influence an individual's subsequent self-efficacy, they can be used to partially explain the cognitive appraisal processes involved in the development of teaching self-efficacy beliefs. Thus, based on my search of the research literature and knowledge of the field, the purpose of this present study is to investigate the sources of information mathematics teachers in urban schools use most to develop their teaching self-efficacy and teachers' interpretations of self-efficacy related classroom experiences through the lens of attribution beliefs. In the next chapter, I will discuss the methodology of the research.

CHAPTER 3: METHODOLOGY

This study examined how mathematics teachers in urban schools develop their teaching self-efficacy and how teachers' attribution beliefs were related to their interpretations of self-efficacy sources. This chapter discusses the methodology of the current study.

Theoretical Framework

The choice and development of my research topic are related to my epistemological stance. I consider myself a constructivist and I believe that "meaning is not discovered, but constructed" (Crotty, 1998, p. 9). Knowledge is developed through an individual unique meaning-making process, and each individual's way to approach this is worthy of respect (Crotty, 1998). Different people may have different interpretations of the same or similar experiences. Cultural contexts may shape the way we see things and approach things. Some meaning may be derived through a social collective process (Crotty, 1998).

This epistemological stance informs my theoretical perspective. I consider myself taking the stance of symbolic interactionism. Symbolic interactionism explores the relationships between how we see ourselves, how we see others, and how we think others see us. It explains the process of meaning-making (Schwandt, 2015). According to Blumer (1969), three basic premises of symbolic interactionism are: a) human beings act toward things that are meaningful to them, b) the meanings of those things are derived from social interactions, and c) these meanings are molded through an interpretive process (as cited in Crotty, 1998). This theoretical perspective gives the basis as I seek to understand how teachers develop teaching self-efficacy beliefs. Such beliefs are dependent on how teachers perceive their experiences. Teachers are socially situated in their schools and their teaching self-efficacy beliefs and experiences are developed and shaped by the environment such as the school culture, colleagues, and students. In

light of the symbolic interactionism perspective, teachers' teaching self-efficacy will be based on the meaning teachers perceived, developed, and refined through those interactions. Therefore, this study will help refine researchers' understanding of the social interactions of teaching, and how they influence teachers' teaching self-efficacy development. Taking a symbolic interactionism stance requires me to attend carefully to the overt behaviors, speech, and the settings in which teaching self-efficacy development takes place (Schwandt, 2015). Admittedly, my values, beliefs, and cultural background may influence the way I interpret teachers' experiences.

Research Design

The purpose of this study was to understand teachers' teaching self-efficacy development and how teachers' attribution beliefs were related to their interpretations of efficacy sources. To understand this relationship, this study employed a basic qualitative research method (Merriam & Tisdell, 2016). According to Merriam and Tisdell (2016), a basic qualitative study is ideal to understand (1) how people interpret their experiences, (2) how people construct their worlds, and (3) what meaning people attribute to their experiences. Thus, using a basic qualitative research method, I can unpack the sources of teaching self-efficacy and teachers' attribution beliefs from teachers' own perspectives (Patton, 2015). For instance, by asking open-ended interview questions, I can allow meanings to emerge from the data, which makes participants' emic perspective be the center of this inquiry instead of the researcher-imposed etic perspective (Given, 2008). I was also able to provide detailed descriptions of teachers' reasoning (Tschannen-Moran et al., 1998), report multiple perspectives held by teachers, and identify other influences involved in the self-efficacy developmental process. Additionally, the qualitative research method permits me to analyze unexpected patterns from data (Morris & Usher, 2011).

Therefore, the basic qualitative research method is appropriate in this study to refine our understanding of the sources of teaching self-efficacy and teachers' interpretations of experiences.

Sampling

This study employed a purposeful sampling strategy, especially a criterion sampling strategy was used to identify participants (Creswell & Creswell, 2017). Criterion sampling involves selecting cases that meet some predetermined criterion of importance (Patton, 2015). A criterion sampling strategy was used in this study to identify and understand information-rich cases.

Recruitment criteria included mathematics teachers working at high-poverty urban secondary schools. Secondary schools in urban areas serving disadvantaged communities were targeted because 1) there are limited studies on K-12 teachers (Morris et al., 2016), and 2) the literature suggests that those schools face more problems than other schools, while also experiencing challenges in administration support, funding, resources, teacher quality, and supply (Freedman & Appleman, 2009; Knoblauch & Chase, 2015; Quartz & TEP Research Group, 2003; Siwatu, 2011). Teachers working in these schools are likely to experience greater difficulties compared to their suburban and rural counterparts (Knoblauch & Hoy, 2005; Lippman et al., 1996; McKinney et al., 2008). Therefore, their teaching self-efficacy development may be prolonged to provide a more complete picture, and may also be more sensitive to contextual influences.

Procedures

After obtaining the approvals from the Institutional Review Boards, school district, and principals of each school, teachers were recruited through emails and face-to-face meetings that

the researcher attended during regularly scheduled staff meetings. Teachers were given a verbal description of the study as well as the procedures. Those who were interested to participate were provided a sign-up sheet asking for email addresses and names. A follow-up email explaining the details of the study was sent to those teachers. Teachers were also asked to provide their availability if they wanted to participate in the study.

Before each interview, teachers were instructed to read the study content carefully and sign it if they agreed to be in the research project. Teachers were assured that the researcher would employ a number of methods to protect their identity confidential such as using pseudonyms and keeping their records secure through the use of password-protected files. Those who were not wanting to participate were allowed to withdraw from this study.

Participants

Participants in the study were 20 secondary mathematics teachers (ten middle school teachers; ten high school teachers) from two school districts serving socio-economically disadvantaged communities in a Midwest city in the U.S. Among the twenty teachers, eight were male and twelve were female. Information on the participants' demographics, including their job position, race/ethnicity, number of years teaching, and number of years teaching mathematics, can be found in Table 1.

Table 1

Participants' Information

	Pseudonym	Position	Gender	Racial Identity	Years at Current School	Years of Teaching	Years of Teaching Math
1	Tiffany	6th	Female	Latino	4	5	1
2	Kandra	6th	Female	Latino/ Asian	3	3	1

3	Hang	8th	Female	Asian	2	24	7
4	Matthew	12th	Male	Hispanic	3	5	5
5	Tim	7th	Male	Irish American	2	7	2
6	Diana	11th & 12th	Female	White	4	8	8
7	Robert	7th &8th	Male	White	2	20+	5
8	Nicole	9 &10th	Female	Hispanic	4	4	4
9	Jack	11th	Male	White	2	2	2
10	Heather	9th	Female	White	2	2	2
11	Jennifer	6th	Female	White	9	49	11
12	Cody	6th	Male	White	1	1	1
13	Mary	9th	Female	White	1	1	1
14	Penny	11th	Female	White	2	4	4
15	Rachel	6th	Female	White	7	22	7
16	Amanda	7th	Female	White	10	16	16
17	Robin	9th	Female	Hispanic	2	2	2
18	Richard	9th & AP statistics	Male	White	3	3	3
19	Daniel	9th	Male	White	1	15	15
20	Sean	8th	Male	White	14	14	14

Semi-structured Interviews

Shank (2006) indicates interviews are one of the most primary ways for researchers to gain information for qualitative inquiry. Participants in this study were invited to participate in a

semi-structured interview lasting around 80 minutes. Core interview questions to elicit participants' experiences included: "How confident do you feel in teaching mathematics?" "Can you tell me some examples of what happened that made you feel you had a stronger/weaker sense of confidence in teaching math?" and "Where do you attribute your success/failure in this episode?" The full interview protocols are attached in Appendix A.

Data Analysis

The recorded interviews were fully transcribed verbatim. To condense the extensive textual data into core themes, the data was segmented by research questions and then analyzed using inductive analysis (LeCompte & Preissle, 1993). Each transcript was read thoroughly and all responses relevant to the phenomena of interest were noted on the transcript. The transcript was then coded and thematically analyzed (LeCompte & Preissle, 1993). The analysis focused on examining teaching self-efficacy sources, the changes in teaching self-efficacy, and teachers' causal attributions in relation to efficacy changes. In the process of analyzing the interview data, I remained open to unexpected categories of self-efficacy sources. In the second round of analysis, significant responses concerning the research questions were coded in the interview transcript and a coding list was developed (See Appendix C). As new data emerge, codes were added, deleted, merged, or modified. Later the codes were compared, contrasted, aggregated, and ordered to find common categories. Any segments in the interview transcripts that the researcher was not sure of were noted and placed in a separate file, which was analyzed again. Later, another researcher was invited to triangulate the data and discuss the findings.

Trustworthiness

To enhance the trustworthiness of the research and reduce my bias, I employed several methods. First, I sought approval from the Institutional Review Board to ensure that appropriate

steps would be taken to protect the participants' identities. As part of the process, I developed an informed consent to fully inform the participants of those steps. For example, once an interview was completed, a participant would be assigned a pseudonym to protect confidentiality. By informing participants of those steps, it would alleviate their privacy concerns and encourage them to provide truthful answers to the research questions, which strengthened the trustworthiness of the results.

Second, I included my subjectivity statement (Appendix D) to inform the reader of my positionality as a researcher and possible biases. Third, I kept a research log in which I documented my analysis and interpretation notes, brainstorming process, significant findings, and questions (Patton, 2015). The log was frequently visited during the data analysis process to minimize the researcher's potential biases.

Last, I used member checking and researcher triangulation to ensure my analysis reflected the participants' meanings (Given, 2008; Lincoln & Guba, 1985). Considering member checking, during the interviews, I repeatedly summarized participants' points to ensure I understood their meanings. I also shared with participants their interview transcripts and a list of key points they mentioned during the interview to make sure my analyses capture their experiences and intended meanings. As for researcher triangulation, one of my colleagues in the Department of Educational Psychology at the University of Oklahoma helped me triangulate the data analysis. This researcher had extensive training in qualitative research. She read through random transcriptions as well as the transcriptions that I was not sure about, which included excerpts of transcriptions from 12 participants. Then we discussed the discrepancies.

Once we finished, the intercoder reliability, which is the level of agreement between coders regarding how the same data should be coded, was calculated (O'Connor & Joffe, 2020).

Calculating and evaluating the intercoder reliability is recommended as good practice in qualitative analysis. I computed the intercoder reliability coefficients (i.e., Cohen's kappa) using an online calculator. The intercoder reliability was 0.895, which is acceptable for a qualitative inquiry (Landis & Koch, 1977; Neuendorf, 2002). In the next chapter, I will report the findings of the current research.

CHAPTER 4: FINDINGS

The purpose of this study was to examine the most influential sources affecting teachers' self-efficacy and teachers' interpretations of the corresponding sources/and or events that affect their self-efficacy through the lens of attribution beliefs. Chapter 4 presents the results of the analysis of the qualitative data based on the research questions. The unit of analysis - the entity being analyzed - of this study was each participant. The findings are presented with respect to the following research questions except for research question 5, which will be weaved into the other four questions.

1. How do mathematics teachers' attribution beliefs are related to their interpretations of mastery experiences and failures?

2. How do mathematics teachers' attribution beliefs are related to their interpretations of social persuasions?

3. How do mathematics teachers' attribution beliefs are related to their interpretations of vicarious experiences?

4. How do mathematics teachers' attribution beliefs are related to their interpretations of physiological and emotional states?

5. Which source(s) do teachers perceive to be most influential in shaping their teaching self-efficacy beliefs?

Teachers' Perceptions of Mastery Experiences

In order to answer the first research question, I identified how teachers conceptualized mastery experiences. Mastery experiences (19 out of 20 teachers) emerged as one of the most influential sources that impacted teachers' self-efficacy. To teachers, mastery experiences were

in various shapes and forms. For instance, Richard, who was teaching 9ᵗʰ-grade geometry and 12ᵗʰ-grade Advanced Placement classes, believed mastery experiences meant "being successful."

> In order for you to be confident, you have to be successful…First-year teachers aren't supposed to be successful. They're not supposed to have success at all. But here I was having a lot, having success is really helpful to build confidence.

Penny, an 11ᵗʰ-grade teacher, thought students behaving well, understanding the lesson, and doing their work were mastery experiences. She stated: "They behave well, they did their job, and their grades high. I like everyone to understand, every single day if the majority of the class understands, do their job, this tends to make me feel more confident." Building on Penny, Rachel, a 6ᵗʰ-grade teacher, believed mastery experiences were accumulative years of experiences. She commented,

> Experience. I've taught a long time and that helps. Because basically, when you've seen everything that kids could possibly do, you pretty much can kind of hit it off…When I first started teaching it, the thing that was hardest on my confidence is when I would have kids act up in class, and I didn't know how to deal with it. And I would just kind of be put on the spot and wouldn't know what to do. That was the big thing. It doesn't happen very much anymore because *I've had to deal with it so long*…But you know, a lot of it just comes with the experience of course.

Rachel believed self-efficacy development was a long journey that progresses with experiences. Her initial inefficacy was due to the lack of experience and classroom management skills. Once she had more experience, she became more self-efficacious in teaching mathematics. Amanda, a 7ᵗʰ-grade mathematics teacher, shared a similar perspective, and she used a metaphor to describe her experience.

It's more like steps, like you're climbing a ladder or a staircase. So *it's every now and then you look and you are with a group of students that were able to help and you can step up another step*. And then you find yourself not on the first rung of the ladder, but you're eight steps up. I would say experience is a great teacher relieving the stress of, oh gosh, I don't know how to teach them Mean, Median Mode yet, you know, but now that I've done it for 16 years. I can look back and be like, 'Well, that was a disaster. Not gonna try that. This group tends to like these things. This group is really mature, so they're going to need a manipulative,' you know, being able to see and have resources. Because you've got that experience. That would definitely help you climb those steps to confidence. But you can go down the ladder, too. Too many hits in the wrong direction, you know, you go down the ladder. And then you go up the ladder a little bit. And again, it's that reflection that brings you back up.

To Amanda, teaching self-efficacy development was not a straightforward, effortless process, rather it was a marathon journey that gradually progresses through many stages, and sometimes ups and downs. Both failures and successes helped expand her knowledge and expertise in various instructional approaches, which further increased her self-efficacy, as she was able to differentiate her approaches to different groups of students. Embracing experiences both positive and negative and being reflective helped Amanda move through the stages of self-efficacy development.

Increased Self-Efficacy with Internal & Controllable Attributions

Next, based on teachers' understanding of mastery experiences, I analyzed data to explore how teachers interpreted these mastery experiences through their attribution beliefs. Even though attribution theory outlines three distinctive causal dimensions (i.e., the locus of

causality, stability, and controllability), these three dimensions are often intertwined in the data when teachers were discussing their experiences. Successes were found in the present study to increase teachers' self-efficacy when teachers attributed their success to internal and controllable factors (16 teachers out of 19). For instance, Amanda, who identified mastery experiences as her sources of self-efficacy, further elaborated on how she interpreted the accumulative experiences using specific examples.

> "I would say just seeing a kid the day to day, knowing they walk in saying I hate math. And then by the end of the year seeing what they really did. They stayed with it and laughed a little and enjoy themselves and *made it a passing grade because of what you as a teacher have helped them with (Internal attributions for successes)*. So when I feel helpful, I feel more confident. *[If] I don't feel like I'm helping, I don't feel very confident.* Because a teacher's job is to help us to get you to know a subject, or how to be successful in life.

Despite the instructional challenges, Amanda's understanding of teachers' responsibility guided her to actively seek different ways to teach the same content and make sure it is comprehensible to students. By altering her instructional approaches, Amanda was able to achieve successes and made internal and controllable attributions for the successes, which helped build her teaching self-efficacy. She continued,

> I have literally filling cabinets or buckets full of five different ways to teach something. And *I can choose from (Internal & controllable attributions for successes)* that now, rather than the only thing I have is what we're going to do. *I have a lot more tools to use (Internal and controllable attributions for successes).* And it helps the students be

successful. And then you feel that success too because you've got that experience. That

would definitely help you climb those steps to confidence.

Amanda's notion that "I can choose from" reflects a sense of personal control over the

environment and a proactive way of dealing with instructional challenges. This personal

controllable perspective was also shown by Tim, who identified mastering instructional

strategies as a form of mastery experiences, and explained how filling skill gaps contributed to

his increased teaching self-efficacy.

> *I've been working a lot on some of my skill gaps* (*Internal and controllable attributions*
>
> *for successes)*. And I'm having a lot of success, where those gaps were with kids. And
>
> that's been really cool… So my research is actually positively affecting their ability to do
>
> stuff. *My confidence was built when I felt that my tool belt was getting fuller (Internal*
>
> *and controllable attributions for successes)* …I've been getting better at it, and it helped
>
> with my confidence a lot.

Learning new instructional strategies and having successes reflects Tim's belief that his effort,

which was internal and controllable, could improve his instruction and students' learning. Such

perspective encouraged Tim to ameliorate his skills. Like Amanda and Tim, 16 teachers in this

study attributed their efficacy-related successes to internal and controllable factors such as effort,

employing different instructional strategies, and implementing classroom management

techniques. This internal and controllable perspective was often reflected in teachers' comments,

such as "feeling like I have more control over the classroom gives me positive confidence

(Mary)," "the more discipline issues and experience I get, the more confident I am to know how

I deal with that situation (Richard)," and "when things don't work, and I'm able to make them

work (Diana)."

Less Affected Self-Efficacy with Internal, Relatively Stable, and Uncontrollable Attributions

Contrastingly, in cases where teachers did not perceive a strong sense of controllability about their successes, their teaching self-efficacy seemed to remain less affected (three teachers out of 19). For instance, Robert, who attributed his success to internal high ability and personality, noted,

I thought that getting students to make connections was pretty successful in those classes. But *I don't know that it takes from or adds to a confidence level.* You think what it does is, when you do see the kids get it, it kind of makes you happy. It's like, 'Okay, I don't have to revisit this topic.'

When prompted where he attributed the successes to, Robert replied: "I understand the material way beyond what needs to be for this level to teach it. I'm 100% confident in my ability. I feel confident and I know the material, I'm confident that I can get the materials taught." It was clear that Robert attributed his successes to high ability, which was internal, relatively stable, and uncontrollable. However, the high ability attribution did not add to Roberts' teaching self-efficacy. It only made him feel "happy" and relieved.

Similarly, Matthew attributed successes to his personality and only felt "really good" about the successes. He stated: "I feel like I've always been *a relatively confident person (Internal, relatively stable, and uncontrollable attributions for successes)*. I was good at things. I knew it wasn't maybe true, or whatever… being able to present [a lesson] in front of the students and the adults, it still feels really good." Like Robert, attributing successes to personality, which was internal, relatively stable, and uncontrollable, did not affect Matthew's teaching self-efficacy. It only made Matthew feel good.

Such a good feeling was also found in Jennifer. When prompted whether a success boosted her teaching self-efficacy, Jennifer replied: "No, but it's always a good feeling. It's a good feeling whenever they [students] get it." Across the three participants, attributing successes to internal, relatively stable, and uncontrollable factors, such as high ability and personality, did not boost teachers' teaching self-efficacy. Compared with other teachers, it seems that only when teachers attributed successes to both internal and controllable factors, such as effort, teachers' teaching self-efficacy increased.

This finding is slightly different from the theoretical proposition and mainstream research findings, which state that successes attributed to either internal or controllable factors enhance an individual's subsequent self-efficacy (Bandura, 1997; Coffee et al., 2009; Ding et al., 2019; Tay et al., 2006; Tolli & Schmidt, 2008; Tschannen-Moran et al., 1998.). In other words, teachers' teaching self-efficacy would increase whether they attribute successes to internal and controllable causes (e.g., effort), or internal and uncontrollable causes (e.g., high ability). However, in this study, when Robert attributed his successes to high ability, his teaching self-efficacy did not increase. Although the current study only has three teachers reporting high ability and/or personality attributions for mastery experiences (which were internal, relatively stable, and uncontrollable), the fact that teachers almost always brought up internal and controllable attributions together seems to suggest both internal and controllable attributions need to be present for mastery experiences to influence teachers' teaching self-efficacy.

This discrepancy in findings is noteworthy because it may capture the nature of mastery experiences. A review of the literature (Chapter 2) suggested there is little shared understanding of what a mastery experience is. Given the findings of the current study, regardless of the forms and how they are described by the teachers, mastery experiences, in essence, might be successes

attributed to internal and controllable reasons. Another point to note is that when the three teachers attributed their success to internal and uncontrollable factors, they all brought up pleasant emotions such as excitement and happiness. The potential theoretical implication of the role emotions play in teachers' efficacy beliefs formation will be further discussed in Chapter 5.

Teachers' Perceptions of Failures

Considering failures, existing findings suggest that failures undermine teachers' self-efficacy (e.g., Cantrel et al., 2003; Knoblauch & Woolfolk Hoy, 2008; Phan & Locke, 2015). While teachers in this study showed similar patterns that persistent instructional struggles generally made teachers feel less efficacious, teachers varied in the way they interpreted and approached those negative experiences, especially in a relatively long period. Some teachers (15 out of 20 teachers) attributed failures to internal, unstable, and controllable causes, which enabled them to acknowledge their weaknesses, and actively and proactively respond to the challenges, such as seeking help, learning new strategies, and attending professional development workshops. Thus, even though experiencing failure made them feel inefficacious temporarily, their belief that failure is temporary and controllable motivated them to improve their current practice and achieve successes.

Increased/Less Affected Self-Efficacy with Internal, Unstable, and Controllable Attributions

Heather, a 9th-grade Algebra teacher, was an example of those teachers who attributed failures to internal, unstable, and controllable causes and actively searched for ways to address the failures.

> *Literally, half of the class were failing (Failure)* at the end of the trimester and knowing
> that's not what I want, I don't want to fail half of my class. That's ridiculous for half of
> the ninth grade to not pass Algebra. You expect some kids to fail. Like, it's not a perfect

system. But for half of the class to fail seems like unreasonable. And that really shook my

confidence. I felt like I'd set up my classes for failure.

The experience that half of the class was failing drastically decreased Heather's teaching self-

efficacy, making her question whether a teaching career was suitable for her.

In the middle was really, really bad. I don't know that I would have come back to teach

another year...*What brought my competence up was that I was able to, like, quickly get*

my F list, down to a reasonable number (Internal, unstable, and controllable attributions

for unsuccessful teaching experiences), at least closer to 10%...A lot of it really was

classroom management. The more I am looking back, the worse I feel about the teaching.

As a first-year teacher, instead of finding an excuse for herself, Heather admitted her weakness

in classroom management and instruction, which enabled her to seek help proactively from the

instructional coach. Heather continued,

I talked a lot with Malinda [the instructional coach] because I and Mary accept her help.

Like, we asked questions. And we asked for her advice…she gave me some really strong

advice. And I took it and if I wasn't able to implement it, *I know where the weaknesses*

are and the lesson. And can strengthen them for later (Internal, unstable, and

controllable attributions for unsuccessful teaching experiences).

Heather's help-seeking behaviors reflect her belief that instructional failures were due to

inappropriate strategies and effort, which were unstable and controllable. Rather than letting the

negative experiences dragged her down, Heather believed they could be improved if she

provided better instruction. As such, the negative teaching experiences were understood and

framed in a way to keep her focus on advancing skills and reachimg out to people who could

help strengthen her weaknesses. Thus, attributing failures to internal, unstable, and controllable

causes (i.e., inappropriate strategies and effort) enabled Heather to see the values of those challenging experiences in the long run.

Diana, who was teaching 11th and 12th grades, also approached the instructional challenges with a more open-minded and controllable perspective. She articulated,

> I've been doing it for eight years. Some days are very successful. There're always days that just completely flop. But you learn just as much if not more from those, then you do today is to go well. If you can kind of reflect on the days that don't go well, then you can get a lot of information about what you should or shouldn't do next time. *You can always change it (Internal and controllable attributions for unsuccessful teaching experiences) …just because it totally flopped this way, doesn't mean that it's never going to work (Failures are unstable)*, you can always try teaching in a different way. There's always another way to teach it. And eventually, you'll find a way that works for you. It might take you longer than you want it to. But eventually, you'll find a way that works for you. It used to affect me more. Like when I first started teaching. It used to affect me more, but I've learned from those first couple of years that *you can tweak it, you can change (Internal & controllable attributions for unsuccessful teaching experiences)*.

Diana's comment that "you can tweak it, you can change" reflects her belief that failures were unstable and controllable. This malleable perspective enabled Diana to tackle the instructional challenges more actively by putting more time and effort into her lessons.

This internal and controllable perspective for instructional challenges was also discussed by Sean, who had 14 years of teaching experience.

> Like today, the second hour, the lesson was too short. It was too much free time. So I had to make some changes. As a teacher, number one, *you can't be afraid to make changes*

(Internal and controllable attributions for failures) and if the lessons not going to last as

long as what you thought it was, and they blow through it, then you try to have something

else to kind of help them.

This internal and controllable perspective was also observed in Robert when he commented on

students' demographics. He shared,

99.9% Hispanic population. They all come from the inner city. Some of them seem to be

willing to learn math. Some of them seem to care one way or the other, but they learn

math …*You get a large majority of the students want to be successful.* Whether they can

or can't, it's kind of a different story, but they come in wanting to be successful. *Some*

students I have to do extra things with. I would say, 'Hey, I need you to come to see me

for half an hour after school, half an hour before school.'

Although being aware of the social and emotional challenges which students brought, Robert

perceived a large majority of students wanted to be successful, which was slightly different from

the existing research on disadvantaged urban communities (e.g., Day & Hong, 2016; Kraft et al.,

2015). Robert also helped those students catch up by meeting them outside of school hours,

which reflects an internal and controllable attribution for challenges.

Decreased Self-Efficacy with External and Uncontrollable Attributions or Internal, Stable, and Uncontrollable Attributions

Contrarily, some teachers (seven out of 20 teachers) attributed the instructional failures to

more external and uncontrollable factors. Consequently, failures only made them feel even less

efficacious since they highlighted the uncontrollable aspects of the problems. As this

uncontrollable perspective perpetuated, teachers could not envision any area to improve the

situation. Inevitably, failures undermined their self-efficacy in a relatively long period of time, which led some teaches quit their jobs (e.g., Matthew described below).

For instance, when commenting on students' achievement, Matthew, a 12th- grade teacher, seemed to attribute students' low grades primarily to students' factors, which were external and uncontrollable. He uttered,

Math is a building, and if you don't have a good foundation for that building, then it's not a good building. And that's essentially what I think has happened with a lot of kids is they don't get a good foundation. And by the time I get them, even in middle school by the time I was getting them there, they really struggled because they didn't have good number sense and good logic and reasoning. A lot of them are just really, really behind. So helping them keep moving along and not left too too behind is a struggle.

Unlike Robert who put more time and effort into helping students, Matthew attributed students' low grades to students' factors, which were external and uncontrollable. This uncontrollable pattern was also evident when he described his past teaching experience.

When I first started teaching. Oh, my Lord, my first six months where I tell people, literally some of the hardest six months of my life, making the adjustment to teaching. I was teaching a pretty rough school, inner-city, *students are pretty disrespectful* (*External and uncontrollable attributions for classroom challenges*). *There was no morale to the school for the students, for anybody, just was a low morale place*. And man, it was just very draining while trying to learn to be a teacher all of the same time, it just was not a great place to start. And so that was a challenge. And that's where I probably would face most kids. The school was really, really tough, really tough.

While starting a teaching career was challenging, Matthew seemed to attribute his negative experiences primarily to students and school factors, which were external and uncontrollable. Thus, focusing on the uncontrollable aspects made Matthew feel even less efficacious, and quickly left the school.

This external and uncontrollable perspective, which lowered teachers' teaching self-efficacy, was more salient when teachers discussed the contextual challenges they were facing at urban schools. For example, Richard, who commented on students' mobility, uttered,

With my regular class, *I think I've lost four and I feel like I'm gained four in a class of 27. That's a pretty big difference.* So all of a sudden you've got a big proportion of students. When I get a bunch of kids that come to me halfway through the year, I don't have a relationship with them. I barely know how to pronounce her name. And I don't know where they came from. I don't know their study habits. I know nothing. And then w*hen I finally do get their grades and I find out that they were failing, it's like, "Ugh, how am I supposed to get a kid that I have no relationship with?"* (*External and uncontrollable attribution for some students' low grades*) And *I think it definitely affects my confidence.*

Kendra shared this external and uncontrollable perspective when she remarked on students' lack of motivation.

I know a lot of students feel like they don't understand a lot of things. So they're kind of question themselves and they don't have the confidence in themselves to do the questions, and *some of them will just either they'll just sit there and not try to do it just to say that "Oh, I don't know so I'm not going to even try."* So *my teaching is a kind of chaos sometimes (External and uncontrollable attribution for failures).*

Jack, an 11th-grade teacher, also highlighted the challenge of having students who range widely in abilities and learning needs, which were out of his control.

> I believe that *a system that allows that is broken*, and *we have a broken system* here in the United States… That's my belief system, *I should not have to put up with those three types of students* [Students who were extremely below, at, and way above the grade level] (*External and uncontrollable attributions for classroom challenges*), I should have the majority of a class all one of those, either give me people who don't know what two times three is, give me people who are ready to learn Algebra II, or give me people who already pass out between ready to learn something else. But if you give me a consistency, then my confidence goes through the roof and I'm able to do my job. *How to deal with those three types of students at the same time, I don't have the skills for that.*

Jack believed that his confidence would "go through the roof" if "you give me" students with a similar level, which clearly showed that he focused on external factors given to him. Even though he was aware of his skill gaps, Jack attributed the classroom challenges primarily to the "broken" educational system, which was external and uncontrollable. Such an uncontrollable attribution may reflect the "fundamental attribution bias," which attributes negative events that an individual might be accountable for to external causes (Ross, 1998).

When this external and uncontrollable perspective for failures becomes so intense, it may not only affect teachers' teaching self-efficacy, but also their instructional approaches as shown in Robin's comments.

> So I know that sometimes as teachers, they say that people want to help every, they want to help everyone make sure that everybody passes. But sometimes that's not being realistic. Like, you're going to have some kids that really don't care, whether they move

on to something else. *And sometimes you have to accept that. And you* know, *you just*

can't save them all… sometimes the kids themselves don't care, or the parents don't care.

So it's like, well, I don't know what else to do at that point, so *you kind of have to just let*

it be I mean (External and uncontrollable attributions for students' lack of engagement).

Although Robin claimed she wanted to help, her perspective "you kind of have to just let it be"

limited her actions. Robin's self-limiting beliefs are similar to learned helplessness, a belief that

an individual is unable to control or change the situation (Diener & Dweck, 1978; Weiner, 2010).

People with learned helplessness tend to simply give up even when opportunities for change

become available. This might be the case with Robin. Instead of altering her instructional

approaches to accommodate all students, Robin seems to have convince herself that it was

inevitable for some students to fail. Such an external and uncontrollable attribution might hinder

her growth and be detrimental to her motivation (Bandura, 1997).

This uncontrollable perspective seems to get even worse when teachers attributed

instructional challenges to internal, stable, and uncontrollable factors (three out of 20 teachers).

Mary, who joined the Teach for America program and started her teaching career expressed: "It

is overwhelming, sometimes I'm like, I just can't with the engagement piece, like me making

lessons and things that I'm more engaged with, like *I just don't have the bandwidth to do it. I just*

can't." Mary believed she did not have the "bandwidth" to work on management issues such as

"students are not engaging," "classroom is chaos," and "behavior or being respectful of other

students." Although Mary recognized the importance of classroom management, she felt "there's

just like a million things" on her plate, which limited her thoughts and actions.

Like there're so many different aspects of that that like fall under the umbrella of

management that I've struggled with, *feeling kind of like the classroom look exactly the*

same whether I was in it or if I walked out…I feel that classroom management is

important, but *it has so many different smaller bags that you have to take care of as a*

new teacher, I just don't know what to do. Like there are so many things and like *once*

I'm better about cell phones and something else is a problem, like it feels like there's just

like a million things I could be trying to worry about (Internal, stable, and uncontrollable

attributions for classroom management challenges).

Despite Mary's efforts in making changes, her classroom experiences continued to be

challenging. Consequently, rather than perceiving her "bandwidth" as something she could

restore or improve, Mary seemed to recognize it as something relatively fixed and uncontrollable.

As she revealed: "it's not like the material I can learn, but it's like every day." Focusing on the

internal, stable, and uncontrollable aspects of teaching diminished Mary's teaching self-efficacy,

making her want to quit teaching. She said: "it's very exhausting. It's very, like emotional

draining, like in a couple of years and see these kids graduate and then I will probably be done."

Such an internal, stable, and uncontrollable perspective was also seen in Nicole when

students were being disrespectful and made fun of her English pronunciation.

There were times that students were making fun of my pronunciation. So that hurt my

confidence. They were being mean, so that affected me. *That is something that is going*

on throughout all these years (Stable and uncontrollable attributions) …English is not my

first language (Internal and uncontrollable attributions). I was bothered. I guess they

didn't understand the impact of how it would affect someone. It affected me a lot

personally, and it's just something that lowers my confidence.

Nicole attributed some classroom challenges to her English proficiency, which was internal, stable, and uncontrollable. Similarly, when Hang transitioned from a suburban school to an urban school, she doubted about herself.

> The first semester was particularly difficult. I wanted to quit. I definitely can't teach at this school. Back then I was not confident at all. It was the least confident time for me in my life. It never happened before. I started to doubt about myself. I don't think I can be a teacher because I felt that all the methods are useless. I have never felt this way since I became a teacher. And I have always been good at management, but at here, it seems that it was my weakest and no matter what I did, it was useless. I felt that I could not manage the students well. In my career, I have never felt like this before…I thought I should not teach anymore. *Maybe I am too old*. All the methods I used before were not working. *It seemed I am too old to teach them (Internal, stable, and uncontrollable attributions for failing to manage the class)*.

Hang attributed her failures to being too old, which was internal, stable, and uncontrollable. This internal, stable, and uncontrollable perspective lowered her self-efficacy, because there was nothing she could do to change the situation. Considering all three teachers' experiences, it seems that attributing failures to internal and uncontrollable reasons lowers teachers' teaching self-efficacy and makes them want to quit their teaching career. This result echoes Schutz, Hong, and Cross Francis's (2020) research, when the cause of a problem is attributed to internal and uncontrollable reasons, teachers' self-efficacy will be lowered, and teachers may also look for ways to avoid or escape the situation by leaving the career.

Across the participants, attributing failures to internal, unstable, and controllable reasons did not affect teachers' teaching self-efficacy. In some cases, it increased teachers' teaching self-

efficacy. In contrast, attributing failures either to external and uncontrollable reasons or internal, stable, and uncontrollable reasons lowered teachers' teaching self-efficacy. Given these findings, it seems that attributing failures to uncontrollable causes lowers teachers' self-efficacy. The dimension of controllability seems to shape teachers' self-efficacy beliefs more than the locus of causality and stability.

Summary of Teachers' Attribution Beliefs Regarding Mastery Experiences and Failures

To sum up, mastery experiences were the most influential source affecting teaching self-efficacy development (19 out of 20 teachers). Regarding teachers' attribution beliefs, internal and controllable attributions for successes made teachers feel more efficacious (16 out of 19 teachers). Both internal and controllable attributions might need to be present, rather than having either one.

Considering negative teaching experiences, while teachers recognized the challenges teaching at urban schools, some teachers (15 out of 20 teachers) seemed to have internal and controllable attributions. Rather than blaming others or external circumstances, those teachers focused on things that they could control and improve, which fed to their self-efficacy over time. In contrast, some teachers tended to attribute failures to external and uncontrollable factors (seven out of 20 teachers), or internal, stable, and uncontrollable (three out of 20 teachers), leading to diminished self-efficacy. Previous studies (e.g., Andreou, & Rapti, 2010; Brady & Woolfson, 2008; Woolfson et al., 2007) indicated that when teachers attribute students' learning difficulties or behavior problems to external factors, such as students' characteristics, family-based factors, or school factors, they typically feel less responsible for helping students, thus preserving their self-efficacy. However, this study has found counterevidence as we have seen in

the case of Jack and Matthew. Even though teachers attributed their negative experiences to external factors, the uncontrollable attributions negatively affected their teaching self-efficacy.

Teachers' Perceptions of Social Persuasions

To answer the second research question, I identified how teachers conceptualized social persuasions. Social persuasions in the forms of evaluations, letters, comments from students and administrators appeared to be as powerful as mastery experiences in influencing mathematics teachers' teaching self-efficacy (19 teachers out of 20). Teachers frequently commented, "when your students tell you they like being in your class, it makes you feel more confidence" (Penny), and "the most powerful one is probably my students' feedback. I get from my students based on like specific lessons or just overall development at the end of the school year like them telling me how they did" (Tiffany), and "my principal left me a note the first time she observed me, and I thought it was a disaster, but she left me a note and it was all encouragement" (Cody).

Increased Efficacy with Internal and Controllable Attribution Beliefs

Depending on the way the feedback was framed and communicated, it would lead to distinct results. When the feedback, especially negative feedback, was specific and framed as supportive, encouraging, and stimulating growth, it would help teachers perceive internal and controllable attributions for successes and failures, thus increasing their self-efficacy (16 teachers out of 19). For instance, Heather gave an example of how a student's letter encouraged her to stay in teaching in the hard days. She uttered,

> A student wrote a letter to me that was really changed my confidence, because the letter was just really, really uplifting. "Miss, I really think you're the bravest. And the strongest teacher that that works at the school. And you really should have given up on us sooner than this, but you haven't" …Getting a letter like that noticing what the strong points was

from a student who was one of the primary troublemakers really boosted my confidence.

Because if I was able to do that, when I was in the class, I felt the worst; if I was able to influence the student I felt the worst in that class, then I can do that for so many other students (Internal and controllable attributions for engaging students) and some days are bad, but that is not the end of the world (Unstable attributions for failures).

The student's letter lifted Heather's teaching self-efficacy because it made Heather realize that her efforts were worthwhile, which were internal and controllable. Also, the letter seemed to help Heather attribute classroom challenges to unstable causes, which could be improved with appropriate strategies and effort. Building on Heather, Diana explained how constructive feedback should be communicated to stimulate growth. She remarked,

I feel like even when I have gotten feedback that has been directed at things like to improve. I feel like it's given in a way that it's like, you know, here's something we can work on, here's some ideas for working on it and making it better. And I'm the type of person like I told you that, I don't believe that I'm ever gonna be a perfect teacher. *I believe that there's always room for me to improve.* And *so I don't take that negatively. Because I take that as something that helps me to become a better teacher.* Because *if they're giving me feedback on something that I can do better (Internal and controllable attributions for observed failures) and helping me to figure out how to do that better, then that's only going to make me a better teacher*. And that would increase my confidence.

To Diana, when the feedback was framed in a constructive and growth-oriented way (i.e., offering specific suggestions for improvements), it boosted her self-efficacy because those concrete suggestions paved practical ways for skill improvement and made her perceive an internal and controllable attribution. Thus, the observed instructional failure together with the

growth-oriented feedback became a teachable moment, which Diana benefited from, rather than a negative judgment on performance. Similarly, Nicole revealed she 'likes' some negative feedback. She announced,

> That [constructive feedback] doesn't affect my confidence. I like that they have some things for me to learn, I had teachers that have told me "Oh, you're doing everything well." But then I don't learn anything from that comment. So *I do like some negative feedback so that I can make changes (Internal and controllable attributions for observed failures)* because if they can see it, I'm sure my students can see it. So that's something that helps my confidence.

Instead of favoring positive feedback, Nicole believed the negative feedback, which identified her skill deficiency, facilitated her professional growth, and made her more efficacious. Such a perspective was also discussed by Tim and Robert, who believed the constructive feedback helped make sure their "confidence is justified," as they were "trying to make better test, learn new things, find new strategies, pedagogical and mathematically to try to figure out these comprehensive for the kids."

Seen from 16 teachers' comments, it seems that when specific feedback was framed and communicated in a growth-oriented way, it triggered teachers' internal and controllable attributions for observed classroom challenges. Thus, the feedback helped teachers develop more accurate self-awareness, and it facilitated their professional growth. Teachers were also more willing to disclose their vulnerability to seek help as they knew failures could be altered with effort and appropriate strategies, which were internal and controllable.

Decreased Self-efficacy with Internal and Uncontrollable Attribution Beliefs

Contrarily, when feedback was communicated in a demanding, blaming, and authoritarian way and made teachers perceive internal and uncontrollable attributions (eight out of 14 teachers), it decreased their teaching self-efficacy. Diana shared,

So the last school that I taught at, we had two different administrators during the time that I taught there. And the second administrator that came in was really not very supportive. *He was really critical.* He was somebody that would be quick to tell you what you were doing wrong. He wouldn't say anything that you were doing right. Does that make sense? *Always tell me you're such a bad teacher, you do this wrong. It was always like, well, you need to fix this. I want to see you get better at this. You need to change that. You know, it was always something like that.* But it was never, 'Oh, this was good. But why don't you work on it?' *The only feedback he really gave was, was negative (Stable attributions for receiving negative feedback)...* And I started to really kind of beat myself a little bit and just think, am I really the teacher that I think I am like, is this even, like, *I've gotten to the point where I was just starting to wonder, "Is teaching even what I am supposed to be doing?"* Like, and that was when I started to think I need a different job. It was crazy. And it was a huge blow [to my confidence]. It just made me question a lot of things.

Compared to the growth-oriented feedback which helped Diana recognize the need and value for development, the repeated finger-pointing feedback made Diana feel inefficacious because failures seemed to be inevitable and uncontrollable. Thus, the feedback became a personal attack, rather than a perspective for improvement. The opportunity for learning and communication suffered. Consequently, Diana wanted to escape and find another position. Diana's intention of

leaving the teaching career implied an internal, stable, and uncontrollable attribution, because she started to question whether she was capable of teaching.

Similarly, Matthew shared how evaluative comments from students had lowered his teaching self-efficacy and made him left the school. He stated,

One time they [students] had said 'How I wish Ms. so and so was back in the class bla bla bla.' I remembered thinking to myself. That kind of hurts. Just thinking about it, *I'm not her*, *and she was a great teacher*. She ended up getting the Teacher of the Year Award at our school. So I'm like, 'Oh, great.' I'm the one that filled in the Teacher of the Year award. *Those are like big shoes to fill (Internal and uncontrollable attributions for engaging students)*. I was just like 'Ugh!' I was already not super happy in what I was doing, and then to hear that, just like, you know what? Forget you."

When students' feedback was communicated in a blaming way, it defeated Matthew's teaching self-efficacy. Matthew's comment "Those are like big shoes to fill" reflected an internal and uncontrollable attribution for engaging students in class. Considering teachers' experiences, it seems when feedback was communicated to blame and criticize teachers and made teachers perceive internal and uncontrollable attributions for the challenges they faced, it lowered their self-efficacy. Thus, the feedback became a condemnation, which also provoked teachers' negative emotions.

Summary of Teachers' Attribution Beliefs and Social Persuasions

To summarize, social persuasions were powerful sources of mathematics teachers' self-efficacy. When feedback was communicated encouragingly and made teachers perceive internal and controllable attributions for observed failures, it made teachers efficacious and stimulated growth (16 out of 19 teachers). This finding contrasts with Morris and Usher (2011) who

concluded that social persuasions were particularly powerful in helping university professors make external attributions for negative experiences to safeguard their teaching self-efficacy. The current study has found that feedback seems to help teachers make internal and controllable attributions for observed failures, thus boosting their teaching self-efficacy.

When feedback was communicated in a reproaching way and made teachers perceive internal and uncontrollable attributions for challenges and skill improvements, it decreased teachers' self-efficacy (eight out of 14 teachers). Previous research concludes that negative feedback lowers teachers' teaching self-efficacy (Mohamadi & Asadzadeh, 2012; Palmer, 2011; Tchannen-Moran & McMaster, 2009; Wang et al., 2017); however, the current study suggests that it depends on the way the evaluative feedback is communicated, and the subsequent attributions teachers make. Negative feedback lowers teachers' teaching self-efficacy when teachers perceive internal and uncontrollable attributions. When negative feedback is framed in a way that makes teachers perceive internal and controllable attributions for challenges, it will not hurt their teaching self-efficacy.

Teachers' Perceptions of Vicarious Experiences

Although teachers had limited opportunities to observe colleagues, seven teachers out of twenty identified vicarious experiences as a source of their teaching self-efficacy, because they could "see the way that other teachers taught, the way that they handled the classroom" (Rachel), and "learn different things from them" (Nicole). Moreover, vicarious experiences seemed to be particularly helpful for teachers who had limited teaching experiences. For example, Kendra, a first-year mathematics teacher, seemed to graciously appreciate vicarious experiences. She declared,

How do I develop my confidence? I think whenever I see someone teach it and then I can

kind of like take notes off of what they would say, how they taught the lesson, cuz this is

my first-year teaching math, I don't have a lot of experience of teaching and math…With

Miss Tiffany [pseudonym] next door, I can hear her so I can kind of like hear what she

says, and then try to like put it in my own words of how I would teach the

lesson…*Whatever I saw her teach it, it made me feel more confident of teaching it in the*

next class. Just her modeling of what she would do in the classroom of how she would

teach it. I see someone doing it, and then it makes me feel confident, 'Oh, I can do it this

way (*Internal and controllable attributions for employing certain instructional strategies*),

and teach it like this.'

Kendra was struggling. Due to the lack of mastery experiences in teaching math, she tried to

mimic her colleague. She even attempted to split her mind into two simultaneously − one hearing

what her colleague said, and the other giving instruction to students. Observing and hearing what

her colleague did gave Kendra the confidence to accomplish similar tasks. The change from "I

feel bad" to "I can do it this way" reflects a shift from a more internal and uncontrollable

attribution to a more internal and controllable attribution.

A similar perspective was also seen in Tiffany's remarks when she commented on the

professional development seminars at her school. She uttered,

The math Institute, it's like professional development that we go to, to learn how to be

better math teachers. *And that definitely gives me confidence and going to that because*

they really focus on research-based things that will help us become better math teachers,

and they take the time to teach us how to teach that. We'll go through the lessons together

and read through research papers together and do all sorts of things and do lesson studies,

where they've come to observe a teacher teach a lesson and then we go talk about it.

They did one in November. I did a lesson study. So I taught a lesson for a class period

and they all observed it. And then *we came together, discussed how the lesson went. And*

we worked on developing that lesson better so it would be effective (*Internal and*

controllable attributions for improving instruction). *I was able to learn different things*

from them. I love how some of the things we do really help the kids put some connections

together.

According to Tiffany, vicarious experiences of seeing how professional development trainers

taught the lesson boosted her self-efficacy because she was provided with effective instructional

strategies and engaged in discussions and reflection of crafting an effective lesson. Her

comments "we work on developing that lesson better" and "I was able to learn different things

from them" reflect an internal and controllable attribution for improving instruction. As Hang

noted, "Teaching is always a process of learning and a process of exploration." Notably, seen

from Tiffany's descriptions, the professional development seminars at her school incorporated

multiple sources of efficacy: vicarious experiences, mastery experiences, and evaluative

feedback. By integrating multiple sources, the professional development seminars seem to

enhance a few mathematics teachers' teaching self-efficacy (six out of 10 teachers at Tiffany's

school).

While good modeling boosted teachers' teaching self-efficacy, bad modeling decreased

their teaching self-efficacy. Four teachers pinpointed instances that their self-efficacy was

decreased by vicarious experiences. For example, Sean revealed how seeing the inconsistency

between teachers lowered his self-efficacy in developing a positive relationship with students.

To be honest, the concepts themselves, teaching math itself, none of that really scares me even moving up to eighth grade the first year. I was fully confident. It's usually things on the outside, *expectations of students throughout the school that frustrates me and lowers my confidence as a teacher. Different teachers have different expectations, even though the principal sets an expectation at a certain level. If that isn't followed by all the teachers (External and uncontrollable attributions)*, then the person starts getting onto the kids, they become the bad person. Like if I see a seventh grader if I have to get on to them, well next year, I've got them, we have already started a bad relationship because they already think that I'm the bad guy.

Sean believed his self-efficacy was influenced by teachers who did not follow the shared expectations. Attributing the issue to other teachers' inconsistency reflected Sean's external and uncontrollable perspective. Similarly, Heather's self-efficacy was affected by teachers who held lower expectations for their students.

Seeing teachers it lowers my competence, because they talk to us all the time about planning minute like from Bell, making sure your class takes 17 minutes, because we have 17 minutes to teach...*We get told this like literally every single Monday morning. And they're still teachers not doing it (External and uncontrollable attributions).* Sometimes it's frustrating because there're students in the hallway or come to my class. I was like 'Are you not supposed to be doing something?' They're like 'Oh, we are not, we're watching a movie,' or they said, 'we don't have to be in class today.'

Both Sean and Heather's teaching self-efficacy were shaken by bad examples because those bad examples constantly challenged their understanding of effective practices and the role of a teacher, which lead to negative emotional experiences. Such a decrease in teaching self-efficacy,

to some extent, results from an external and uncontrollable attribution as teachers found themselves caught in a situation that they had limited control over.

Summary of Teachers' Attributions and Vicarious Experiences

To sum up, vicarious experiences emerged as a source of teaching self-efficacy for seven teachers. Given teachers' responses, vicarious experiences seemed to be particularly beneficial for teachers who were struggling. This is probably because the observations not only spark teachers acquiring new knowledge and skills but also provide a concrete experience of how activities are carried out in the classroom. Thus, teachers are propelled to reflect on and appraise their skillset. When teachers believe it is something that they could accomplish (internal and controllable attributions), their teaching self-efficacy increases. Contrary to the good vicarious experiences, negative models lowered teachers' teaching self-efficacy (four out of seven teachers). This is probably because negative models made teachers perceive little control and made them question whether the environment they were in was congruent with their understanding of effective practices.

Teachers' Perceptions of Physiological and Emotional States

None of the teachers in this study explicitly identified physiological and emotional states as a source of their self-efficacy, although they spontaneously talked about their positive emotions when discussing mastery experiences. For example, Jack used a metaphor to describe how he felt when students got the "aha" moments.

> I like teaching. Teaching is like a drug when a student has struggled, and *they had that aha moment. Their eyes light up and they go, 'Oh!' That is like putting heroin directly into my vein. I'm just like, 'Oh, I feel so good. I love it. I would live for that.'* And if I can get one of those once a week, it's enough to keep me coming back.

Not as radical as Jack, teachers also expressed their positive feelings. They commented, "I feel happy when I'm teaching math. I really enjoy it (Tiffany);" "when you start to connect those mathematical concepts to all kinds of other things, it makes it more fun to teach, and more exciting (Richard);" and "I feel pretty excited. Some days more than others. And sometimes my students laugh at me, because I'm like, 'Isn't that awesome?' And they're like, 'Okay, whatever.' I just think Math is cool (Matthew)." However, given participants' responses, such arousal seems cannot be separated from teachers' mastery experiences. This finding aligns with Morris et al.'s (2017) review study, which argues "teachers have been less likely to mention physiological and affective states than other sources in describing the development of their self-efficacy" (p. 815).

Summary of the Findings

To sum up, mastery experiences paired with internal and controllable attributions were salient sources that influenced mathematics teachers' self-efficacy (16 out of 19 teachers). Failures undermined teachers' self-efficacy when they were attributed to either external and ***uncontrollable (seven out of 20 teachers) or internal, stable, and uncontrollable factors (three out*** of 20 teachers). In contrast, attributing failures to internal, unstable, and controllable reasons made some teachers focus on things that they could improve, which fed to their teaching self-efficacy over time (15 out of 20 teachers).

Social persuasions were as powerful as mastery experiences in raising teachers' teaching self-efficacy. When the feedback made teachers perceive internal and controllable attributions for observed failures, teachers' self-efficacy increased (16 out of 19 teachers). However, when feedback was communicated in a hostile way and made teachers perceive internal and

uncontrollable attributions for classroom challenges, it decreased mathematics teachers' self-efficacy (eight out of 19 teachers).

Vicarious experiences emerged as the third influential source of teaching self-efficacy (seven out of 20 teachers). They were particularly beneficial for teachers who were struggling because they enabled teachers to believe they could accomplish similar tasks (internal and controllable attributions). However, negative models lowered teachers' self-efficacy as they made teachers perceive little control over the situation (four out of seven teachers). Last, none of the teachers in this study identified their physiological and emotional states as a source of their self-efficacy. These findings are also summarized in Table 2 below. In the next chapter, I will discuss the findings and the limitations of the study.

Table 2

Summary of the Findings

Sources (number of teachers)	Attribution	Self-efficacy Change (number of teachers)	Sample Quotes
Mastery Experiences	Internal and controllable	Increased self-efficacy (16)	*I have literally filling cabinets or buckets full of five different ways to teach something. And I can choose from (Internal and controllable attributions) that now, rather than most of the only thing I have is what we're going to do. I have a lot more tools to use (Internal and controllable attributions). And it helps the students be successful. And then you feel that success too because you've got that experience.*
	Internal and less uncontrollable	Less affected self-efficacy (3)	*I feel like I've always been a relatively confident person (Internal, relatively stable, and less uncontrollable attributions). I was good at things. I knew it wasn't maybe true, or whatever… being able to present [a lesson] in front of the students and the adults, it still feels really good."*

Failures	Internal, unstable, and controllable	Unaffected and increased self-efficacy over time (15)	*Some days are very successful. There're always days that just completely flop. But you learn just as much if not more from those, then you do today is to go well. If you can kind of reflect on the days that don't go well, then you can get a lot of information about that about what you should or shouldn't do next time. You can always change it (Internal & controllable attributions) ...just because it totally flopped this way, doesn't mean that it's never going to work (Failures are unstable), you can always try teaching in a different way.*
	External and uncontrollable	Decreased self-efficacy (7)	With my regular class, *I think I've lost four and I feel like I'm gained four in a class of 27. That's a pretty big difference.* So all of a sudden you've got a big proportion of students. When I get a bunch of kids that come to me halfway through the year, I don't have a relationship with them. I barely know how to pronounce her name. And I don't know where they came from. I don't know their study habits. I know nothing. And then w*hen I finally do get their grades and I find out that they were failing, it's like, "Ugh, how am I supposed to get a kid that I have no relationship with?"* (*External and uncontrollable attribution for some students' low grades*) And *I think it definitely affects my confidence.*
	Internal and uncontrollable	Decreased self-efficacy (3)	*It has so many different smaller bags that you have to take care of as a new teacher, I just don't know what to* do *(Internal and uncontrollable attributions).* Like there are so many things and like once I'm better about cell phones and something else is a problem, like it feels like there's just like a million things I could be trying to worry about.
Evaluative feedback	Supportive feedback + internal and controllable	Increased self-efficacy (16)	When I have gotten feedback that's been directed at things like to improve…I don't take that negatively. *Because I take that as something that helps me to become a better teacher. Because if they're giving me feedback on something that I can do better, and helping me to figure out how to do that better, then that's only going to make me a better teacher (Internal and controllable attributions). And that would increase my confidence.*

	Unsupportive feedback + internal and uncontrollable	Decreased self-efficacy (8)	*Always tell me you're such a bad teacher, you do this wrong. It was always like, well, you need to fix this. I want to see you get better at this. You need to change that. You know, it was always something like that. But it was never, 'Oh, this was good. But why don't you work on it?' You know, like, I feel like most administrators that I've had have done a good job of balancing criticism with positive feedback. He did not. It was always like, the only feedback he really gave was, was negative(Stable)…*And I started to really kind of bit myself a little bit and just think, am I and I really the teacher that I think I am like, is this even, like, I've gotten to the point where I was just starting to wonder, "Is teaching even what I am supposed to be doing?" Like, and that was when I started to think I need a different job *(Internal and uncontrollable attributions).*
Vicarious experiences	Positive models + internal and controllable	Increased self-efficacy (7)	*With Miss Tiffany [pseudonym] next door, I can hear her so I can kind of like hear what she says, and then try to like put it in my own words of how I would teach the lesson…Whatever I saw her teach it, it made me feel more confident of teaching it in the next class. Just her modeling of what she would do in the classroom of how she would teach it. I see someone doing it, and then it makes me feel confident, 'Oh, I can do it this way (Internal and controllable attributions), and teach it like this.'*
	Negative models + uncontrollable	Decreased self-efficacy (4)	Seeing teachers it lowers my competence, because they talk to us all the time about planning minute like from Bell, making sure your class takes 17 minutes, because we have 17 minutes to teach...*We get told this like literally every single Monday morning. And they're still teachers not doing it (Uncontrollable).*

CHAPTER 5: DISCUSSION AND IMPLICATIONS

The purpose of this study was to explore how mathematic teachers in urban schools that serve disadvantaged communities develop their teaching self-efficacy and how teachers' attribution beliefs were related to their interpretations of self-efficacy sources. To achieve the purpose, I focused on analyzing the sources that teachers identified as most influential in the evolution of their teaching self-efficacy and teachers' attribution beliefs. In this chapter, I will discuss notable findings based on the data collected. Then the implications for future practices and research will be considered as well as the limitations of the study.

The Importance of Attribution Beliefs and Training

The findings show that mathematics teachers understood their efficacy-related experiences through the lens of attribution beliefs. While previous studies (e.g., Yoo, 2012; Phan & Locke, 2015) concluded that unsuccessful experiences lowered teachers' self-efficacy, data in the current study indicated it depended on teachers' attribution beliefs. For instance, some teachers attributed challenges to unstable, internal, and controllable causes, which enabled them to respond to the challenges actively and proactively, such as seeking help, learning new strategies, and attending professional development seminars, thus leading to increased self-efficacy over time. As discussed in chapter 4, Heather actively sought advice from an instructional coach and identified ways to enhance her pedagogical skills as well as content knowledge, which fed to her teaching self-efficacy. Contrastingly, some teachers attributed challenges to more external and uncontrollable factors, such as students' low motivation and the "broken" educational system, leading to diminished self-efficacy, as we have seen in the case of Robin and Jack.

Attributing instructional failures to uncontrollable factors is detrimental to mathematics teachers' motivation and may hinder their professional growth. The results of this study underline the need for high-quality, in-depth professional development activities and teacher education programs to target teachers' beliefs of capability and attributions. De Boer et al. (2016) developed an attribution tool to help student teachers analyze problematic teaching experiences. Nine student teachers were asked to reflect on multiple lessons they considered challenging using an attribution tool and filled in a teaching efficacy survey after each lesson. The results showed that student teachers' self-efficacy increased and the number of failures during the lessons decreased. Despite limitations of research design, the attribution tool seemed to be a promising tool for student teachers to enhance their teacher efficacy and to support reflection on problematic teaching experiences. Given the findings of De Boer et al. (2016), I developed an attribution tool to facilitate preservice teachers and in-service teachers to analyze challenging classroom events (see Appendix E). This tool can be used throughout the practicum to let student teachers reflect on their experience, solve problems collaboratively with their mentor teachers, and discuss ideas for improving their teaching. I believe it is meaningful to offer teachers and preservice teachers tools and varied opportunities to analyze challenging classroom events and explore issues related to student learning. Those reflective activities may help them identify their skill gaps, develop more adaptive attributions for challenges, and better understand who they want to be professionally, which are beneficial to their self-efficacy development.

Intertwined Nature of Self-Efficacy Sources

Evidence from existing studies suggests that mastery experiences are the most impactful sources of teaching self-efficacy followed by social persuasions, vicarious experiences, and physiological and emotional states (e.g., Cantrel et al., 2003; Knoblauch & Woolfolk Hoy,

2008). Slightly contrasting existing findings, teachers in the current study seem to find social persuasions as powerful as mastery experiences in boosting their teaching self-efficacy. This may be because teachers at schools serving low-income urban communities experience more challenges in meeting students' academic, behavioral, and social-emotional needs (Milner, 2006; Weiner, 2003), which have prevented them from having a lot of mastery experiences.

Unexpectedly, none of the teachers in this study explicitly identified physiological and emotional states as a source of efficacy although they spontaneously talked about their positive emotions when discussing mastery experiences. For example, Jack stated, "Teaching is like a drug when a student has struggled, and they had that aha moment. Their eyes light up and they go, 'Oh', that is like putting heroin directly into my vein. I'm like, 'Oh, I feel so good.'"

Emotions that people experience are the core of their unique life experiences. This finding may reveal the differences between moment-to-moment emotions and retrospective emotions (Csikszentmihalyi, 1999; Mill, 2016). For example, Hetland et al. (2018) argued that people have intense feelings during flow, but emotional feelings such as happiness and enjoyment may come afterward. In other words, the moment-to-moment feelings are feelings experienced during the execution of an activity, while memories of those feelings are feelings experienced during the evaluation of an activity. Teachers' physiological and emotional states are essentially moment-to-moment feelings. When asking teachers about their physiological and emotional states retrospectively, it is challenging for teachers to pinpoint the frequency and the intensity of those moment-to-moment emotions. Future researchers are encouraged to use videos and experience sampling methods to capture teachers' moment-to-moment emotions.

While physiological and affective states are found to be weakly correlated with teaching self-efficacy (Morris et al., 2017), existing studies (e.g., Mohamadi & Asadzadeh, 2012; Phan &

Locke, 2015) tend to treat four sources of efficacy (i.e., mastery experiences, social persuasions, vicarious experiences, and physiological states) as distinctive categories. For example, Pfitzner-Eden (2016) developed an instrument to measure the contribution of each source to the development of preservice teachers' teaching self-efficacy during a practicum at a school. However, the results indicated that mastery experiences directly predicted changes in preservice teachers' self-efficacy, and mastery experiences were largely informed by the other three sources.

Echoing Pfitzner-Eden (2016), the findings of the current study suggest that physiological and emotional states are closely related to teachers' mastery experiences, and teachers' mastery experience is a more salient source of efficacy over physiological and emotional states. Thus, these findings underline the need for self-efficacy researchers to rethink the theoretical categories of self-efficacy sources, which may be interlinked and connected in a complicated way. In light of the current study and Pfitzner-Eden (2016), future research is needed to examine the interconnectedness of mastery experiences and the other three sources. For instance, are there distinctively separate four sources of self-efficacy? To what extent and under what conditions may social persuasions or vicarious experiences inform teachers' mastery experiences? Answering these questions has both theoretical and methodological implications.

Given the explorative and descriptive nature of qualitative research, qualitative and mix-methods approaches would have benefits to explicate teachers' interpretations and integration of sources of self-efficacy information. Qualitative research and mixed-methods research that can capture teachers' interpretative lens may also help identify other teachers' beliefs that may also implicitly shape teachers' teaching self-efficacy, such as epistemological beliefs (Voss et al., 2013), beliefs about teaching and learning (Stipek et al., 2001), and beliefs about contexts (i.e., urban, rural, and suburban).

Mathematics Teachers' Attribution Beliefs

The findings of this study also revealed the intertwined nature of mathematics teachers' attribution beliefs. Although attribution theory identifies three attributional dimensions (i.e., locus of causality, controllability, and stability), it seems that teachers often bring up internal and controllable attributions or internal and uncontrollable attributions together. Also, teachers in this current study seem to mention more frequently about the controllability dimension in the interviews than the other two dimensions. Such a controllable perspective is closely linked to an agentic sense of self as a teacher, who has the capacity to recognize a challenge, develop a strategy to address the challenge, and successfully implement the strategy to overcome the challenge (Biesta et al., 2015).

Concerning the locus of causality, according to attribution theory, causes can be classified as either internal or external causes (Weiner, 1985; 2018). However, sometimes it is hard to tell from the data whether teachers attributed their unsuccessful instructional experiences more to internal or external reasons even after probing multiple times. Comments indicating both internal and external attributions of unsuccessful experiences prevailed in the interviews. For example, teachers noted, "Students are disruptive" (External); "These kids have just been lazy. They haven't learned" (External). At the same time, they mentioned, "Maybe I'm not a good teacher, maybe I'm not doing something right" (Internal); "Maybe I am too old to teach anymore" (Internal). Teachers seem to acknowledge both internal and external causes for their unsuccessful teaching experiences. Although attribution theory has provided a dichotic framework to understand the locus of causality, it seems the distinction between the two categories (i.e., internal and external) is not as clear as the theory has stated. When a behavior, like teaching, is

embedded within a multi-layered social context, teachers often address both internal and external attributions.

The stability dimension is the least frequently mentioned dimension by the teachers in this study probably because teachers' self-efficacy is not a static state, rather it is a dynamic process where teachers continuously calibrate and evaluate their capability and task difficult through the transactions within the contexts. As Tiffany said, "I'll keep gaining confidence and I think that's something that comes with experience and with time, and even if things do change, like our standards, but I think as I continue to teach sixth-grade math, it'll improve every year." Another possible reason is teachers who tend to perceive a stable and uncontrollable attribution for instructional challenges may have already left urban schools or even the profession since teaching itself is a demanding job. As shown in the case of Mary, who perceived internal, stable, and uncontrollable attributions for classroom management challenges, wanted to quit teaching. Such findings point to the need to provide teachers with broad access to effective training, early career supports, and continuous professional development.

Holistic Support to Mathematics Teachers' Professional Growth

Compared to other subject matter teachers, mathematics teachers seem to face more challenges. Two thirds of adults in the U.S. dislike mathematics and recall negative experience with mathematics at school (Burnes 1998). A great number of students have a fixed mindset about learning mathematics (Dweck, 2008). They either believe they were born with the ability to learn mathematics or they were not. As a result, many students come into the class with pre-established mathematics anxiety, a negative emotional reaction experienced when thinking about or performing mathematical problems (Ashcraft, 2002). This discomfort feeling occurs before performing a mathematics task. The feeling of tension and anxiety interferes with manipulating

numbers and solving mathematical problems. It erodes students' confidence and skills in the long run, making students more reluctant to practice mathematics. When the mathematics anxiety combines with a fixed mindset of learning mathematics and a lack of prerequisite skills, teaching mathematics can become an even greater challenge. Therefore, providing support to mathematics teachers is essential for them to thrive in challenging environments. Mathematics teachers in the current study perceived professional development, leadership, and policy as powerful influences on their mastery experiences and teaching self-efficacy. Therefore, the findings of this study underline the importance of providing holistic support to mathematics teachers, including professional development, leadership, and policy.

The need to support and retain effective mathematics teachers is high across the country. This need is even higher in disadvantaged communities (Borman & Dowling, 2008; Carver-Thomas & Darling-Hammond, 2017; Redding & Henry, 2018). In this study, we found teachers like Mary, who wanted to be difference makers and participated in Teach for America to serve the disadvantaged communities. However, their initial passion and commitment cannot be sustained easily if they lack skills, and the school environment impedes their willingness and capacities to teach. Thus, drawing upon their inner motivation seems to be a necessary but insufficient condition for teachers to manage the challenges of teaching in urban schools. It is important for teacher education programs and training to equip teachers with the necessary content, pedagogy, management, and contextual knowledge to ensure teachers can thrive in challenging contexts. Creating multiple and varied opportunities for preservice and in-service teachers to learn the content knowledge and experience mastery experiences, social persuasions, and vicarious experiences are beneficial to their self-efficacy development. Additionally, having weekly or bi-weekly mentoring meetings throughout practicum, which guides student teachers in

all aspects of planning, instruction, assessment, and reflection, is valuable to strengthen their skills on an ongoing basis. Teacher education programs are also encouraged to reflection on the question-what constitutes strong preparation for teaching mathematics? What program elements, formats, delivery systems should they have to better prepare mathematics teachers for the classrooms?

Additionally, this study underscores the importance for school leaders, districts, and policymakers to continuously empower the professional growth of teachers who serve low-income, disadvantaged communities. As the current study reveals, the majority of teachers in the current data are alternatively certified teachers, and they struggle with pedagogy and classroom management. At the same time, they have students who range widely in interests, abilities, and learning needs and face challenges associated with students' low motivation, low achievement, and family mobility, which add another layer of complexity. The interaction between the internal and external reasons prevented teachers from having abundant mastery experiences that lead to their increased self-efficacy. Since schools and school districts have better knowledge of what teachers need to be successful in the classroom, they are encouraged to partner with teacher education programs to provide early career supports and continuous learning opportunities, both quantitively and qualitatively, to facilitate teachers gaining skills in instruction, classroom management, and student engagement.

Considering how to structure the learning activities, professional development seminars have been found beneficial to teachers' professional growth when they provide teachers with opportunities to converse with colleague teachers, reflect on their practices, and deepen their knowledge about the subject (Osman & Warner, 2020; Sims & Fletcher-Wood, 2021). As Tiffany in this study stated, "[The professional development program] definitely gives me

confidence…We'll go through the lessons together and read through research papers together and do all sorts of things and do lesson studies." When partnered with teacher education programs, school districts can design, implement, and monitor continuous professional development activities that encompass research-based practices and multiple sources of efficacy information. Including mastery experiences and social persuasions is essential as the current study and previous research suggest that they are the most influential sources of teaching self-efficacy (Knoblauch & Woolfolk Hoy, 2008; Poulou, 2007). Teachers may participate in professional learning communities, peer coaching, observations, collaborative planning, and collective problem-solving activities. For schools, those collaborative activities not only engage teachers in concrete tasks that help develop knowledge and skills but also help nurture a feeling of comfort and belongingness within the school.

For teacher education programs, working with teachers and their school district help them update their programs and better prepare their graduates for success. Heineke et al. (2010) discussed a partnership between a university teacher education program, Teach for America, and schools to support alternatively certified teachers. The results indicated with the support and coaching from teacher educators and schools many teachers achieved significant growth professionally, and many of them returned to the classroom with a renewed sense of enthusiasm and increased confidence in the second year. Given the positive findings, future policy should encourage and support such collaborative partnerships between the school districts and university programs. For instance, policymakers can consider making the partnership a prerequisite for teacher education program accreditation. Policies like this are essential to ensure the sustained effort and effectiveness of the partnerships.

Moreover, we also believe policy should be focused on directing resources and funding to enhance the self-efficacy of teachers who serve disadvantaged communities. For example, districts and schools may be provided with flexible funding to support teachers' continued education and professional learning. Sustained investment is required to ensure sustained changes in teachers' learning. Also, districts and schools may be supported financially to adopt standards for the design, implementation, and evaluation of professional development activities to make sure that those seminars increase teachers' knowledge and skills, rather than being disconnected from daily practices.

Beyond teachers, policy making needs to focus on nurturing effective school leaders who have long-term visions for school improvements, which can enhance teachers' effectiveness and teacher retention in the long run (Parsons et al., 2021). The current study suggests teaching self-efficacy was influenced by the school environment and leadership. Teachers are more likely to remain in the classroom when they enjoy the school environment and when they feel supported by administrators (Peterson & Deal, 1998; Zheng, Shi, & Liu, 2020). The task of creating a school environment that is conducive to continuous learning and growth rests heavily on the invested efforts and effectiveness of school administrators. Thus, it is critical to support school leaders to establish a supportive, encouraging, and collaborative environment where teachers feel comfortable to seek help, which ultimately facilitates teachers' professional growth (Thoonen et al., 2012; Hong et al., 2020). Holistic efforts focusing on enhancing teachers' knowledge and skill and improving the school environment are crucial not only for the immediate outcomes, but also lay a solid foundation for the continuous improvements of teacher effectiveness, teacher retention, and educational equity.

Limitations

　　While this study presents valuable insights, it also has limitations in design, which provides useful directions for future research. First, although the study was designed as a multi-site qualitative research, the data was collected in two urban school districts which were vastly different in terms of teachers, leaders, and infrastructure. Therefore, the findings of this study need to be interpreted in relation to the unique characteristics and contexts that those teachers were situated in even though both school districts served marginalized students.

　　Second, due to the small sample size, it is limited to fully compare teachers' self-efficacy beliefs and attribution beliefs as well as how teachers' beliefs may be different depending on the school culture and environment.

　　Last, the majority of teachers in this study were White Caucasians. Evidence suggests that the racial, social similarity between teachers and students influences teacher-student relationships, which impacts teachers' self-efficacy (Payne, 1994). This is also seen in the data that Hang and Richard believed having a positive relationship with students was essential to learning and instruction. A possible outcome is that some participants found it challenging to develop a trusting relationship with their students, which prevented them from having many successes and made them feel less efficacious.

Future Directions

　　There are numerous future directions given the findings of this research. I will discuss three potential areas of future research: 1) using mixed methods research to obtain a fuller understanding of teachers' self-efficacy beliefs and attribution beliefs, 2) using experience sampling methods to capture teachers physiological and emotional states, and 3) exploring the

relationship between teacher-student racial similarity and teachers' self-efficacy development in disadvantaged communities.

My dissertation research employed a basic qualitative research method. To fully compare teachers' self-efficacy beliefs and attribution beliefs, future research can be designed as mix-methods studies to obtain a fuller understanding of teachers' self-efficacy beliefs, attribution beliefs, and how school culture vitalizes or impedes teachers' beliefs. For example, researchers can first use quantitative measures to identify groups of teachers who are significantly different in terms of self-efficacy beliefs, and then employ qualitative interviews to compare teachers' attribution beliefs and their understanding of efficacy sources as well as their contexts. Another possible area of research is to identify teachers in different career stages and see how their self-efficacy beliefs and attribution beliefs differ quantitively and qualitatively. Those comparisons may advance our understanding of the structure of teaching self-efficacy and teachers' attribution beliefs as well as the integration of the information from each source.

Another future research direction is to use experience sampling methods (ESM) to explore the relationship between teachers' self-efficacy and their physiological and emotional states. My dissertation research attempted to capture mathematics physiological and emotional states using interviews. However, participants were not able to articulate the authentic emotions they experienced in retrospective interviews. ESM has the potential to reveal more information about the emotions participants are experiencing in the moment. For example, Wang et al. (2017) used ESM to assess college students' thoughts, behaviors, and emotions by surveying them multiple times throughout a day in a longitudinal study. The results revealed important information about the frequency and intensity of participants' emotions across time. This type of

information is useful to explore the relationship between teachers' self-efficacy and their physiological and emotional states.

Finally, given that the majority of the participants in this study were White Caucasians, and that self-efficacy is a context-dependent construct, future research can explore the beliefs of those teachers who share a similar racial and social background with students. Research in this area will refine and expand our understanding of the nature of teaching self-efficacy as well as preconditions for teachers to be efficacious.

Conclusion

The goals of this research are to examine how mathematics teachers in urban schools serving disadvantaged communities develop their teaching self-efficacy and how teachers' attribution beliefs were related to their interpretations of self-efficacy sources. Results of qualitative interviews suggest that teachers understood their efficacy-related experiences through the lens of attribution beliefs. Additionally, the results revealed the intertwined nature of self-efficacy sources and teachers' attribution beliefs. By using teachers' attribution beliefs as the interpretive lens, this study provides valuable insights into the teaching self-efficacy development of mathematics teachers as well as preparing and supporting teachers in schools that serve disadvantaged urban communities. The findings of this study also lay a foundation for future intervention studies that aim at improving teachers' teaching self-efficacy.

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APPENDIX A

Participant Recruitment Email

Good morning! My name is Qian Wang. I am a doctoral student from the Department of Educational Psychology at the University of Oklahoma. I am looking for a math teacher to participate in my study. I was wondering if you had any interest.

All you need is to participate in a one-hour interview. As compensation, you will receive a 50-dollar gift card. The district has already approved my study. The attached is the approval form and some information about my study. I am very flexible concerning when to come to school. Anytime between now and the end of this semester works for me. Let me know if you have any questions and concerns. Thank you for your consideration.

Thank you,
Qian Wang

Doctoral Candidate
Department of Educational Psychology
Jeannine Rainbolt College of Education
University of Oklahoma

APPENDIX B

Interview Protocol

Background Questions

1. Please tell me something about your teaching position (school, grade level, subject matter,

    student characteristics...etc).

    1) How long have you been teaching?

    2) Have you taught at other schools?

    3) What are some reasons that brought you here?

Core Interview Questions
2. How confident do you feel in teaching math?

3. What made you think you have a weak/strong sense of confidence in teaching math?

4. [If the teacher's response is related to mastery experience] Can you tell me some examples,

    either from today's class that I observed or from any other days that you remember well,

    what happened in the classroom and how you responded?

    o [Definition of success/failure] What made you think that it was

       successful/unsuccessful?

    o [Internal/external] Where do you attribute to your success/failure in this episode?

    o [Stability] To what extent do you think you will be successful/unsuccessful in the

       future in addressing similar classroom management issues?

    o   [Controllability] How much control do you think you had over that situation?

    o [Situational factors] What are some situational factors that might have contributed to

       your success/failure in this situation? [Ask at the end]

5. [If vicarious/Modeling-seen, read, observe.] How successful/unsuccessful was the teacher?

- o [Attributions]What are the reasons for her/him to be successful? / Where do you contribute to his/her success?

- o [Controllability] How much control do you think the teacher has in terms of managing her/his students?

- o [Locus, controllability, similarity] After watching them, do you think you can do similar things in your classroom? Why/Why not?

- o [Stability] To what extent do you think the teacher/you will be successful in the future?

6. [If the teacher's response is related to verbal persuasions] [Attributions] What are the reasons for you to believe her/him? (((What are some examples of people's comments that boost your self-efficacy in classroom management?))))

   [Stability, controllability] To what extent do you think you will be successful in teaching math, if you follow her/his suggestions or continue to use the strategies that he/she validated?

7. [If the teacher's response is related to physiological and emotion states]-What emotions/physiological reactions do you typically experience when you were teaching?

   - o How do these emotions raise or lower your confidence? And why?

8. Besides that, what else do you believe had powerful influences on your confidence in teaching math? [# 4, 5, 6 or 7]

9. Among all the influences that increase your self-efficacy, which is the most important factor?

10. If #4 is successful, ask for unsuccessful experience, or vice versa

11. If #4 addressed past experiences, then ask about today's classroom experiences.

12. Repeat the same questions around critical incidences [most positive/negative experience]

   Are there any significant events that affect your self-efficacy in teaching math?

- If so, how?

Code Categories for Teacher Efficacy Sources and Attribution Beliefs

Self-Efficacy Source Categories	Categories	Attributions Codes	Attribution Categories	Self-Efficacy Changes	Sources
Being successful	Previous successes	High ability	Internal, stable, and relatively uncontrollable	Unaffected	Mastery experiences and failures
Experience					
Success in term of classroom management					
Success in terms of using appropriate instructional strategies		Personality/Self-esteem			
Success in terms of engaging the students					
Content knowledge		Learning (e.g., PD, research)	Internal and controllable	Increased	
Positive feelings associated with instructional successes		Effort			
		Reflection			
Unsuccessful experience in terms of managing students	Previous failures	Inappropriate strategy	Internal, unstable, and controllable	Increased or unaffected	
		Inappropriate effort			
Unsuccessful experience in terms of engaging students		Lack of skill but can be improved			

		Lack of skill but cannot be improved	Internal, stable, uncontrollable	Decreased	
Unsuccessful experience in terms of using appropriate instructional strategies		Bad administrators	External, stable, uncontrollable	Decreased	
		Disrespectful students			
		Students are too behind			
Students failed the exams		Students' mobility			
		Students' lack of motivation			
		Negative attitude toward learning			
		Students' showing learned helplessness			
		Low morale school environment			
Student positive feedback	Positive feedback	Continuous effort	Internal and controllable attributions	Increased	Social persuasions
Colleague positive feedback		Skill improvement			
Admin positive feedback/evaluation		Altering instructional strategies			
Student negative feedback Colleague negative feedback	Negative feedbacks	Lack of skill but very hard to improve	Internal, stable, uncontrollable	Decreased	

			Internal and uncontrollable		
Admin negative feedback/evaluation					
Observing Professional development trainers	Positive modeling	Inappropriate strategy	Internal and uncontrollable for applying certain instructional strategy	Increased	Vicarious experiences
Book clubs					
Collaborative problem solving					
Observing other teachers					
Teaches failed to teach the content	Negative modeling	Unqualified teachers	External, uncontrollable	Decreased	
Teachers repeatedly failed to manage students					
Teachers repeatedly failed to follow school rules		Irresponsible teachers	External, stable, uncontrollable		
Relationship building			Internal and controllable	Increased	Pre-condition for success
			Internal and uncontrollable	Decreased	
Lack of substitute teachers		Lack of resources	External, stable, uncontrollable	Decreased	Things impacting teachers' experiences

APPENDIX D

Subjectivity Statement

My interest in this topic was inspired by my teaching and research experience. I was a Chinese teacher before. The first semester of my teaching career, I experienced the "reality shock." Teaching was much harder than I thought. I struggled every day to figure out what I could do to teach my class effectively. My teaching self-efficacy was lowered in spite of the fact that I got a lot of support from my mentoring teacher. The situation changed as I gained more teaching experience. Later, I began my doctoral study and started to teach as a graduate student. Although I had teaching experience, I still had to reflect on my teaching practices to figure out how to engage students and how to manage the class more effectively. Therefore, I was passionate to see how other teachers become effective teachers from the lens of how they develop their teaching self-efficacy.

My research experience drives me to study urban teachers in particular. I was fortunate to participate in a research project examining urban teachers working at high poverty schools. While interacting with those teachers, many of them shared that they had experienced considerable classroom management issues. After interacting with them and reflecting on my own teaching experience, I constantly ask myself "What can I do to help those teachers so that they can have a positive impact on the students in disadvantaged communities?"

Although my prior experience spurs me to examine the problem, I also have limitations. The participants in my study are mathematics teachers. I have never taught mathematics before, and I know little about mathematics teaching. Inevitably, it creates the insider and outsider problem (Creswell & Poth, 2018). I may be considered as an outsider by the participants because I do not belong to the mathematics teacher community. Additionally, I am Chinese, born and

raised in China. I may be perceived as an outsider of U.S. education and culture, adding another

limitation. Therefore, it might be effortful for me to establish a trusting relationship with the

participants. However, as a researcher, being an outsider can be beneficial. Since I am an

outsider, the participants may provide more background information for me to understand their

experiences, which facilitates data collection. Such information may be omitted when they

interact with other researchers. Being an outsider, I can also view the issue from a different

perspective or even a distinct cultural perspective that other researchers may not notice.

Appendix E

Attribution Support Tool for Challenging Classroom Event

Direction: Think about a recent challenge you experienced in the classroom and answer the following questions.

1. What happened in the classroom?

2. Who owns the problem? E.g., Student, You (teacher), School leaders

3. What did you do or not do?

4. How would you evaluate your response? What do you learn from the experience?

5. What can **you** do to improve the situation next time? E.g., Clear expectations, giving students more practice/time, motivating students, improving instruction, asking for help

6. What are specific goals you would like to achieve in a month or so to improve your skills?

7. What's your specific plan for achieving the goals?