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Operationalizing Reflective Practice in an Elementary Math Classroom

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by

Tiffany Leigh Lewis

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ABSTRACT OF THE DISSERTATION

Operationalizing Reflective Practice in an Elementary Math Classroom

by

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Doctor of Education

University of California, Los Angeles, 2021

Professor Megan Loef Franke, Co-Chair

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The purpose of this qualitative study was to investigate reflective practice. Specifically, it asked: What do reflective practices look like in an elementary Cognitively Guided Instruction classroom? Reflective thinking provides a framework for teachers to apply their knowledge and generate an awareness of their professional development (Dervent, 2015). When teachers become more reflective, they can slow down their thinking and reasoning process to become more aware of how to react to students and become more cognizant of how they respond to students. The ability to integrate research with practice in response to uncertainty qualifies the reflective practitioner for professional status (Russell et al., 1988). Reflection-in-action may provide the key to understanding not only what effective teachers do, but also how they are able to do it. Reflection-in-action accepts that teachers draw on personal experiences and are willing

to engage in on-the-spot changes, creating solutions to the current situation. Teachers who alter tack mid-lesson based on both formal and informal assessment of student engagement and understanding make a move (an action) that generates an effect, and this effect is feedback for the teacher to reaffirm or modify their approach and continue the feedback loop (reflective practice).

Highly successful practitioners utilize more than technical and procedural knowledge in their expert practice. They have developed a level of expertise characterized by their ability to spontaneously generate solutions within problematic situations. These practitioners use reflection-in-action to transform experience into knowledge and skills (Schön, 1983).

The dissertation of Tiffany Leigh Lewis is approved.

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2021

DEDICATION

I dedicate this dissertation to my family's unwavering support and encouragement; to my partner, Geoff, for carrying the lion's share of our partnership the past 3 years; and to the Luskin Crew, without whom none of this would have been possible.

TABLE OF CONTENTS

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VITA

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CHAPTER 1: STATEMENT OF THE PROBLEM

There is ample research on the direct effect teachers have on students' lives. The Organisation for Economic Co-operation and Development (OECD, 2005) concluded that the most important in-school variable influencing student achievement is teacher quality. In a synthesis of more than 500,000 studies of the effects of teacher influences on student achievement, Hattie (2003) determined that 30% of the variance in student achievement is attributed to what teachers do in a classroom. According to Hattie, "Excellence in teaching is the single most powerful influence on [student] achievement" (p. 4). Teacher quality is more strongly correlated with student achievement than class size, per-pupil spending, or teacher salaries (Darling-Hammond, 2000). Darling-Hammond (2000) found a strong correlation between teacher quality and student achievement even after controlling for student poverty and language background.

Furthermore, high-quality teachers can positively affect a student's learning outcomes for the year(s) they are with a particular student (Darling-Hammond, 2000). Students who have several ineffective teachers in a row have significantly lower achievement than those who are assigned to highly effective teachers (Sanders & Rivers, 1996). If we value the education of our citizens, we must ensure high-quality, effective classroom teachers.

Becoming an effective teacher involves more than accumulating skills and strategies. Classrooms are dynamic, and a teacher's ability to make changes in the moment dramatically affects the quality of instruction and the experiences of the students. Schön (1987) posited that formal training does not always prepare teachers for the ever-changing environment, whereas reflective practice helps teachers respond to the most current needs in a classroom. Reflective teaching practice can lead to improved classroom methodologies (Krulatz, 2016).

Teaching requires engagement and motivation for learning to establish a successful teaching process, remain current, and improve in education (Fokkens-Bruinsma & Canrinus, 2014). Strong teaching requires fluidity and making decisions in the moment while developing and maintaining a sense of efficacy. In this way, teachers can develop strategies and solutions to problems as they arise in the classroom. Teachers do not learn to teach solely by imitating experts or by guided remediation of past errors but are themselves researchers "continually reframing their world of work in response to puzzling or surprising events of practice" (Russell et al., 1988, p. 16).

Reflective practice is the integration of research, theory, and experience in the formulation of solutions to problems of practice. Engaging in reflective practice, according to Argyris and Schön (1974), requires problem setting or definition, testing hypothesized solutions, and belief in personal causation. Schön (1983) theorized that, in professions characterized by ambiguous or conflicting theories, a reflective stance will lead to increased effectiveness. Reflective thinking provides a framework for teachers to apply their knowledge and generate an awareness of their professional development (Dervent, 2015). When teachers become more reflective, they can slow down their thinking and reasoning process to become more aware of how to react to students and become more cognizant of how they respond to students. Dewey (1910/1933) perceived reflective thinking as thought that involved doubt and perplexity plus searching and inquiring, which resolved doubt and removed perplexity. He surmised that a person would have to endure dissonances that resolved themselves in inquiry, itself a long-lasting process. Köksal and Genç (2019) emphasized that reflective teaching practices improve teachers' professional lives through their ability to reflect on their teaching and assessments. This contributes positively to teachers' efficacy and thus can positively influence student learning.

Background of the Problem

Individual teachers choose whether to reflect and to alter their practice (Kottkamp, 1990). Teachers make these choices every day. Understanding what factors influence teachers' motivation to engage in practices that increase efficacy and remain effective has far-reaching and practical implications for principals and educators of teachers. Understanding what skills enhance the efficacy of teachers and, therefore, have the potential to increase student achievement is worth investigating.

The distinction often made between routine and reflective practice highlights the pedagogical differences among different teachers and their practices (Dewey, 1910/1933). Dewey (1910/1933) considered reflection a means to independence from routine behavior:

> Reflection emancipates us from merely impulsive and merely routine activity. . . . [It] enables us to direct our activities with foresight and to plan according to ends-in-view or purposes of which we are aware[,] . . . to act in deliberate and intentional fashion . . . to know what we are about when we act. (p. 17)

Dewey's approach to reflection encourages teachers to avoid making instructional decisions based on impulse or routine; rather, teachers are encouraged to use the data to make informed decisions about their practice. Schön (1987) argued that teachers who are thoughtful and reflect upon their practice are more desirable than teachers who are ruled by tradition. Schön (1987) argued for attention directed at the art of teaching by encouraging "reflection-in-action" and "reflection-on-action" among teachers. According to his definition, reflection-in-action is the ability to reflect on behavior as it happens and pivot as the needs of the students demand. In contrast, he described reflection-on-action as reflecting after the event, reviewing, analyzing, and evaluating the situation.

The ability to integrate research with practice in response to uncertainty qualifies the reflective practitioner for professional status (Russell et al., 1988). Reflection-in-action may provide the key to understanding not only what effective teachers do, but also how they are able to do it. Reflection-in-action accepts that teachers draw on personal experiences and are willing to engage in on-the-spot changes, creating solutions to the current situation. Teachers who alter tack mid-lesson based on both formal and informal assessment of student engagement and understanding make a move (an action) that generates an effect, and this effect is feedback for the teacher to reaffirm or modify their approach and continue the feedback loop (reflective practice).

In my experience, as a principal who observes teachers, teachers successfully reflect-in-action and make the necessary changes to a lesson to either reengage students or immediately change their plans when a lesson is not obtaining the desired results. For example, a first-grade teacher, a few minutes into a lesson on understanding that 10 can be thought of as a bundle of 10 ones, realizes that the majority of her students can count by 10 but do not understand that 20 is composed of 20 ones. She changes the focus of her lesson from counting by 10s to counting groups of objects in groups of 10s, 20s, 30s, etc., to help her students better understand the connection that a bundle of 10 is made up of 10 ones. These changes often happen seamlessly, although I have seen them be more explicit and involve students in the process as well. What happens is both external and internal. At the same time the teacher is changing the situation, they are also changing their ideas, often having discovered new ways of thinking about that kind of situation. They have a new mental model for the situation and have evolved in their professional capacity. Reflection-in-action means to think about or reflect while carrying out the activity. Conversely, I have observed teachers who are unable to pivot mid-lesson and complete lessons

without student engagement or who fail to get across the lesson's objectives. While these teachers may reflect on the lesson afterward and make adjustments for future similar lessons, the original time spent is lost and ineffective in increasing either student achievement or the teacher's personal development.

Reflective practice is the capacity to look at one's professional activities, both technical and interpersonal, and examine them to see if there is congruence among one's intentions, one's actions, and outcomes (Argyris & Schön, 1974). Intentions are tied to values; uncertainty, unique situations, and value conflicts prevail, creating an environment where educational practitioners are required to demonstrate their artistry as a kind of knowledge of their actions (Schön, 1987). The reflective practice seeks to make explicit the implicit aspects of this knowledge that competent practitioners possess.

Gap This Research Fills

Educators are interested in reflective teaching based on the presumption that it leads to more effective practice (Reiman, 1999). Several studies have been conducted addressing the effects of reflective teaching on pre-service teachers. These studies address reflection as a means to support new teachers and teachers entering the profession. However, very little if any research has been done regarding how to progress from reflection *on* practice to reflection *in* practice: reflection-in-action. The research that has addressed reflection in/on practice discusses Schön's theoretical approach, the general features of his work, and the common misconceptions of Schön's two concepts of reflection. There has been little effort devoted to testing various models of reflection, or to consider how we might better conceptualize reflection in teaching. This study aimed to fill in some of the missing research. Research in this area can provide both a valuable

testing ground for reflection in and on practice, and insight into how reflection might figure in learning to teach, leading to more effective teachers and ultimately benefiting student learning. Understanding the link between reflective practice and teacher effectiveness would contribute to teacher education, which enables teachers to analyze their practice and be able to direct their professional growth. Experience alone does not make for a more effective teacher; research does not indicate that the passage of time makes teachers better or incompetent teachers effective (Kini & Podolsky, 2016). Research on teachers' professional learning may inform our understanding of reflection and transform reflection in practice from an idea to a practical, working principle. It is through our knowledge of the processes of the effects of reflection on professional learning that we might begin to provide the structure and support that is needed to facilitate learning to teach, leading to more effective teachers and ultimately benefiting student learning.

Nature of the Project

This research examined what reflective practice looks like in an elementary classroom and its connection to the actions required to move from reflection *on* practice to reflection *in* practice in order to better understand how reflection in practice affects teacher efficacy and leads to improved student outcomes. As part of this study, I investigated what reflective practice looks like in classrooms to understand and operationalize reflective practices and conceptualize tools and mechanisms for teachers to utilize. Then, I looked at the characteristics of a reflective teacher to help my understanding of what is required in supporting reflective practice. I accomplished this by listening to teachers' voices and looking for elements that identify how reflective teaching affects teacher efficacy. The following research question directed this study: What do reflective practices look like in an elementary Cognitively Guided Instruction

classroom? A sub-question was also investigated: How are some teachers able to make decisions in the moment that affect student outcomes?

Significance of the Research for Solving the Problem

Reflection *on* practice is often thought of as profoundly connected to teacher quality (Del Carlo et al., 2010; Furtado & Anderson, 2012). However, there is a lack of research that exhibits a clear connection between the constructs of teacher quality and reflective practice. Despite this scarcity, reflective practice in the arena of education is commonly recognized as a critical component in promoting teacher quality.

Improvement of teacher quality is elevated to a top priority in educational policy at both the federal and state levels (Johnson et al., 2007; Lewis & Young, 2013; Marsh & Wohlstetter, 2013). Sanders and Rivers (1996) found that students who are assigned to ineffective teachers in subsequent years have significantly lower achievement than those who are assigned to highly effective teachers. Effective teachers influence the lives of students in a positive, meaningful way. Unfortunately, the converse is also true.

Understanding how reflective practice contributes to teacher efficacy will be beneficial to teachers, administrators, and others in supportive roles who can help keep teachers effective throughout their careers, expanding the number of students they positively affect. Principals and district leaders need to create learning experiences that support reflection on and in practice to help teachers to understand, identify, and expand their capacity so they may remain effective.

CHAPTER 2: LITERATURE REVIEW

Reflective practice in teaching is a deliberate effort to improve the quality of results by influencing the method of a problem requiring a resolution (Dewey, 1938; Hart, 1990; Schön, 1987). Reflection rarely ends with a simple solution, but rather stimulates information for further consideration, new questions, and improved understanding that ultimately aims at improved student learning. By developing the habits of reflective practice, teachers can improve the quality of their decisions and the range and scope of knowledge applied to the improvement of their teaching practice, ultimately leading to an increase in student achievement (Hart, 1990; Schön, 1987).

This chapter presents a review of the literature related to reflection and reflective practice, with particular emphasis on teacher reflective practice. I first define reflection within the educational setting and then provide the history of reflection in U.S. public schools as context for this important process. Next, I examine the current state of reflective practice and discuss the connection between reflective practice and Cognitively Guided Instruction (CGI). I conclude the chapter by presenting a reflective conceptual framework that serves to provide the context in which I examine reflective practice.

History of Reflection in U.S. Public Schools

The role of reflective practice in U.S. public schools stems from the pragmatic philosophy of John Dewey and his work *How We Think* (1910). In Dewey's words, reflection is an "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and further conclusions to which it leads" (1910/1933, p. 118). His work continues to influence how to approach problem solving through efficient thought processes grounded in evidence, logic, and reasoning (Dewey, 1938; Schön, 1983;

Tannenbaum et al., 2013). Researchers have described reflection as a continuous pattern of argument in which conflicting positions foster insight into a problem (Beauchamp, 2015). In the field of education, reflection includes deliberation, making choices, and coming to decisions about alternative courses of action (Short, 1997; Tannenbaum et al., 2013; Valli, 1997). In his book *The Reflective Practitioner: How Professionals Think in Action* (1983), Schön analyzed five occupations and found that the most competent professionals were those who used inventiveness to solve problems outside of the scope of education obtained in their respective fields. The ability of professionals to reframe their understanding of a situation is the core of Schön's (1983) theory of professional knowledge. Schön's texts have influenced numerous teachers and lecturers at both the K–12 and the university levels (Larrivee, 2006).

Emphasized in teacher education and frequently referenced in literature is Dewey's seminal work on reflective practice (Hébert, 2015; Short, 1997; Short & Rinehart, 1993). The terms *reflection* and *reflective practice* are so widely used in education that they are nearly mandatory terms; however, they lack a uniform definition, and their meanings differ depending on the context (Farrell, 2012). Dewey found that for many practicing teachers, reflective practice is "thinking about doing something while doing it" (Dewey, 1938, p. 54). Schön (1987) asserted that the reflective practitioner reflects during action, in what he terms the "action present" (p. 26). Therefore, reflective practices are an integral aspect of teacher education, along with pedagogical research, because of the connection of knowledge and experience toward informed practice (Beauchamp, 2006; Hébert, 2015; Short, 1997; Short & Rinehart, 1993).

Rodgers (2002a, 2002b). described four criteria for reflection: (a) Reflection is a meaning-making process, (b) it is systematic, (c) it should happen in a community, and (d) it requires personal and intellectual growth. Once achieved, reflection as a practice can be taught,

learned, and assessed (Rodgers, 2002a, 2002b). According to Dewey (1938), reflection is a complex, rigorous, intellectual, and emotional enterprise that takes time to do well. Reflection requires practitioners to confront others' learning, their practice, and the subject matter at hand (Rodgers, 2002a, 2002b; Short, 1997). Reflection is not a means to an end; instead, it is a vehicle to transform experience into a symbiotic relationship between theory and practice (Rodgers, 2002a, 2002b; Schön, 1992; Van Manen, 1997).

Short and Rinehart (1993) investigated the impact of reflection on levels of thinking in an administrator preparation program. Like teachers, administrators require the ability to make decisions in the moment and then reflect to analyze the effectiveness and appropriateness of the decisions to continue their learning. The levels of thinking investigated by Short and Rinehart describe problems from surface characteristics to viewing problems by describing their underlying principles, theories, and deep structures. Short and Rinehart (1993) proposed a specific process for reflective thinking. Part of the process forced students in administrative preparatory programs to analyze what they did based on four frames: culture, action, position, and tradition. Students reflected on a critical event by writing about the event, the action they took, why they took that action, and identifying alternative ways to react to the event. Journal entries were analyzed using a model for reflection developed by Sparks-Langer and Colton (1991). The results of the analysis indicated that students were reflecting on underlying principles or theories as they wrote about their events. Students were developing characteristics of experts relative to their identification of the underlying deep structures of the issues and problems they addressed in their journal entries (Short & Rinehart, 1993).

The terms associated with reflective practice can vary because there is not a uniform or cohesive definition (Farrell, 2012; Hébert, 2015; Larrivee, 2008; Tannenbaum et al., 2013).

Dewey's reflective model has been "criticized for its overreliance on rationalism and adherence to technical rationality" (Hébert, 2015, p. 363). The shifting definition of reflection and its varied epistemological approaches has brought forth questions regarding its place in the education profession (Beauchamp, 2015; Danielson, 2008; Jay & Johnson, 2002). For the purpose of my research, reflective practice is defined as the practice by which professionals become aware of their implicit knowledge base and learn from their experiences (Schön, 1983). Implicit knowledge is knowledge of complex information learned in an incidental manner, without awareness of what has been learned (Seger, 1994).

Despite the literature's lack of clear consensus on how to define reflection, reflective practice has the potential to promote more efficient decision making and positively affect students and teachers (Marcos et al., 2011; Tannenbaum et al., 2013; Van Manen, 1997; Williams & Grudnoff, 2011). In addition, multiple researchers have claimed that reflection is not an intuitive act and must be taught (Beauchamp, 2015; Clark et al., 1996; Danielson, 2008). Recent writing has emphasized the importance of applying new approaches to reflective practices "to account for social changes" and enhance professional practice (Beauchamp, 2015, p. 137). Overall, teacher education utilizes reflection as a tool rather than as a concept that must be understood (Beauchamp, 2015; Clark et al., 1996; Danielson, 2008; Furtado & Anderson, 2012).

Current State of Teacher Reflective Practice

The preparation of teachers to provide effective instruction requires programmatic approaches that foster and develop problem solving, decision making, and complex thinking. Reflection appears to be an essential practice for developing expertise and the capacity to change behavior (Clark et al., 1996; Short, 1997). Behavioral changes occur because new information

obtained from the reflection on one's actions leads to the development of new theories-in-use (Osterman, 1991; Short, 1997). People have maps in their heads about the planning, implementation, and review of their actions. Few people are aware that the maps they use are not the theories they explicitly adopt or their theories-in-use (Argyris & Schön, 1974).

Frederiksen (1983) suggested that decision making around undefined problems, often the kinds of problems facing teachers, requires a repertoire of information and flexibility in strategies for accessing and using that knowledge. Schön suggested that, as teachers encounter "gray areas" with problems in their work, reflection serves as a means to assist with rethinking ill-defined problems in different ways (1987, p. 45). Atkins and Murphy (1993), in their review of the literature, showed how reflection has been defined. They reviewed both theoretical and empirical works on reflection and identified key stages of reflection and skills needed. They concluded that reflection must involve the self and must lead to a changed perspective. It is this which distinguishes reflection from analysis. The cognitive and affective skills necessary to engage in reflection are description, critical analysis, self-awareness, synthesis, and evaluation. An understanding of the processes of reflection is essential, and sufficient attention must be given to developing the skills required to engage in reflection (Atkins & Murphy, 1983).

There is evidence that expertise requires specific and general strategies for the application and monitoring of content knowledge (Alexander & Judy, 1988; Clark et al., 1996). Research further has suggested that expertise requires a knowledge base that is extensive and accessible and entails critical reflection (Chi et al., 1981; Short, 1997). Teachers utilize components of critical reflection to begin the decision-making process by "reflecting on what worked in the past and then decid[ing] on a strategy or procedure" for future action (Hardiman et al., 1989, p. 627).

Furthermore, teachers utilize reflection-in-action as a strong component of professional practice. Reflection both in and after action is essential in evaluating and moderating decision making (Eraut, 1997; Griffiths, 2000; Schön, 1987). Reflection, where knowledge and its use become objects of interrogation, can be the mechanism by which knowledge can become increasingly interconnected and integrated with past experiences, allowing educators to develop schemata that facilitate problem solving and decision making (Glaser, 1989).

Reflection on what one knows before and during action not only increases the quality of choices in decision making but also expands the teacher's knowledge base, thus affecting future decisions (Hart, 1990). Developing the habit of reflecting on what one knows both *before* and *while* acting improves the quality and creativity of decisions, and eventually contributes to the knowledge available in subsequent decisions (Hardiman et al., 1989; Hart, 1990; Hébert, 2015). Reflective practice can provide a key to more effective teaching (Darling-Hammond, 2007; Hart, 1990; Short, 1997; Short & Rinehart, 1993). In this way, teaching is improved through the process of reflection.

Reflection and Teacher Quality

Teacher quality is one of the most important variables affecting student achievement (Darling-Hammond, 2007; OECD, 2005). It is critical to address topics such as standards of educational quality and student achievement outcomes (Darling-Hammond & Sykes, 2003; Gordon, 1972; Howe, 1989). Researchers (Dewey, 1910/1933; Schön, 1987; Shulman, 1987; Van Manen, 1997; Zeichner & Liston, 1987) have studied how teachers think in order to understand what makes some teachers more effective practitioners than others. Organizations such as the National Council for Accreditation of Teacher Education, Interstate New Teacher Assessment and Support Consortium, and National Board for Professional Teaching Standards

all promote accomplished teaching and identify reflective practice as a coveted competency (Danielson, 2008). Productive and purposeful reflection involves the integration of content knowledge, skills of teaching and mentoring, a disposition of openness to change, and a wholehearted commitment to student success (Dewey, 1938; Hébert, 2015; Jaeger, 2013; Jay & Johnson, 2002).

The objective of reflection is to evaluate the effectiveness of instructional strategies in obtaining a given end and to promote knowledge to the level of theoretical research while linking it to rigorous instructional practices (Akbari, 2007; Cruickshank, 1981). This view is based on the notion that teachers are competent, highly technical people. Moreover, it regards the mastery of skills of the students as the primary aim of education. For Schön (1983, 1987), reflection involves some form of experimentation, in which practitioners consistently interpret situations employing problem-setting, a process that can lead to a reframing of the situation. Schön's descriptions do not make explicit his interpretation of effective teaching. Although differing in opinion on what constitutes good teaching, it is clear that reflection is linked to high-quality teaching. The specific relationship between a teacher's reflective skills and teacher quality needs to be explored in more depth (Kennedy, 1989; Wubbels & Korthagen, 1990). Tsui (2009) postulated that the critical difference between expert and non-expert teachers is their ability to engage in reflection and conscientious deliberations. According to Dreyfus and Dreyfus (1986), reflection can increase the level of expertise of intuitive experts. Still not understood is the connection between reflection and expertise, or whether it is indicative of quality teaching. Tsui's study found that it is through the process of reflection in which knowledge is interpreted in practice that an expert's knowledge is developed. When teachers engaged in self-monitoring

and reflected on their teaching methods and problems of their students, they felt they became better educators, which resulted in better student performance (Fahim et al., 2013).

Moving From Reflection-*on*-Action to Reflection-*in*-Action

Reflection-in-action is reflection that requires teachers to adjust their responses to the situation in the moment. The teachers' strategies are reviewed mentally, and the lessons are adjusted on the spot (Schön, 1983, 1987). Teachers may reflect on their practice automatically when readjusting lessons (reflection-in-action); the challenge is to be deliberate about reflection in order to see desired results (Clark et al., 1996; Farrell, 2012; Ferry & Ross-Gordon, 1998; Russell et al., 1988). When teachers engage in *reflection-in-action*, they attempt to consciously stand back while they are teaching, as they monitor and adjust to various circumstances that are happening within the lesson. When teachers engage in *reflection-on-action*, they are examining what happened in a lesson after the event has taken place. The latter is a more delayed type of reflection than the former (Farrell & Kennedy, 2019). Making reflective practice part of the decision-making process for teachers can support student learning. Dreyfus and Dreyfus (1986) characterized experts as those who are able to make intuitive judgments in a manner that "defies explanation" (p. 3). This intuition of knowing how, as opposed to knowing what, is critical to understanding reflection in practice. Reflection-in-action is a process that requires simultaneously doing and reflecting on experiences and adjusting practice according to the development of the situation (Tannenbaum et al., 2013). Van Manen (1997) identified anticipatory reflection as a planning stage in which the teacher examines alternatives for an organized set of actions. Active or interactive reflection occurs when the teacher is faced with a challenge that requires an immediate stop-and-think response—literally in action. Many teacher educators believe that considerable practice with reflection-on-action will lead to a greater

capacity for reflection-in-action, enhancing a teacher's in-the-moment decision making (Farrell, 2012).

Many professionals can pause while working, reflect on their progress, consider alternative solutions, and make logical decisions, or in Schön's terms, reflecting-in-action. Gilliss (1988) found troublesome the ability to incorporate Schön's form of reflection into education (Gilliss, 1988; Gilroy, 1993). Gilliss described a scenario in which a teacher with 30 students spends 10 minutes a day individually instructing each student. This would take 300 minutes—the entire school day. She continued by postulating that any reflection occurring in the classroom must be extremely fast, or the rate of unique situations is much less than Schön's approximation (Gilliss, 1988).

In *The Reflective Practitioner*, Schön (1982) wrote,

> A practitioner's reflection-in-action may not be very rapid. It is bounded by the "action-present," the zone of time in which action can still make a difference to the situation. The action present may stretch over minutes, hours, days, or even weeks or months, depending on the pace of activity and the situational boundaries that are characteristic of the practice. (p. 62)

He described how baseball pitchers and jazz musicians demonstrate reflection-in-action; such practical comparisons enable teachers to identify quickly with the process of reflecting-in-action. He offered simplistic descriptions of the process, noting that reflection-in-action is intuitive, spontaneous performance yielding nothing more than the results expected for it. When intuitive performance leads to surprises, whether pleasing, promising, or unwanted, teachers may respond by reflecting-in-action (Schön, 1982). Through these examples, Schön emphasized the importance of individuals reframing problems in "one-to-one" situations. A teacher may unconsciously select a particular strategy because it enables the teacher to retain control of a situation.

Boyd and Fales (1983), in a synthesis of several studies of the process of reflective learning, focused on exploring and defining the parameters of reflection. Repeated interviews of counselors yielded a progression of focus shifts within an activity of reflecting on the process of reflection. As interviewees became aware of the process of reflecting, they used it intentionally and considered it important to their learning and growth. They expressed interest in controlling their process and had attempted to manipulate their process as they became aware of it. This could confirm the movement from reflection *on* to reflection *in* practice.

The Connection Between Cognitively Guided Instruction and Reflective Practice

A 3-year longitudinal study by Fennema et al. (1996) explored the nature of change among teachers and the correlation between beliefs and instruction. They identified four levels of beliefs and practices. Level Four teachers used what they learned from listening to students to make decisions and changes to instruction in the moment. The researchers found that Level Four teachers had a more fluid perspective of student thinking, using it to develop a deeper understanding of children's thinking (Fennema et al., 1996). These teachers continually reflected, modified, adapted, and expanded their models in reaction to their students (Carpenter et al., 1996).

In their early work, Carpenter et al. (1996) speculated that understanding the development of children's mathematical thinking could lead to radical changes in teachers' beliefs and practices, and that these changes would be reflected in students' learning. Their work examined the development of children's mathematical thinking and the need for teachers to focus on reflection and discussion. They identified that significant changes in practice are dependent upon teachers altering what they know to be true so that they understand that students construct knowledge and that they must adapt instruction accordingly. By being submerged in a

constructivist teaching environment, teachers start to question their conceptions of what it means to learn mathematics and begin to develop their understanding of children's thinking. Teachers develop an appreciation of students' thinking after reflecting on their learning in an environment based on constructivist principles and, in turn, explore how their new perspectives apply to their students. The analysis of children's mathematical thinking is not a fixed body of knowledge that teachers are expected to assimilate. Instead, it provides a framework in which teachers construct and test their models of students' thinking to guide their instructional practices (Carpenter et al., 1996). Cognitively Guided Instruction (CGI) provides a context for reflecting on and evaluating pedagogical knowledge and guides teachers in constructing models of students' thinking that are meaningful and useful to them in making instructional decisions.

Reflective Practice Framework

The concept of reflective practice is a form of problem solving: resolving an issue through an active and deliberate cognitive process of addressing practical problems that allows for doubt and perplexity before solutions are reached and decisions made (Clark et al., 1996; Dewey, 1938; Farrell, 2012; Schön, 1983, 1987). Dewey (1938) considered reflective practice to be an intentional, systematic inquiry that requires discipline and that will ultimately lead to the implementation of solutions once problems have been thought through. Dewey (1938) asserted that the one aim of education is to help people acquire habits of reflection in order to engage in intelligent thought and action rather than *routine* thought and action. He expressed concern about routine thinking whereby actions are guided by impulse, tradition, or authority within education, stating that educators who do not bother to think intelligently about their work become slaves to routine (Beauchamp, 2015; Dewey, 1938; Farrell, 2012).

Schön continued the revolutionary work of Dewey and focused on the notion of practitioner-generated intuitive practice for educators. Central to the discussion of when and how reflection takes place, and what processes are used in reflective teaching, has been Schön's (1983, 1987) framework of reflection-in-action and reflection-on-action. Schön (1987) theorized that engaging in reflective practice enables practitioners to articulate what they do, how and why they do it, and its impact on decision making. A core tenet of Schön's (1983) epistemology of practice is that reflective thought is a dialectic process that incorporates action with experience, which then leads to modified action. Schön studied how educators "know" through their practice; he claimed that they know more than they articulate (Beauchamp, 2015; Farrell, 2012). He referred to this as *reflection-in-action*, or how educators think on their feet, as reflection involves examining beliefs and experiences and determining how they connect to theories (Farrell, 2012).

Reflective practice is a compass that enables practitioners to stop, look, and discover where they are at that moment and then discover where they want to go in the future (Farrell, 2012). By developing the habits of reflective practice, educators can improve the quality of their decision making and the range and scope of knowledge applied to the improvement of students (Farrell, 2012; Hart, 1990). According to Farrell (2012), reflective action should have an educational purpose.

Reflective practice develops in stages and continuously involves an interactive process of change and development (Hart, 1990; Larrivee, 2008; Valli, 1997). Schön (1987) suggested that unique challenges, such as those encountered by educators, require decisions and actions in which the educator goes beyond the rules and technical knowledge in order to devise new methods of reasoning, constructing, and testing new categories of understanding, strategies of action, and ways of framing problems. When educators use reflective thoughts and actions, they

become more skillful at addressing ill-defined problems (Short, 1997). Reflection allows professionals to discover what they do not know and then shape the nature of their inquiry for problem solving and decision making (Hart, 1990; Short, 1997). Educators in the habit of reflecting on what one knows before and while acting could improve the quality of action and contribute to the knowledge available in subsequent decisions.

Thus, reflection can improve the quality of teaching in several ways. First, reflection can enhance the probability of action consistent with conscious, long-range goals; teachers can spend less time reacting to the vivid and pressing stimuli familiar in daily activities (Farrell, 2012; Hart, 1990). Second, reflection makes possible systematic analyses and interventions that challenge practice and enable the search for new solutions (Farrell, 2012; Hart, 1990). Third, to become a more effective teacher, one must use new and different sources of information, integrate this expanded knowledge, and translate the resulting self-awareness into effective action toward student improvement (Farrell, 2012; Hart, 1990).

Reflective practice can lead to positive outcomes, such as confidence and higher self-efficacy (Furtado & Anderson, 2012; Lieberman & Miller, 2005). To grow professionally through the use of reflective practice, educators must be comfortable with research-based methods while voluntarily aspiring to improve their practice (Beauchamp, 2015; Furtado & Anderson, 2012). Ongoing reflective practice enables educators to become critically aware of the action that generates the cognitive acts of learning between teachers and students (Dewey, 1938). Taking time to reflect on one's actions indicates a desire to improve in one's profession (Schön, 1987). Thus, when educators utilize reflective practice, a positive increase in self-efficacy and improvement of student learning occurs (Furtado & Anderson, 2012; Lieberman & Miller, 2005).

Another important reason for teachers to engage in reflective practice is that reflective action should have an educational purpose and can involve the ethical and moral aspects stressed so strongly by Dewey (1938). Schön (1983) identified reflection-in-action as central to professional practice. He stated that reflection-in-action takes place when professionals are faced with a situation that they experience as unique. Rather than directly applying theory or experience, educators draw on their repertoire of examples to reframe the situation and find new solutions. This generates new reflection-in-action in a compounding, intuitive process. According to Schön (1983), this intuitive decision making based on reflection-in-action is central to professional practice.

The preparation of teachers requires programmatic approaches that foster and develop expertise in problem solving, decision making, and critical thinking (Hart, 1990; Short & Rinehart, 1993). Reflection on what is known before and during action not only increases the quality of decision making but also expands the teacher's knowledge base, thus affecting future decisions (Hart, 1990; Schön, 1983, 1987). A commitment to reflective practice becomes a commitment to a way of thinking and acting, and the process itself enhances the future quality of reflective practice (Hart, 1990; Short & Rinehart, 1993). By developing habits of reflective practice, teachers can improve the quality of their decisions and the range and scope of knowledge applied to the improvement of schools (Hart, 1990).

The ability of students to articulate their ideas and engage with others' ideas is shown to have a positive effect on learning outcomes (Webb et al., 2017). To promote this type of dialogue, teachers can utilize a variety of strategies including probing questions, challenging students in their thinking, and asking for elaboration of student responses. Specific principles for practice, as identified by Webb and colleagues, include drawing upon moves in the moment,

asking questions about details, and describing ways in which one student's ideas are similar to another's. Other principles for practice include continuously adjusting follow-up moves in accordance with student responses and connecting mathematical ideas and asking students to engage with them (Webb et al., 2015). These strategies require teachers to react to situations as they arise, to be reflective *in* action.

Limited research in the area of reflection makes it difficult to claim that reflection is a transferable skill and, more importantly, that it produces the desired result of improved student learning. However, by developing the habits of reflective practice, teachers can improve the quality of their decisions and the range and scope of knowledge applied to the improvement of students (Hart, 1990; Jaeger, 2013). The objective of my research was to examine the professional qualities of teachers who engage in reflective practice, specifically teachers who are able to not only reflect *on* but reflect *in* practice. This is important because reflection rarely ends with a simple solution but instead with information for further reflection, new questions, and improved understanding that ultimately aims at improved student learning. By developing the habits of reflective practice, teachers can improve the quality of their decisions and the range and scope of knowledge applied to the improvement of their teaching practice and ultimately increase student achievement (Hart, 1990; Schön, 1987).

Individual teachers choose whether to reflect and to alter their practice (Kottkamp, 1990). This choice is key to understanding what factors influence teachers' motivation to engage in practices that retain and even increase efficacy. Understanding the professional qualities of reflective teachers has far-reaching and practical implications for principals and educators of teachers. Understanding what skills enhance the efficacy of teachers and, therefore, have the potential to increase student achievement is worth investigating.

Reflective practice is based on the belief that people are designers of action. *Theories-in-use* refers to implicit, informal information that guides the design of action within an ongoing situation. Argyris and Schön (1974) viewed theories-in-use in terms of situational information and understanding concerning the unique aspects and characteristics of a given situation the teacher is attempting to deal with. This is the essence of reflective practice. The theories of reflective practice and theories-in-use guided this investigation into the teaching practices used by teachers to make decisions in the moment.

My Study

Several studies have been conducted addressing the effects of reflective teaching on pre-service teachers. These studies addressed reflection as a means to support new teachers and teachers entering the profession. There has been limited effort devoted to considering how we might better conceptualize reflection in teaching. Research in this area can provide both a valuable testing ground for reflection in and on action and an insight into how reflection might figure in learning to teach, leading to more effective teachers and ultimately benefiting student learning. This study fills in some of the missing research. It was guided by the CGI framework to conceptualize teachers reflecting in action through eliciting student thinking and modifying instruction in the moment. This study contributes to the existing knowledge of reflection, explicitly adding to our understanding of the professional qualities associated with teachers who are successfully incorporating reflection into their practice. Utilizing observations and teacher interviews allowed for the type of conversation and analysis necessary to understand the thinking occurring during the practice of reflection. Teacher surveys provided insight into the qualities of teachers who are reflective both in and on their practice. Utilizing CGI as an approach provided a framework and backdrop where reflective practice could take place.

Teachers versed in CGI understand that reacting to students is a means to deepen their learning, and that a teacher's supporting moves help to engage students more deeply (Webb et al., 2017). CGI teachers might adapt to the students' knowledge, making them more likely to be reflective in practice and ideal for this study. CGI engages teachers as learners and provides the opportunity for teachers to see themselves as learning within the context of their practice. Observing teachers utilizing CGI, I expected to see teachers pushing students to explain their thinking, students pressed to elaborate, and follow-up probes. At the beginning of the study, I proposed that teachers' reflective skills and their ability as CGI teachers would correlate with positive student outcomes. I expected to find student achievement linked to the quality of teacher reflection. In conducting the study, I sought to understand one aspect of quality teaching: teachers' reflection on their own practice.

"The only way to increase the learning of students is to augment the quantity and quality of real teaching" (Dewey, 1910/1933, p. 36). In this simple idea, Dewey stated the simple principle of teaching and learning, distilling it into the essentials that really matter in education. Students learn when teachers teach well. In-the-moment interactions with students affect student outcomes; if teachers are better at thinking and reacting, then it follows that an increase in student outcomes will be observed. Teachers' experiences with reflection differ, and some experiences with reflection are more substantial or meaningful than others, which may be due to the quality of reflection. Because the notion of quality in reflection is understudied, it is difficult to define. The concept of "higher order" versus "lower order" thinking skills from Bloom's (1956) taxonomy can be useful in studying differences in quality with respect to reflection. The ability to distinguish between the quality of different kinds of thinking can be useful to exploring the quality of different kinds of reflection. By studying a wide range of teachers' experiences

with reflection, I sought to discover whether some experiences are more valuable than others and what makes them seem more valuable. I aimed to discover how some experiences with reflection might differ in terms of quality, effectiveness, or value.

CHAPTER 3: METHODOLOGY

This study provides insight into the reflective practices in which teachers engage, specifically while utilizing Cognitively Guided Instruction. My study sought to conceptualize and identify what reflection-in-action looks like in an elementary classroom, specifically in a classroom where the teacher is versed in CGI pedagogy. Given the objective of my research, my study was guided by the following central question, which aimed to identify what and how reflective practices were implemented in a successful classroom setting: What do reflective practices look like in an elementary Cognitively Guided Instruction classroom? This was accompanied by a sub-question: How are some teachers able to make decisions in the moment that affect student outcomes?

Research Design and Rationale

I utilized a qualitative research design, as I sought to gain a deeper understanding of a specific organization or event (Creswell, 2009; Merriam, 2009). Qualitative research aims for better understanding through firsthand experience, truthful reporting, and quotations of actual conversations. Specifically, qualitative research intends to obtain a holistic picture of the subject of study with an emphasis on portraying the everyday experiences of individuals (Merriam, 2009).

My study included classroom observations and interviews with teachers to inductively access the perspectives of the participants. Understanding how participants made meaning of what had occurred in their classrooms and how their perspectives influence their attitudes and behaviors provided a much-needed perspective. I looked specifically at the quality of reflections versus quantity. I aimed to identify what in-the-moment reflection looks like, what it looks like to be reflective, and what good reflective practice looks like.

Methods

Site and Sample Selection

The selected site for my study was a medium-sized school district in Orange County, California. There are 22 elementary schools within this school district, serving close to 15,000 TK–sixth-grade students. Forty-four percent of students are on free or reduced lunch meal plans, and 24% are English learners. I selected this school district because it is currently working with the county to train its teachers in Cognitively Guided Instruction (CGI), which creates opportunities for reflective practice and, therefore, provided access to teachers who are becoming trained in and who are currently interested in Cognitively Guided Instruction. Because I was interested in examining the intersection of reflective practice and CGI, this district was a good fit for my research design.

Currently, the district has two cohorts of teachers undergoing CGI training. The training is optional. There are 45 teachers in cohort 1, currently in year 2 of professional development, and 60 teachers in cohort 2, finishing up their first year of CGI professional development. There are 6 days of CGI professional development per year that include readings, coaching sessions and specific lessons, samples collected, and lessons analyzed. The district is supportive of maintaining and expanding the CGI professional development. I am currently a member of cohort 2 and have developed a good working relationship with several of the teachers in both cohorts.

This study targeted teachers participating in the district's CGI professional development opportunity because CGI is grounded in the idea that teachers need to elicit information about student understanding and build upon that understanding in the moment (Jacobs et al., 2007). The analysis of children's mathematical thinking is not a fixed body of knowledge that teachers

are expected to assimilate. Instead, it provides a framework in which teachers construct and test their models of students' thinking to guide their instructional practices (Carpenter et al., 1996). Cognitively Guided Instruction provides a context for reflecting on and evaluating pedagogical knowledge, one that guides teachers in constructing models of students' thinking that give meaning and aid in making instructional decisions. Thus, it provided an appropriate setting for understanding how teachers move from reflection *on* to reflection *in* action. It is important to note that the teaches who participated in this study self-selected into a multi-year CGI Professional Development cohort, this context is significant in understanding the teachers in this study.

Sample

My study utilized purposeful sampling. I generated a list of 125 teachers who were participating in the district's CGI professional development cohorts. I recruited teachers from both cohorts, which included teachers in multiple grade levels, and from several different school sites. I sampled teachers who taught in a range of grade levels, from transitional kindergarten to fifth grade. Within the district, purposive sampling was used as I needed to include teachers who are reflective in practice. I determined this from the initial survey sent to all teachers identified as belonging to a CGI cohort. My intended goal was to focus on 10 to 15 elementary teachers working in suburban schools participating in Cognitively Guided Instruction professional development; my final sample size was 12. This sample size of participants gave me enough information to make sense of reflective practice while maintaining feasibility for the study. As a part of CGI professional development, teachers are videotaped and their lessons analyzed with cohort members and coaches; this aspect of the program attempted to help ease teachers' natural anxiety from being observed, recorded, and analyzed. This allowed for more authentic

conversations and discussions with the teachers as well as a true representation of the teachers' teaching style and use of reflection.

Data Collection Methods

A survey was given to elementary teachers enrolled in one of the cohorts participating in the district's CGI professional development. This was a web-based survey sent via email to all teachers participating in CGI training. The survey asked questions pertaining to reflective practice and assisted in selecting teachers most likely to be reflective in their practice. From the information provided in the survey, I recruited teachers to be observed and interviewed. My goal was 10 to 15 teachers; my final sample was 12 teachers.

Teachers selected from the survey and who agreed to continue were observed in their classrooms. The observations were video and audio recorded, and I took field notes as well. The recorded observations were part of the post-interview component. The videos were transcribed using Rev.com.

My primary method for data collection was semi-structured interviews with the teachers observed. The interviews were semi-structured with a set of guiding questions that allowed for more open-ended conversation to emerge as opposed to a set of questions in a fully question-and-answer format. I also asked questions about moments that I observed in their classrooms. After the classroom lessons were recorded, I listened to the videos, reviewed my field notes, and identified moments where I noted the teacher paused, pivoted, changed direction, or displayed any other indication of reflection occurring. I pointed out these moments to the teacher during the interview portion; additionally, the teacher was given the opportunity to identify moments during the lesson where internal reflection took place and when, if at all, the teacher changed course in response to what was/was not happening during the lesson that I did not identify. I

conducted 30- to 45-minute interviews of the observed teachers in their classrooms. I recorded the interviews on an audio recorder and used my iPhone as a backup, and then transcribed them via Rev.com; I also took notes during the interviews.

Data Analysis Methods

The following several sections describe the process, including coding the data, preparation of instances, and case analysis, as shown in Table 1.

Table 1

Phases and Methods of Data Analysis

Phase of data analysis	Section heading	Method of data described
Phase I	Preparation and Coding of the Data	Coded interview transcripts and field notes using open-coding techniques and code list
Phase II	Identification of Instances for Analysis	Identified and prepared instances of reflection using data (first interview transcripts, then observation data)
Phase III	Case Analysis	Analyzed instances using a condensed coding scheme based on extensive code list and conceptual framework; compared instances in data

Phase I: Preparation and Coding of the Data

Audio recordings from classroom observations and interviews were transcribed so that they could be coded easily to identify recurring themes. Transcripts were initially coded using an "open-coding" strategy (Strauss, 1987) to capture initial impressions. Analytic notes about insights and the use of codes were kept consistently throughout this process. Second, the codes were collected into a separate working document and arranged into a working code list. This list

became the primary basis for analysis, although refining and modifying codes and searching the data continued throughout the entire data analysis process. Because the majority of my data involved conversations between participants and field notes from teacher observations, I found it valuable to pull out key lines from each interview and observation and sort them into categories. I then began to look for themes within each category. I continued this approach until I had exhausted my data sources. To aid in analysis, I looked at each teacher's interview and classroom observations as a unit, looking for patterns and themes that appeared. These then were coded and categorized.

During the preliminary reading, I pre-coded my data by circling words or phrases that struck me as interesting, as well as underlining specific quotations that resonated with me. Within each category, I created preliminary codes. After reviewing, I reshaped the codes, which I used systematically to analyze my data. I read the transcripts multiple times, sometimes looking for particular information related to codes or categories, other times reading holistically in an attempt to ensure the ideas and thoughts of the teachers were authentically represented.

Phase II: Identification of Instances for Analysis

This data analysis phase involved the selection and examination of instances of perceived reflection-in-action. Instances were defined as teachers' examples of reflection-in-action, and the observers noted identification of reflection-in-action moves. For the sake of comparison and contrast, examples of missed opportunities to reflect ("non-reflective instances"), identified by myself and teachers, were also included in the analysis. The use of reflective and non-reflective instances for analysis had several advantages. The nature of the instances made it possible for teachers to metacognitively view and comment on their own experiences, reflective or otherwise.

Additionally, using them as the basis for analysis ensured that the study's results would be based on experiences significant to the teachers, not just the researcher.

This process involved several steps. I located instances of teachers' reflection and missed opportunities in the data (starting with observation notes), additional information from the observations, and interviews. These segments (hereafter referred to as instances of "cases" of reflection) were indexed, arranged, and rearranged according to patterns related to codes.

Phase III: Case Analysis

The next phase of analysis focused exclusively on these instances, or cases. During this phase, I reanalyzed my data and categories and identified themes, which I narrowed down into key findings. As instances were sorted, three major themes emerged as particularly salient: (a) teachers understanding where their students are, (b) observable shifts, and (c) how teachers are able to make in-action moves. The instances were then sorted and classified, making it possible to compare instances and examine their relationships.

Ethical Considerations

My role as an administrator posed some ethical issues, as I work closely with teachers. Although my research project did not include teachers at my site, there still could have been some concern about my sharing observations and findings with participants' site administrators. In order to address those concerns, I worked to ensure that participants were comfortable, that they understood the study was voluntary, and that their anonymity would be protected. First of all, no identifying information was shared in the study, and teachers were assigned a code as an additional layer of identity protection. In addition, I prepared a Memorandum of Understanding for the district, explaining that the original data are mine. I housed all sources of data on my

laptop and on an external hard drive. Lastly, upon completion, I will provide a copy of my dissertation to all teachers who are interested.

My role as administrator could have led to subjects' reactivity threatening the study. Some teachers may see me as a district representative, so I was careful to come first as a graduate student from UCLA and clearly explained my purpose to them. Teachers may also have felt pressure to answer survey questions a certain way or alter their normal teaching because I was observing them. This had potential to affect the credibility of the study. Utilizing the triangulation of data—surveys, observations, and interviews—helped minimize the effects of any potential reactivity. I practiced my interview questions and technique, thinking about how to ask without leading and elicit honest, thoughtful responses. Being a member of one of the cohorts allowed me to develop relationships and establish trust and credibility with the teachers I worked with.

Credibility/Trustworthiness

My personal bias was also a threat to the credibility of this study. I was careful not to presume I saw changes in instruction or lead teachers to identify instances because I was too enthusiastic about highlighting what I was looking for. My bias could have led me to draw nonexistent conclusions because I was eager to find them. To mitigate this, I used rich data and drew from the interviews themselves, including quotes from teachers to validate the findings.

This study was subject to reliability threats. I pretested my survey by sharing it with content experts and others to ensure my questions were aligned to my research questions. After initial feedback and adjustments, I conducted a pretest with a few teachers and took their feedback into consideration as well. I asked them about the comprehension of the questions, the average time needed to complete the survey, and any other feedback they felt would increase the

survey's validity. After the teachers participating in the study completed the interview, I allowed them to review the transcripts to make sure I accurately represented their information. These efforts were made in order to increase the reliability of the study.

Summary

Reflection and *reflective practice* are ambiguous terms, and their use does not connote the same understanding, which makes the complexity of reflection difficult to measure (Beauchamp, 2015; Danielson, 2008; Jay & Johnson, 2002). However, Clark et al. (1996) asserted that reflective practice allows teachers to practice thoughtfully, intelligently, and carefully, drawing on their knowledge of the context in which they are working during decision making. Reflective teachers must be attentive to students and inclined to make adjustments and devise new models in order to provide educational environments focused on student achievement (Darling-Hammond, 2007; Hart, 1990; Short, 1997).

This study utilized a qualitative approach, incorporating data from semi-structured interviews, surveys, and direct observations. Triangulation of findings from these sources and those from a review of literature provided a robust and complex understanding of teacher reflective practice and its impact on student achievement.

CHAPTER 4: RESULTS

The purpose of this qualitative study was to investigate reflective practice. The following research question directed this study: What do reflective practices look like in an elementary Cognitively Guided Instruction classroom? A sub-question was also investigated: How are some teachers able to make decisions in the moment that affect student outcomes?

This chapter presents the findings of the data reported by the participants through surveys, observation, and interviews. Overall, the interest in the study generated a great deal of curiosity and enthusiasm from the participating teachers. Participants were excited to share their experiences and articulated their hope to influence and improve the quality of others' learning experiences.

My initial goal in observing multiple teachers was to compare teachers who reflected-in-action with those who did not to better understand why some teachers are able to and do reflect-in-action. In my observations of teachers, I saw differing levels of reflection-in-action, finding it more prevalent in some classrooms and not as often in others. It is important to keep in mind this was one observation of a teacher and not necessarily reflective of the teacher's entire practice. I investigated two areas in the data: what reflection-in-action looks like and how teachers are able to reflect-in-action.

Findings

What Reflection-in-Action Looks Like

Reflection-in-action occurs in the teacher's mind but can have visible tells observable to someone looking for them. In my observation of 12 elementary school teachers teaching a CGI lesson, I noticed two main ways teachers pivoted during their lessons. Almost all of the teachers paused at some point. The difference was that after some of the pauses, the direction of the

lesson changed. Most teachers pivoted either in the middle of the lesson due to the whole class's response to the lesson or after a particular interaction with an individual student.

Mid-Lesson Pivot to Meet the Needs of the Class

In most classroom observations, I identified moments of teachers pausing mid-lesson to adjust to the class's needs, needing to either back up and revisit the concept being taught or change tack and move the lesson in another direction. In the interviews, I asked teachers about these moments to better understand their thinking process and how they came to make a change in what they were doing. As the observer, I noticed and highlighted moments where it appeared a change had been made so I could follow up with the teachers in the interviews. I noted explicit mid-lesson pivots and more subtle pivots. Additionally, teachers identified moments where they had changed tack that I had missed during my observation.

Occasionally, I observed the teacher make an explicit move indicating reflection-in-action. Here, the teacher paused the class to highlight specific student work or a strategy to encourage more students to move in that direction or select a different set of numbers to take the lesson back a few steps. In one instance, a kindergarten teacher, DR, stopped the class from completing an exercise. When I asked her why, she explained,

> I've noticed sometimes with choral accounting, it's way too easy, but in this case, that particular lesson, they got stuck on the hundreds. And that's when I was like, OK, well, you know what, we'll come back and visit it tomorrow.

When pressed to help me understand her thinking, she continued:

> Like, I know I can stop [be]cause, they are just, the kids are just throwing out random things, and you're like, OK, this is not, we're not building on anything at this point, and we are at the point where the students are OK with that.

DR was able to identify a moment in her lesson where the direction in which it was heading was no longer benefiting her students. Discontinuing the lesson and changing direction allowed her to meet the needs of her students.

More often, I observed a more subtle change in the lesson. These more subtle changes in the lesson included a comment or suggestion to a small group of students as they were working to help move their thinking along. LS exemplified this type of reflection-in-action when she made a move that changed the lesson for the entire class after a conversation with a small group of students. LS stopped and adjusted the numbers to a problem the class was working on. She explained that in walking around the classroom, she was "gauging their levels" and noticed that this group, which typically represents the class average, was not quite where she expected, so she needed to make a change. LS used the information she gathered from one representative group to make a mid-lesson pivot that affected the entire class.

In addition to the explicit and subtle moves, there were moments completely undetectable (or missed) by me, as illustrated by this exchange in my interview with NJ. While watching the video of her lesson together, I indicated a moment where it looked like she had made a change. She asked me to back up the video a few moments earlier to share when exactly she had decided to make the change. She explained the situation as follows:

> I got [student]'s whiteboard because I was originally going to move on with the lesson and I was just like, let's take a step back and look at her board again . . . because if you look, if you look while I'm walking around, I'm almost ready to move on, and then I kind of back up and stop at [student] and ask her if I can . . . I honestly was about to move forward with the lesson, and then I kind of backed up the train and pivoted because I saw what I wanted to. She [student] did something uniquely different than everybody else did that was accessible for everybody else.

She continued to explain her reasoning:

> She was the only one that did it. So I thought that would support her, but also bring other people into the conversation about what she was thinking and what she was doing. And then that started a whole new conversation. So that was definitely a pivot right there.

I had noticed a point where I thought she had pivoted, but the beginning of her thought process, where she was reflecting-in-action, had started a few moments earlier. This teacher was able to identify the moment where her thinking about making the change occurred versus where I identified the change happening. She was also able to articulate how the mid-lesson pivot brought more of the class into the conversation.

When I noticed a point where a teacher changed the number set she had the students use to solve a problem, she reflected, "If I'm going one way and students don't understand what I'm trying to get them to say to me, I'll rephrase it, back up a little bit." Her insight explained what I witnessed and what was expressed by several teachers during their post-observation interviews, as evidenced further by JD in explaining a change in direction she made mid-lesson after working with a student: "He's not quite there yet where he's organizing it by 10s or by fives or by twos so it [became] a whole class discussion." Teachers who are able and do pivot continuously monitor the situation looking for moments when students, either individual or the whole group, are at a point where a change needs to occur. This is sometimes due to the lesson moving faster than the students, as identified by the teacher.

In-the-Moment Adjustments to Meet the Needs of Individual Students

Another type of reflection-in-action that I observed was teachers pivoting to meet the needs of individual students. I did not see this quite as often, but that may be because it is difficult to capture. During the post-observation interviews, teachers were able to identify moments where they made adjustments to move individual students along the math progressions or help them articulate their mathematical thinking. While not as prevalent as the mid-lesson

reflection-in-action pivot, it was observed or identified in seven of the 12 teachers. Here, the teachers would pause and engage with a student, and that engagement led to a change for that student. LS, when asked about a particular interaction with a student, replied,

> I stopped and asked her how she got certain things, like, are you decomposing numbers when you're counting up? Are you, in other words, using math facts to count up what? What are you doing? She said, "I counted it on my fingers," and I'm like, well, OK. So how did you do that? How does it look? What did you do? How did you do it? Then she told me, "I decomposed the eight into a five and three," which was more advanced than counting on her fingers.

By asking the student questions to gather more specific information about where the student was in their thinking, this teacher could reflect in the moment of the situation and make adjustments to push her student to identify the strategies she was utilizing.

One teacher, SS, teaches an ABA class and shared that she continuously reflects in the moment and adjusts to the ever-changing demands of her students. At one point during her lesson, SS had an exchange with one of her nonverbal students. It appeared to me that she adjusted how she was engaging the student. She asked him to hold up cards but switched to asking him to point to the words on an interactive board. When asked about the moment, she explained,

> So I'm thinking like, gosh, how can I have my student, who's very impacted with his language, participate in this. So I'm thinking through my head, like, I still want him to join in. OK, what question am I going to ask him? And I don't necessarily remember the question, but I remember thinking I want him to participate. Right? And he actually is using a talker [speech aid]. Now I wanted him to have that, that way, to participate receptively. So that's where I was kind of gauging and changing, you know, what I was doing so that they can be that active participant.

In addition to monitoring the whole class, SS was able to identify the needs of one particular student and make changes that affected his ability to participate in the learning.

I observed CA interact with a student, and I asked her about the interaction during our interview. CA had wanted all students to try a particular strategy during the observed lesson, but it was clear the student changed strategies (and found success) after the interaction. I asked her to reflect on what happened and why she had decided to change her plan for the individual student. She said,

> I could see she, she was getting frustrated. I didn't want to lose her completely during the lesson. So I said, "Oh, let's look at this again. What, what do you think about that?" I tried to get her to find her mistakes and ask the right questions, and finally suggested a strategy she had used several times before. Um, but when do I do that? When I can see they're struggling, they don't have anything written down, or they're kind of on the wrong track. They're subtracting instead of adding some, something like that.

I observed JD teach a Counting Collections lesson and noticed that she switched what she gave a student to count after a few minutes. I asked her about this and whether or not she was intentional about who received what collection. Her reply demonstrated her ability to balance student choice with intentionality in making decisions for certain students to ensure their success:

> Yes. So when I'm handing them out, I kind of, I've looked over their pages [work samples] from before. So I know I kind of had an idea of who got what last time, but mostly I let them choose. Right. But with [student] I'm like, Ooh, I know last time she counted up to 50. Great. Let's see if I can challenge her with, you know, like a 75 or an 80. So that's what I did and kind of how I choose.

This ability to identify and target the needs of individual students was harder to identify as it was often subtle, but to the individual students, the impact was tangible.

What Teachers Attribute Their Ability to Adjust Their Lessons To

How teachers were able to reflect-in-action, especially in terms of how they can stop, reflect, and make a change, was an important focus of this study. Three main ideas surfaced: understanding their students, in-depth curricular content knowledge, and teaching experience.

Understanding Their Students

Understanding their students was a common reason many teachers claimed they were able to make the adjustments during their lessons. When asked how she was able to get to the point where she was able to pivot in the moment, MS shared,

> I actually know the answer. Just because I'm thinking about [student], I absolutely know how he sees the numbers. I know that he can decompose that 47 to 40 and 7. And I know he sees the ones as ones, you know, like one, two, three, you know, I knew because I had that knowledge, I was able to take that knowledge and nudge him forward. He said that this 2 represents 20 and that there's 2 represents 20, but you also have a 2 here. You know, I'm like, oh, I wonder why you did that. And then he's like, wait, that doesn't make sense. Because at first he wasn't seeing, and I'm like, it's right there, dude. You got it. It was, he wasn't seeing the mistake on his paper, and then he saw it, and he's like, it says 7 plus 4 is 11. And I'm like, Oh, so then what can we do? And then he's like, ah, the answer's 70. Thank you for highlighting that with [student] because it made me realize if I did it and if I had not known that about [student] and how well he combines like units and understands place value, I wouldn't have been able to ask those questions.

In this example, MS was able to take her knowledge of her student and his understanding of numbers and push his thinking forward. MS directly attributed her ability to make in-the-moment adjustments to her lessons to her knowledge of her students.

The ability to make in-the-moment decisions that affect the direction of the lesson was also demonstrated by GG when asked about a specific move she made:

> I could see out of the corner of my eye that one of my students [for whom] math comes really easy. I knew what he was going to do. I knew he was going to; I just knew it before he even raised his hand. That's why I added it for me, partly as a placeholder, but then also, it dawned on me like, OK, he's going to say this, but this is also good 'cause we've done this before.

GG had been teaching a lesson on fractions along a number line. At one point, she added an additional marker along the line that required a student to add an additional fraction representation. This pushed the student to extend his thinking, in this case from a mixed number to an improper fraction.

When asked "What are you looking for and how do you decide when to shift?" CA responded, "If I'm going one way with it and the kids aren't understanding, I can tell, I mean, obviously when some kids aren't getting it and others are." CA was able to articulate that her understanding of her students allows her to make needed shifts in her instruction.

Content Knowledge

Some teachers attributed their ability to reflect-in-action to the knowledge acquired through specific professional development they had received. Knowledge of content, in this case, math progressions learned through the CGI training, was one reason many teachers claimed they were able to reflect on what was happening and make adjustments. Sometimes it was an adjustment to the whole class lesson, and other times it was with a specific student or small group. For example, when asked how she was able to make a particular move, one teacher explained,

> We've been working on double-digit addition for a while. We've done a lot, like within the 50s. So I wanted to push them towards bigger numbers. We've also been working on a crossing over decades to work on counting. And so I knew I wanted numbers that could have them count and practice counting over decades. So that's why those numbers were chosen next.

The teacher explained that her understanding of the math progressions allows her to experiment more and take risks in her classroom: "So I had to backstep and push them forward. I knew this because of what, what I wasn't seeing and where I knew they needed to go, toward crossing over the decades." This teacher's understanding of math content and the progression along which students learn allowed her to adjust her lesson as needed to meet the needs of her students.

During her lesson, AR was eliciting student responses to a pattern. Students were predicting the following number as they counted by threes. Students were making predictions, and the teacher was recording them on a hundreds chart. At one point, the teacher jumped ahead

and switched to recording vertically compared with the horizontal way she had been recording. I asked her if that was planned or an in-the-moment decision. She reflected on how using what one student shared instigated the pivot and her reaction:

> I was hoping for it, but then he got that so quick. Like that was not far down when we first got started; he already made that connection. So I thought that was great. I figured they would start to see the three at the end, which they did. It helped me adjust because I didn't really pick out the challenge to begin with. I knew I wanted to have some in there, but pick them as the lesson was going on. So I had to change and add more challenging numbers. Sometimes it's hard; you just react for the kids.

This teacher was able to make adjustments to her lesson based on the connections her students were making and her knowledge of the content she was teaching.

When asked if she was looking for certain tells, anything in particular that provoked a reflection-in-action, LS attributed her ability to respond to her understanding of math and the strategies students use in solving problems:

> I stop and ask them how they got certain things, like, are you decomposing numbers when you're counting up? Are you, in other words, using math facts to count up what, what are you doing? Because they'll say I counted it on my fingers, and I'm like, well, OK. So how did you do that? How does it look? Did you decompose the eight into a five and three? What did you do? How did you do it? You go by ones, and then they would tell me exactly what they were doing. So I was just looking for strategies and seeing where they were so I can support them in their next steps.

Later in the interview, we discussed students sharing out, and LS discussed how she selects certain students:

> So I'm looking for the more advanced strategies for the harder problems. But I know the kids that pretty much always use the more complicated strategies because they stick to them by now. And then I'm looking for the ability for [student] to share on that first one and, and build her confidence so that as you could see, she really wanted to share on the first one, and I wanted her to be able to build her confidence so that she feels more. So it's kind of a combination of things, the strategy itself, but also confidence building so that they feel like they're in a safe space to share their thoughts. That's what I hope. That's what I hope I'm doing.

Her pedagogical content knowledge, combined with her understanding of her students, allows her to pause, make decisions, and intentionally move the lesson in a certain direction.

The importance of a thorough understanding of content knowledge, specifically a variety of strategies students utilize, is seen here in my exchange with MV. At one point in the lesson, MV worked with a student and recommended a different strategy for her than she was currently using:

> Interviewer: My question is, why did you recommend drawing?
>
> MV: If I remember correctly, I think [student] had an answer; she had an incorrect solution and not based on anything that she had written down. So I wanted her to think through the problem and draw what she was thinking before she came up with some kind of a solution.
>
> Interviewer: To make sure she's tying the numbers correctly to the story? She kept saying two eights, which it was not; it was supposed to be two fourths.
>
> MV: She was thinking this way, and that's why—I wanted to help her adjust her thinking. She was telling me one thing, but her numbers didn't match her thinking, so I knew drawing it out would help her see what she was saying.

MV's understanding of math strategies, a component of pedagogical content knowledge, provided her the tools needed to make adjustments in response to the needs of her students.

NJ's response to my question about number choice exemplifies the idea that content knowledge is why teachers can reflect-in-action:

> We were doing the number of the day . . . like how many days in school we've been. However, what happened is that I lost a couple of my kids because . . . they didn't have a really strong foundation for number sense. . . . I still have one or two kids that are still drawing by ones. So when we're at like 95, you know, even though I'm trying to give them the guidance and "Hey, look at this person, and they drew 10 frames, and is that more efficient than drawing?"

Here, NJ explained how she was attempting to guide students toward more efficient strategies because the strategies they were using were cumbersome and ineffective with the larger

numbers. She also explained her need to return to smaller numbers in response to some of her students not adopting more efficient strategies:

> One of my kiddos was like drawing. I think the number was 92, and she was drawing them by ones. And it wasn't organized ones. They were kind of like all over the place. And so I'm like, OK, you know what? Let's back this train up a little bit and give her some success.

The teacher could put her student's needs ahead of her original plan of using a particular number. Her knowledge and understanding of where that student was and where she needed to go—in this case, back a few steps—allowed her to adjust what she had planned.

Another teacher, MS, explained that she was able to pivot in response to a student to avoid confusing the entire class. She shared how she monitors the students and changes her instruction based on her hearing and seeing from her students:

> [Student] had pointed out all the 10s and the 7s and how in the beginning of the lesson, she had said that we're counting by 10s. And then at that moment, like 15 minutes later, and she's like, wait a second. We're counting by 7s. And so, at that moment, I had to pivot. I had to address the misconception at that moment. I didn't predict that was going to happen. And so I, most of the time, tell them what we're counting by. We're going to count by 10s, but I didn't start that way. And so my lesson actually did pivot at the point, like the choral count was different. Not telling them what we were counting by, but what do you notice, and what do you wonder? And I wanted them to come to that realization that the 7s always stay there, you know, and the 10s are going. And then [student] is like, well, we're counting by 10s and 7s. And then I wanted to address that. What do you mean by that? And then he's like, well, let's see if you take away the 7, it's 10, 20, 30, 40. And then I knew that the [student] understood.

This teacher could articulate her thought process as she consciously decided to change her instruction in response to the class.

A teacher, in explaining her pause at a specific point, noted,

> It makes me really uncomfortable to let it lay there, and if they don't get it, you don't want to just spoon-feed them the answer. You want them to be thinking and discovering. And so that's definitely a pivot point where I would try and be like, OK, and what if we did this? It's uncomfortable for me to leave something unsolved or incorrect without correcting them.

This teacher shared her struggle with wait time and her conscious effort to react (by not responding) to moments where it makes sense to reflect-in-action.

Experience

During the interview, I asked GG how she got to the point where it is easy for her to make changes in the middle of a lesson. Again, she attributed her ability to reflect-in-action and adjust to her knowledge of her students, but added her experiences in her career contribute as well:

> Well, there's a couple of reasons. First of all, I know my students, right? And secondly, I was lucky that early in my career, there wasn't the prescribed curriculum. And so, like when we were in the RCD [Rigorous Curriculum Design] team, that was like, for me, it was amazing because I felt like the district gave us the freedom to be creative based on our students' needs. Whereas before, like I felt like I had to do day one lesson whatever. So I do follow the curriculum, you know, like Bridges and the Wonders and all that. But I'm also adding to my lessons, and then I just know, and I'll back up. There are times when some, particularly in math, some days they'll throw something at me and I, I have to stop and process it, and then I have to go, OK, let me write this down or let me think this through. Some days, it's easy to take and run with it.

GG is able to draw on her experience, both in the number of years she has been teaching and the different learning experiences she has had, to make changes in her lessons. This implied a logical, analytical approach to the situation based on an understanding of curriculum experience in her career. This highlights the theme that knowing has everything to do with possession of information, analyzing a situation, and applying the information. Teachers were also able to articulate an understanding of themselves as professional teachers.

Another teacher also attributed her ability to pivot to experience. She discussed her frustration with students learning from outside tutors and how she manages what they bring to class:

> So I've also learned over the years, particularly in math, I have to be so prepared every day, you know, because you never know which strategy your student's going to use, which is a good thing. It's, it's a wonderful thing. I'm trying to figure out their strategy!

She is able to handle and adjust based on her years of teaching.

The following exchange between MS and myself exemplifies reflection-in-action, based on experience, although in this case, a lack of action. While watching her observation, she stops herself from explaining and allows for a long pause and (almost) uncomfortable silence:

> Interviewer: How do you think in your teaching you got to the point where like you have the ability and wherewithal—for lack of a better word—to do that?
>
> MS: This is the hardest challenge. Because I've been doing the CGI work, this is my fourth year. The hardest part of this whole process is how to know when to not say anything. Because our words, I mean, just one word here or there, are going to take them into a direction one way or the other. So I think it's experience. I'll be honest because I'm still learning how to do this because when we first did that work, I am doing in the professional development. So, then, how, where's that balance? And I think for me it's been experience and yeah, 'cause it's because each kid is different, each problem is different, and that is, this is it.

MS is able to reflect on and articulate how she is able to use her experience and understanding of CGI pedagogy to adjust as she teaches; in this case, the adjustment was to pause to allow students to sit and think about the work they were doing. Reflection-in-action values the artistry of practice.

Why Teachers Are Able to Reflect-in-Action

Many of the teachers referred to a certain level of confidence that allowed them to adjust their lessons. Not only did this confidence or sense of self allow them to make the initial move, but it gave them the conviction to respond to wherever the pivot led the students. Some teachers spoke of this as developing throughout their career; others more explicitly attributed the confidence to CGI training.

Toward the end of our conversation, I asked DR to help me understand why she was able to make the necessary adjustments, both with the whole class and with individual students. She replied,

> I think, well, now I know I had it in me, but I wasn't confident with it. I was always, well, I want to do this, but is that the traditional way? Is that, you know, I always had hesitation. I have to say since I've started really getting more involved with the district and more involved, like with math fellows and science fellows, and really taking on ownership of a lot of the professional developments and they're guiding us towards it's OK to pivot.

DR attributed her ability to make in-the-moment changes to her experiences and professional growth opportunities. Specifically, she shared,

> I know some of it comes with experience. Right. But then I also think there's some kind of like that wherewithal within me. The confidence to be able to say, yes, I'm going to make this pivot. And I'm, you know, I'm trusting myself that it's the right one, but if it's not, well, we're all learning.

Her answer exemplifies the idea that confidence empowers teachers to take risks and be comfortable with the outcome.

Sense of Self

Not all teachers used the word *confident* to describe how they were able to reflect-in-action, but teachers with a solid sense of self were able to articulate the thought process of their reflection-in-action. When asked why she moved away from a specific problem, NJ explained,

> They [students] didn't get it, but I'm not going to just throw the answer at them or lead them and spoon-feed them every single piece. I want them to discover and look at it. That might be something that we circle back to another day.

NJ was comfortable enough with her teaching to be OK with stopping the lesson and not pushing through for the sake of completing a task.

Other teachers were able to share how their decisions were directly connected to understanding themselves as intuitive professionals. There was a moment in the video of GG's

lesson when she adjusted the numbers of a problem set. It was not something I had observed, but she identified it as a conscious move on her part. When I asked her how, she responded,

> I think it happens intuitively, it's just like, we're going to start adjusting now. It's not only those structured things that you learn and take notes on and study, but it's a part of thinking on your feet, and this is a good idea. It wasn't in my plans, but I'm going to do it because it's going to work for my class right now.

She continued by explaining that the fluidity in her lessons has become second nature, acquired confidence, or a sense of self.

An understanding of self was not as evident as an understanding of students; however, teachers who demonstrated and articulated both concepts also had more instances of reflection-in-action identified, either self-identified or pointed out by myself. Of the 12 teachers, six explicitly shared both qualities, and examples of reflection-in-action were evident.

Confidence From Knowledge

Another area that emerged from the data was teachers crediting their confidence in making adjustments to lessons in the moment to their deep understanding of curriculum and instructional strategies. Teachers made statements that indicated that this knowledge gave them the confidence to pivot when needed to support the class or individual students.

When asked why she had participated in the CGI training, SS shared that she understood her lack of confidence was holding her back from addressing her students' needs:

> I enjoy learning, but I just didn't feel confident in understanding the standards and being able to help support my students. And I was like, I need to figure this out. Like, there's a lot more to this. I felt like the area of, and the understanding of math was my weaker side. I wanted to take some classes to help my students. I don't want them just to memorize. I want them to know, like know it. I want them to be able to explain it to me; I want to be able to support their learning. And that's what really motivated me to go through a CGI professional development program.

SS continued by explaining that because she has a deeper understanding of math and the math progressions, she is able to make adjustments and support her students with confidence, knowing she will be able to address whatever happens in the classroom.

This idea of confidence, regardless of where an adjustment made in the moment takes the class, was exemplified by MV while discussing a student who was sharing out and slow to grasp the concept of the lesson. I asked MV how she balanced allowing the student to share incorrect information while she worked through her thinking with making sure the rest of the class did not become confused. MV shared that she knew she would be able to clear up any misconceptions developed, and in that instance, allowing the student to process her thinking was worth a controlled risk. Her confidence, while not explicitly stated, was evident in her actions.

Another teacher, MS, displayed similar confidence during a Choral Counting lesson. The teacher had students counting by 10s starting at 7. For me as the observer, it appeared the lesson shifted from its original path. When I asked MS about the shift, she explained:

> So in particular, this lesson, when I saw that she [student] said, we're counting by 7s, and then [another student] followed up with 10 and 7s. I had [another student] come in to kind of clarify the 7s never change, you know? And then I go back to [original student], can you reverse what she just said? And then that way now they're all like competent because they're all part of it, because what she said was correct, what he said was correct. You know, and then now she's just clarifying what they're all saying. And then, hopefully, you're bringing others on the bandwagon. So that's kind of like where that went, and I did not expect that to happen. And that was truly in the moment.

Her expectation of her students' ability to teach one another, her being OK with letting the lesson go, knowing in the end she would be able to bring it back if the students were not able to, is an example of confidence due to a teacher's understanding of her students and in her classroom management abilities. Without a clear understanding of where her students needed to go and the confidence to adjust to wherever they went, she would not have been able to adjust the lesson.

Conclusion

Reflection-in-action begins and develops in recognition of opportunities to make adjustments. Opportunities "in action" provide material for reflection. Teachers' understanding of the curriculum and a clear understanding of their students contribute to their ability to reflect-in-action. Finally, the importance of confidence reveals the significance of this concept to the development of reflection-in-action in teachers.

CHAPTER 5: DISCUSSION

Understanding reflection and reflection in practice as a practical, working principle provides the structure and support needed to facilitate learning to teach, leading to more effective teachers and ultimately benefiting student learning. Reflection-in-action accepts that teachers draw on personal and professional experiences and are willing to engage in on-the-spot changes creating solutions to the current situation. Teachers who alter tack mid-lesson based on formal and informal assessment of student engagement and understanding make a move (an action) that generates an effect. This effect is feedback for the teacher to reaffirm or modify their approach and continue the feedback loop (reflective practice).

This study builds on others that have explored reflection but not reflection in practice. The findings of this study both support and extend what is understood about reflective practice. Perhaps the most significant contribution of the study is what reflection in practice looks like in an elementary classroom. This chapter first discusses implications and continues by providing recommendations. The recommendations that emerged from this study can inform practice.

Summary of Key Findings

I identified two principal moments in which teachers pivoted while teaching. Most teachers pivoted either in the middle of the lesson due to the whole class's response to the lesson or after a particular interaction with an individual student. Additionally, teachers attributed their ability to make these adjustments to their understanding of their students, their own knowledge of the content being taught, and their personal and professional experiences. My research also found that a sense of self and confidence were reasons teachers identified as aiding in their ability to make in-the-moment decisions and alter the trajectory of their lessons. These findings are further outlined in the previous chapter.

Connection to Literature and Research

The findings of this study make a contribution to prior literature and research on theories of reflective practice. First, they increase the body of information surrounding Schön's (1983, 1987) theoretical model of reflection-in-action, on which the study was based. They add to what is known about the teacher as a reflective practitioner, including what reflection-in-action looks like and how teachers develop reflection-in-action practices. As early as 1910, John Dewey recognized and stated the value of using the reflection process as a vehicle for practitioners to enhance their educational experiences, evaluate their instructional practices, and make sense of their decision-making processes. Dewey argued that reflective thinking moved people away from routine thinking and acting toward reflective action. This way of conceptualizing reflection stresses how we learn from doing, i.e., practice and experience. Dewey argued that we "think the problem out" toward formulating hypotheses in trial-and-error reflective situations and then use these to plan action, testing out our ideas. The teachers I observed demonstrated this idea and discussed it in post-observation interviews by connecting their ability to pivot to experience.

Decades later, Schön (1987) would not only complement Dewey's work but expand upon it, calling for the incorporation of reflection in in-service or professional development experiences. Schön believed that as professionals become more expert in their practice, they develop the skill of monitoring and adapting their practice simultaneously, perhaps even intuitively. The results of this study correlate with Schön's thinking about the role experience plays in a teacher's ability to reflect-in-action. Frederiksen (1983) suggested that decision making around undefined problems requires a repertoire of information (content knowledge) and flexibility in strategies for accessing and using that knowledge. These ideas were identified and discussed by the teachers in this study.

Several teachers in this study identified their content knowledge, specifically related to mathematical content and progressions studied in CGI professional development, as a reason they were able to make needed adjustments to aid in their students' learning. This correlates with the work of Carpenter et al. (1996), who theorized that understanding the development of children's mathematical thinking could result in changes in teachers' beliefs and practices. Their work examined the need for teachers to focus on reflection and discussion. They identified that significant changes in practice are dependent upon teachers altering what they know to be true. They understand that students construct knowledge and must adapt instruction accordingly.

The identification of confidence as a means to reflective action agrees with the research of Furtado and Anderson (2012) and Lieberman and Miller (2005), who proclaimed that reflective practice can lead to positive outcomes, such as confidence and higher self-efficacy. The idea of a sense of self as important to a teacher's ability to make adjustments is connected to Tannenbaum's idea that there is an intuition of knowing how, as opposed to knowing what, that is critical to understanding reflection in practice. Teachers in this study who were able to adjust in the moment referred to, often indirectly, an intuitive ability to monitor the situation, utilize their understanding of their students, and integrate their experiences and content knowledge to intuitively adjust their teaching.

Implications

A careful review of the data revealed several themes. I was able to identify specific moments where reflection-in-action took place. The identification of specific tells is an important addition to our understanding of reflective practice. Not frequently discussed in the current literature are specific identifiers as to what reflection-in-action looks like. These moments allow for post-observation conversations surrounding the effects of the adjustments made as well as

conversation as to the how and why teachers were able to recognize the need to alter course. Schön believed that as professionals become more expert in their practice, they develop the skill of monitoring and adapting their approach simultaneously, perhaps even intuitively: reflection-in-action. The work of Schön is instrumental, but it is limited. The data from this study, the recognition of identifiable moments, go into new territory, allowing us into the actual moments to tease out how and why teachers are able to act on their thoughts. We should leverage this information to provide teachers specific feedback and tools to incorporate reflective practices into their repertoire. We need to incorporate identified and perceived moments of change into teacher observations, encourage reflection, and empower teachers to make adjustments based on knowledge of their students, curriculum, and experience.

Prevalent in the conversation and observable during lessons was the idea of confidence being an underlying contributor to a teacher's ability to pivot. While not all teachers identified confidence by name, it was palpable and observable to me. Sometimes, it was heard in their voice as they described knowing their students or why they made a particular adjustment, but more often, it was in how they described their lack of concern for where the lesson would go post-adjustment. Knowing that they would handle whatever occurred as a result of the change was noticeable confidence. What teachers perceive as enabling their ability—their knowledge of students, experience, content knowledge, and confidence—is another area where this study deviates from prior research and contributes to our understanding of reflection-in-action. This study points to a few important implications for teacher educators and leaders in their work with students. The first is concerning how teachers respond to students, both to their class as a whole and to individual students. The second implication concerns ideas surrounding to what teachers

attribute their ability to reflect-in-action. The third concerns the role a teacher's confidence plays in reflection-in-action. In this section, I explore the implications of the findings of this study.

I begin this discussion of implications by considering reflection-in-action as one method of transforming the way teachers respond to situations. At one time or another, each participant in this study reacted to a situation in their classroom. For example, AR, in explaining why she switched her Choral Count from 2s to 10s, articulated her inner dialogue and the resulting action:

> I thought it's going to sound like a huge challenge to jump by 10s, but maybe they'll make those connections and fill in those gaps so that when we move to the Bridges work we've been doing, it can help them move forward. I felt like 10s is really where it's at. I did say it was challenging because I knew at first it was going to seem challenging, but they seemed to make those connections. So I felt like it went pretty well.

Reflections-in-action were challenging to capture, as they were observer-noted or participants' recollections. Evidence of a reflective process was interspersed throughout the data and was primarily represented by comments and actions. The most important implication for me as the researcher was the need for instruction in reflection. Implications for the field include examining how teachers learn to conceptualize reflection and identify and discuss reflection as a part of their practice. Studying teachers in the school environment, Wildman et al. (1987) discovered that many teachers demonstrate a naturally reflective style in their daily work. However, their reflection may be unintentional as well as unfocused and unsystematic (p. 144). By incorporating specific, observable moments (the tells identified in this study), those in charge of coaching and supporting teachers will have the ability to turn unfocused and unintentional into concrete moments to discuss and learn from.

The study described in this dissertation was designed to contribute to a better understanding of reflection-in-action. Because reflection is so central to teacher learning and effective teaching (Hawley & Valli, 1999), the results of this study have implications for

teachers' professional learning. Following are recommendations at both the district and site levels.

District Level

Ambitious changes in education and teacher development are being called for by both opponents and proponents of public education and educational reform movements (Darling-Hammond, 2000; Fullan & Miles, 1992; No Child Left Behind Act, 2001; National Commission on Teaching and America's Future, 1996; The Teaching Commission, 2004). Within the context of change, policies and practices should be adopted systemically to incorporate the support and education of reflective practice teaching through professional development to improve classroom teachers' instructional methods. Failure to change policies and practices will fall short of the goal of improved teacher quality and student outcomes (Borko, 2004; Fullan & Miles, 1992; Ravitch, 2006). The findings of this study suggest that teachers' knowledge of their students and curriculum enables teachers to reflect-in-action. Several factors have the ability to increase this phenomenon. Instruction in the use and purpose of informal/formal and formative and summative assessments will provide teachers the information and skills needed to gather data on where their students are.

Additionally, an in-depth understanding of standards and their application will provide teachers the foundation for making in-the-moment decisions based upon their knowledge of their students and the curriculum. Professional development in these areas is critical to providing teachers the tools to develop as reflective practitioners. Clark et al. (1996) stated that professionals should be able to improve their decision-making process by using education and experience and applying this knowledge to a new problem of practice.

The potential for learning associated with a reflective approach to practice depends on teachers' opportunities to engage in activities that require particular conditions and resources to create them. The study of CGI pedagogy and its reflective nature may provide opportunities and experiences that support a reflective approach. Leaders interested in providing opportunities for teachers to reflect-in-action and systems that support these opportunities should consider training and instruction for teachers and those in positions to support teachers in CGI pedagogy. In the future, research that focuses on fostering reflection activities will be helpful, for such a focus makes it possible to discuss, encourage, and support reflective practice.

Additional considerations in planning experiences for teachers to increase reflection-in-action include taking the developmental readiness of teachers into consideration. Hobbs (2007) suggested that learners need to be developmentally ready to engage in critical reflection. Utilizing the finding from this study regarding teachers attributing their ability to reflect-in-action to experience supports this theory. Understanding when teachers would be ready to engage in discussions and professional growth in reflective practices should be considered when planning professional development opportunities. Hobbs (2007) argued that novice teachers have not yet examined their own personal theories of learning/teaching and that using borrowed routines requires depths of understanding these new teachers do not possess.

School Level

The teaching of reflection-in-action is difficult by nature. One possibility would be for teachers to hear about the experiences of other teachers in practice and how reflection helped them. In addition, I would recommend they be given opportunities to discuss various situations, allowing for teachers to discuss, ask questions, and be questioned. Teachers need to see that practice often involves uncertainty and that answers are never clear-cut. Creating spaces where

teachers can share and ask for input without judgment or evaluation is a critical component of the successful implementation of professional development opportunities. Pairing novice teachers with more experienced teachers known to be competent, reflective practitioners is one way to support the process. Reflection is not always an easy process; sometimes, it is difficult to identify areas of weakness or strength. A mentor teacher will bring in different perspectives and experiences that will help teachers analyze reflection-in-action moments and their outcomes to assist teachers in gaining the confidence to continue future implementation: "Unless teachers develop the practice of critical reflection, they stay trapped in unexamined judgments, interpretations, assumptions, and expectations. Approaching teaching as a reflective practitioner involves fusing personal beliefs and values into a professional identity" (Larrivee, 2000, p. 293).

During the interviews, several teachers identified and discussed moments that led to moving students' thinking or progressed them through the lesson. These were often missed by me as the observer of the lesson but are important to acknowledge. This study identified specific and tangible tells. Recognizing certain moments and tells that are exemplars of reflection-in-action is important to leaders supporting teachers. Identifying these moments will provide substantial examples to discuss, specifically the how, why, and result of the change. Normalizing this is an important next step in teacher observations. Most current models are observation focused, and the conversions rarely include evaluators questioning and validating the moments where a change happened and acknowledging it as a positive component of quality teaching.

Administrators and others in evaluative roles need to recognize their positionality and provide opportunities for teachers to be observed and discussed—explicitly looking for reflections-in-action, both seen and missed opportunities—without fear of penalty or judgment. Here, teachers will be able to identify moments of internal reflection in a nonjudgmental arena

and develop the confidence this study also found to be impactful in successful reflection-in-action practitioners. Given the pedagogic aim of developing teachers' confidence and proficiency in reflection, I would recommend small group work acknowledging that practitioners gain from working in a dialogical team able to provide the alternative perspectives vital for reflective practice. Teachers knowing their students and the content they teach is critical, but not enough. Teachers need the confidence gained from knowing they are making the correct adjustments that benefit students.

The use of technology similar to the recording device used in this study should be considered. A video-enhanced reflection process provides solutions to the barriers that could potentially prevent reflection from being meaningful by providing an additional perspective. A recorded video can provide a platform where the practitioner and/or a support teacher can identify moments of reflection, both actual and suspected, increasing the number of things teachers notice about their teaching, which would help them more effectively identify areas for improvement.

Video recordings of master teachers can provide teachers developing their practice with concrete examples of what reflection-in-action looks like. Pairing that with the master teacher's insights, explanation, and commentary of their thought processes can be a powerful tool available to teachers without access to a master teacher on site. Understanding what reflection in practice looks like will provide teachers with experiences to draw upon as they work to understand their own reflection-in-action process.

Another essential element is time. Teachers and school sites need to commit to the process, the time it takes to develop all of the support tools (content knowledge and understanding of students), and the time needed to fully develop as a teacher able to reflect-in-

action. Time in professional growth opportunities, time to watch recorded lessons, time to reflect, and time to meet and dialogue with a mentor are all important pieces of the reflection puzzle, and they should be incorporated into teachers' schedules.

Limitations

There were several limitations to this study. The number of research participants was small compared with the number of teachers utilizing CGI within the district utilized for this study. The convenience sample included only teachers who agreed to take the survey, be observed, and complete the post-observation interview. Only a portion of eligible teachers participated. This limited the study to participants who have had a positive experience with CGI. This same limitation may have included various participant biases and could have been an exaggerated or understated description of the reflective process. The study was further limited by the researcher's own limited understanding of CGI, as I have attended many seminars but am limited in teaching experience utilizing CGI.

Recommendations for Future Research

This study suggests future directions of inquiry for reflection-in-action. The first is the effect of training in CGI pedagogy and its impact on the quality of reflection. We need to take what we have learned from reflective practices in CGI and apply it to other curricular areas. Additional research in the predominance of reflection-in-action in different curricular domains is a logical next step based on the comments made by several teachers during the interviews. This was exemplified by AR when she was asked if she was more responsive in other curricular areas after her CGI training. She shared a moment during a recent ELA lesson:

> It just kind of turned into this conversation that I didn't plan on. And it was just like, let's go with it because it was really like, they were having a much more in-depth conversation. So I think that yeah, it's definitely changed the way we have conversations.

To accomplish this, the sample size should be larger and more representative of the teachers in the district, not just those involved in a CGI cohort. This will present a more comprehensive view of the use of reflection-in-action across classrooms. Second, future research should employ several methods to gather data. This will require substantial resources in time and people and include conducting long-term field observations and multiple interviews. I would further recommend developing new or expanded ways to incorporate and measure reflection-in-action as a component of a professional development program. Research on tools beneficial to reflection-in-action development and sustainability, including a mechanism for evaluating reflection-in-action, are important next steps. The tools should be able to link to the impact on student outcomes.

In the future, research that continues to focus on fostering reflection activities will be helpful, for such a focus makes it possible to discuss, encourage, and support reflective practice. Reflection as a practice can be taught, learned, and assessed (Rodgers, 2002a, 2002b).

Conclusions

In *The Reflective Practitioner* (1983), Schön inquired into the epistemology of professional practice by closely examining how certain professionals actually work—their wisdom, talent, intuition, and artistry. He focused on the process of reflection on the doing of one's work, particularly in situations of uncertainty, uniqueness, and value conflict. He was interested in how competent professionals are aware of puzzling events during practice and their ability to analyze and explore these events. "Reflection-in-action" is his term for "how professionals think in action," and he believes that "it is the entire process of reflection-in-action

which is central to the 'art' by which practitioners sometimes deal well with situations of uncertainty, instability, uniqueness, and value conflict" (p. 50).

Research has shown that formal reflection on teaching can improve the understanding and practice of pedagogy, classroom management, and professionalism (Grossman & Williston, 2003). Reflection-in-action provides a framework that acknowledges the "not knowing" of teachers and transforms it from a negative to a positive state, leading to experimentation, change, and growth. The concept of reflection-in-action encourages a move from easy answers to thoughtful responses. The findings of this study point to the need to consider ways of creating opportunities for the development of reflective thinking among teachers to promote the development of their ability to think critically and be flexible in solving problems. Reflection can therefore be seen as an integral part of the teacher's professional development.

APPENDIX A: SURVEY & INTERVIEW PROTOCOL

Introduction (Appreciation, Purpose, Line of Inquiry, Plan, Confidentiality, Reciprocity, Consent to Participate, Permission to Record):

Thank you for agreeing to participate in my study. I appreciate the time that you have set aside to answer some of my questions. The interview should take about an hour, does that work for you?

Before we get started, I want to provide you with an overview of my study and answer any questions you might have about participating. I am currently conducting a study to be used in my dissertation for UCLA. The primary purpose of this study is to investigate reflective practice. I am conducting interviews and I have structured my line of inquiry around reflective practice, looking closely at teachers utilizing CGI.

I want to assure you that I am strictly wearing the hat of researcher today. What this means is that the nature of my questions is not evaluative. I will not be making any judgments.

I am happy to provide you with a copy of my final paper if you are interested. Might you have any questions about the study before we get started? If you don't have any (more) questions, I would like to have your permission to begin the interview. I have brought a recorder with me today so that I can accurately capture what you share with me. May I also have your permission to record our conversation?

Survey Questions

Please Note: All responses will be kept confidential. Thank you for your assistance in this research.

1. Share a recent experience where a student surprised you or did something unexpected.
2. How do you make decisions about what to take-up or not, during a lesson? How do you know when to pause and when to move forward?
3. What student indicators do you look for in order to make adjustments to a lesson?
4. Outside of school, are there areas in your life where you are reflective?
5. Do all reflections lead to action?
6. What if, after reflection, you do not know what to do?

Interview Questions

It will be important that I set-up the questions and experience to allow for teachers to share non-experiences, or moments that weren't reflective without it feeling like a negative. I will need to frame the interview by stating that sometimes teachers need to think about their actions and other times teachers just know in the moment. …how much, if at all, were you thinking here?" Giving teachers permission to say they weren't thinking in the moment.

I anticipate I will use phrases like:

That is interesting, could you please tell me a little bit more about…

I want to make sure I understand, could you please tell me what you mean by…

I am wondering how you were feeling in that moment.

Can you explain where you had to make a different decision, or were unsure of the next steps, how to react to the student?

What supported you to get here?

What did you want to learn?

Why/how were you able to make this shift?

Can you describe what you were feeling?

Why did you make that move?

Can you explain…

That looks interesting, why did you….

What enabled you to reflection in that moment?

I will conclude with:

You've had a chance to hear my questions. Is there something you think is important that I haven't asked about, or that you'd like to share with me?

Thank you so much for you sharing your thoughts with me today! I appreciate your time and willingness to share. Everything that you have shared is beneficial for my study. If I find myself with a follow-up question, I wonder if I might contact you, and if so, if email is ok? Again, thank you for participating in my study.

Proposed email to recruit teachers.

You are receiving this email because you are involved in NMUSD CGI Professional Development and are a member of one of its cohorts. As part of my dissertation through UCLA I am conducting a study on teachers utilizing CGI in their classrooms. I am seeking participants

willing to complete a brief survey, have a CGI lesson recorded by me and participate in an interview about the lesson afterwards. Teachers selected will receive a $25 gift card. No teacher names or other personal information will be included in the study, all participants will be given a generated code. The information gathered is purely for research and will not be shared with your administrator or used as part of any evaluation. Please reply to this email if you are interested in participating or learning more.

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