Title

Trust in Action: An Examination of Middle School Math Coaching Relationships

Permalink

https://escholarship.org/uc/item/2qv248cc

Author

Moreno, Callie

Publication Date

2018

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Trust in Action:

An Examination of Middle School Math Coaching Relationships

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Education

by

Callie Lauren Moreno

2018

ABSTRACT OF THE DISSERTATION

Trust in Action:

An Examination of Middle School Math Coaching Relationships

by

Callie Lauren Moreno

Doctor of Education

University of California, Los Angeles, 2018

Professor Christina A. Christie, Chair

Mathematics coaching can have a positive impact on classroom teaching practices and outcomes for students, and there is a demonstrated need for improvement in mathematics teaching. This qualitative study examined the practices of three middle school mathematics coaches implementing the *Responsive Teaching Cycle* (RTC), a budding new approach to coaching. The math coaches were part of a U.S. Department of Education Investing in Innovation (i3) grant-funded project with California State University Northridge called Collaboration Resulting in Educators Applying Technology Effectively (CREATE). Teachers collaborated with an RTC coach and other grade-level teachers and were supported in the use of technology to aid in the design of learning activities.

Data collection and analysis painted a picture of teacher-coach relationships through an open-ended questionnaire, document analysis, observations of coaches with their teachers, and individual interviews with coaches and their teachers. These data were analyzed and discussed to

provide a rich description of teacher-coach relationships in RTC coaching to give insight to building trust within these relationships.

This study of trust-building in the context of RTC coaching provided rich descriptions of trust in action that supplied valuable insights to this model as well as learnings and additional questions that extend beyond its boundaries. The results of this study confirm prior findings on trust in that trust was found to be influenced by a number of factors in varied combinations within the examined relationships. This study supports the literature finding that trust changes over time. The relative absence of trust-building symbolic acts carried out by coaches is incongruous with the literature and represents a strength of RTC. RTC holds promise as a coaching model that builds trust while building teacher capacity. When implemented with fidelity, RTC coaches build trust as they engage teachers in meaningful coaching conversations. Coaching practices observed and described herein can be incorporated by coaches outside the studied context. Concrete examples of trust in coaching relationships help inform current practice for coaches and coach trainers. It is my hope that this work contributes to the improvement of student outcomes by aiding in the development teachers through expansion of a nascent coaching model.

The dissertation of Callie Lauren Moreno is approved.

Megan Loef Franke

Jody Z. Priselac

James W. Stigler

Christina A. Christie, Committee Chair

University of California, Los Angeles

2018

DEDICATION

To Ventura and Daniel. My reason and my foundation. I love love love you.

To Nic and Bo. My role models and my keepers.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

VITA

1999 – 2004	Bachelor of Arts Occidental College Los Angeles, CA
2007 – 2009	Multiple Subjects California Teacher Credential CalState TEACH, Los Angeles, CA
2008 – 2013	Math Teacher Aveson Charter Schools Altadena, CA
2013 – 2018	Math Coordinator Aveson Charter Schools Altadena, CA
2018	Director of Educational Programs Allegiance STEAM Academy – Thrive Chino, CA

PUBLICATION

Cheng, I., Ainsworth, A., Applerouth, S., Xie, J., & Moreno, C. (April 2018). *Equipping and empowering 8th grade mathematics teachers to create dynamic learning activities promoting conceptual understanding*. Paper presented at the Annual Meeting of American Educational Research Association, New York, NY.

Introduction

Ample evidence suggests that current U.S. mathematics instruction is not serving to produce a quantitatively literate populace. Fewer than half of students tested meet national benchmarks (National Assessment on Education Progress [NAEP], 2015). Additionally, U.S. students perform below the international average on the Programme for International Student Assessment (PISA; Organisation for Economic Co-operation and Development [OECD], 2014). Trends of low numeracy skills persist in adulthood as American adults performed below the international mean on the Programme for International Assessment of Adult Competencies (PIAAC), taken in 2012 and 2014 (Rampey et al., 2016). On average, U.S. schools are not providing students with adequate learning opportunities to succeed in mathematics. Increasing achievement in math is critically important and requires a multi-faceted solution. The aim of this study is to contribute to research regarding an approach to a solution.

Middle grade math teachers are confronted with an especially challenging confluence of circumstances—rigorous content, substantial pre-adolescent and adolescent developmental needs, and a teacher preparation system that lacks specialization in training for middle level education (National Council of Teachers of Mathematics [NCTM], 2000). These conditions necessitate a strong professional development strategy for teachers of middle school mathematics.

Mathematics Performance

On both international and national mathematics achievement tests, American students demonstrate sub-standard math skills. The latest PISA results show the U.S. is below average in math among the world's most developed countries (OECD, 2014, 2016). Despite some upward

1

trends in the most recent NAEP results, reporting a nationally representative sample of fourth and eighth grade students, only 40% of U.S. fourth grade and 33% of U.S. eighth grade students performed at or above proficient on the mathematics test (NAEP, 2015). On the Smarter Balanced Assessment for the State of California, administered in third through eighth and 11th grades, more than half of students (63%) scored below proficiency standards (California Department of Education [CDE], 2016).

Examination of mathematics assessment performance by U.S. students reveals the persistence of race, class, and gender achievement gaps (Bahr, 2010; Braun, Chapman, & Vezzu, 2010; Cheema & Galluzzo, 2013; Lubienski, 2002; Tine & Gotlieb, 2013). Average math scores on the NAEP (2015), for example, show that White students outperform their Black and Latino counterparts, and the racial achievement gap is greater in eighth grade than in fourth grade. The achievement gap in mathematics contributes to educational, economic, and social inequities.

Importance of Quality Mathematics Education

The struggles students face in middle grades can lead to challenges later in life. Math achievement has a close relationship with attaining higher levels of education. Placement in remedial or developmental courses makes students much less likely to attain a 2-year degree or transfer to a 4-year school (Bahr, 2013). Almost 60% of students entering community colleges require remedial math (Bailey, Jeong, & Cho, 2010), and 75% of those placed in remedial math do not achieve college level mathematics skills (Bahr, 2013). The K-12 racial disparity in math persists into postsecondary education, with Black and Latino students placing into and failing to complete remedial math courses at disproportionate rates (Bahr, 2010).

Furthermore, a lack of basic math skills can be a handicap in the labor market. According to a recent survey by the National Association of Colleges and Employers (NACE), 70% of

employers are seeking problem-solving skills in applicants and almost two-thirds are seeking analytical and quantitative skills (National Association of Colleges and Employers [NACE], 2015).

In addition to acting as a barrier to higher education and employment, lack of basic quantitative literacy has deleterious effects for having an informed citizenry. In order to participate in our democracy in a productive way, people need a basic level of numeracy (D'Ambrosio, 2009; NCTM, 2014). For individuals to make informed decisions about elected leaders and policies, the ability to interpret data accurately is essential. Understanding unemployment rates, economic statistics, crime rates, and atmospheric carbon rates all have implications for evaluating important local, state, and national policy agendas. Math education in the U.S. warrants attention and research-backed solutions aimed at providing our youth with the tools and reasoning skills they need to navigate and critically analyze our socio-political environments.

Background of the Problem Studied

Well-trained and highly competent teachers are instrumental in improving student outcomes in math. Although both in-school and out-of-school factors influence student achievement, research abounds that teachers have profound effect on student achievement (Darling-Hammond, 2000; Goldhaber, 2016; Ing et al., 2015).

Successful teaching is a complex and demanding endeavor. It involves having deep content knowledge, understanding how students learn within the discipline, understanding and knowing each student's preferred learning style, facilitating learning for different learning modalities, managing classroom behavior, evaluating student skill level, and more. An

examination of the preparation of U.S. middle school math teachers exposes a challenging landscape for middle level educators.

Middle school mathematics teacher preparation. Thorough training is required for teaching middle school mathematics to address both the content matter and the developmental level of this age group. As young adolescents, middle school-aged students experience a time of significant cognitive, physical, and emotional transition. Teachers who are aware of these developmental needs and how they affect learning are more likely to be effective (Horowitz, Darling-Hammond, & Bransford, 2007). This unique and dramatic shift in child development substantiates the specialized training required for teaching this age group. However, California lacks a middle grades teaching credential, and therefore, few if any programs are tailored to prepare teachers for the unique developmental needs of young adolescents (Howell, Faulkner, Cook, Miller, & Thompson, 2016).

Exacerbating the problem of preparing U.S. middle school math teachers is the limited opportunity for content knowledge development. Training in mathematics content of U.S. middle school teachers is not as strong as that provided to teachers in countries with students who perform better on the international Trends in Mathematics and Science Study (TIMSS; Center for Research in Mathematics and Science Education [CRMSE], 2010). Individuals who become teachers in the U.S. begin their teacher education programs with a lower mathematical content knowledge than their international peers, and once they complete teacher preparation programs, they are similarly behind (CRMSE, 2010; Schmidt et al., 2007). The math content knowledge of U.S. elementary and middle school teachers reflects the trend that is seen in student performance on TIMSS—like their teachers, third and fourth grade students perform about average and middle school students are below average (CRMSE, 2010).

Both the amount and level of coursework in mathematics for prospective teachers is lower in the U.S. than in higher performing countries. U.S. middle school teacher preparation programs devote about 40% of courses to mathematics preparation, whereas top-performing countries allocate 50% of courses to mathematics. Just 55% of future middle school math teachers took calculus, while 90% of teachers in top-performing countries took the course (CRMSE, 2010). In addition to the need for improvement of middle school teacher preparation programs, it is a challenge to supply qualified mathematics teachers to the classroom.

California teacher shortage. A shortage of qualified teachers in California impacts the preparedness of teachers a student may encounter in the classroom. When fully credentialed teachers are in limited supply, students often end up with underprepared[1] teachers. This trend is most evident in mathematics, science, and special education; and high-poverty and high-minority schools are more likely to have underprepared teachers. Since 2011, the number of credentials awarded in science and mathematics has been declining, whereas over the same period of time, the number of waivers, permits, and intern credentials has increased (Darling-Hammond, Furger, & Sutcher, 2016).

Having classroom teachers with temporary permits or who are otherwise underprepared to teach mathematics contributes to weak math education for students. Moreover, mathematics teacher preparation programs award credentials that may not be accurate indicators of readiness for teaching math (CRMSE, 2010; Schmidt et al., 2007). These factors indicate a field of professionals that would benefit from on-the-job training.

---

[1] Fully prepared teachers are fully credentialed teachers while underprepared teachers are those with temporary permits, waivers and intern credentials (Darling-Hammond, Furger, & Sutcher, 2016).

Regardless of the quality of pre-service programs or the credentials of in-service teachers, mathematics educators find themselves in yet another era of reform with the onset of the Common Core State Standards and new high-stakes assessments. Considering this significant shift in content and pedagogy, it follows that current teachers need additional support and training to meet these new demands (Porter, McMaken, Hwang, & Yang, 2011).

In the hope of improving math achievement, schools and districts are increasingly devoting resources for math coaches to facilitate improvement in teaching and learning of mathematics. While there are strong indications that coaching can increase the quality of instruction (Coburn & Woulfin, 2012; Marsh, Bertrand, & Huguet, 2015; Neuman & Cunningham, 2009), it is less clear what specific coaching techniques or activities may influence teacher practice. It is important to know how coaches effect that change. A key feature of effective coaching identified in the literature is the need for coaches to build positive relationships with teachers (Lowenhaupt, McKinney, & Reeves, 2014; Poglinco et al., 2003; Smith, 2012). Examining how these relationships are built was the focus of this study.

Background: Interventions in Math Instruction

Effective professional development. For teachers of mathematics, a strong professional development (PD) plan is essential to improve the practice of teaching mathematics. Some common forms of PD are workshops, conferences, university coursework, trainings, and observational visits to other schools (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). Characteristics of high quality PD emerge from research: it is of sustained duration, focused on academic content matter, has opportunities for hands-on work, is integrated into the daily life of the school, and is collaborative (Darling-Hammond et al., 2009; Desimone, 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001). Efforts to increase teachers' knowledge about

content and methods in isolation will not be as effective as teachers having opportunities to learn about instructional interventions in context as they occur (Cohen & Ball, 1999). Embedded support delivered by math coaches is a promising route to effective PD for math teachers (Darling-Hammond et al., 2009; Neuman & Cunningham, 2009), and, therefore, improving student learning.

Math coaching. Coaching is a strategy for PD wherein an expert works with teachers to improve their classroom practice and enhance student learning (Hull, Balka, & Miles, 2009). *Content coaches* are experts who work closely with classroom teachers in a specific content area, usually math or literacy. Coaches work with teachers on almost every aspect of teaching, and they support and instigate changes that will have positive outcomes for students—including lesson planning, peer observation, resource management, and analyzing data (Bengo, 2016; Mudzimiri, Burroughs, Luebeck, Sutton, & Yopp, 2014; Neufeld & Roper, 2003).

Studies about coaching are emerging. Researchers have identified the primary roles of a math coach (Hull et al., 2009; Neufeld & Roper, 2003), described qualities and characteristics of effective coaches (Bengo, 2016; Obara, 2010), and developed frameworks for PD for math coaches (Gallucci, DeVoogt Van Lare, Yoon, & Boatright, 2010). Studies have found that PD that includes coaching resulted in higher quality practices by educators (Neuman & Cunningham, 2009) and in improvements to student outcomes (Biancarosa, Bryk, & Dexter, 2010; Campbell & Malkus, 2011).

There are distinct models for math coaching, including *cognitive coaching* (Costa & Garmston, 1985), *instructional coaching* (Knight, 2009b), and *content coaching* (West & Staub, 2003). An innovative and under-researched model for coaching that has documented effectiveness in improving student outcomes is the *Responsive Teaching Cycle* (RTC; Cheng,

Gainsburg, & Schlackman, 2013). The RTC model for coaching is novel in that it shifts the focus of coaching from teacher behaviors to student learning. Rather than examining a teacher's actions, which can cause defensiveness, RTC coaches consistently draw attention to the students' current mathematical understandings and how to improve student learning. This study examined RTC coaches as they worked with teachers, focusing on the development of trust in teacher-coach relationships.

Statement of the Project

Mathematics coaching can have a positive impact on classroom teaching practices and outcomes for students, and there is a demonstrated need for improvement in mathematics teaching. The RTC coaching model is a budding new approach to coaching that has been applied with middle school math teachers. This study fills a gap in the literature on mathematics coaching by focusing on the relationship between teachers and coaches as they engaged in this innovative mathematics coaching model.

Research Questions

1. What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?

2. What does trust look like in RTC coaching sessions?

3. To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?

Research Design

Site and population. The study examined the practices of three middle school mathematics coaches trained to implement the RTC model. The math coaches were part of a U.S. Department of Education Investing in Innovation (i3) grant-funded project with California State

University Northridge in collaboration with nine school districts, encompassing 44 schools, including two charter schools. The project, Collaboration Resulting in Educators Applying Technology Effectively (CREATE), aimed to improve student achievement by supporting teachers to create Common Core-aligned learning activities. Teachers collaborated with an RTC coach and other grade-level teachers and were supported in the use of technology to aid in the design of learning activities. Three of nine coaches involved in the CREATE Project participated in this study, along with two teachers for each coach.

Once data collection was complete and preliminary analysis was carried out, I determined that one of the three coaches was not implementing the RTC coaching model. For this reason, data collected from this coach and her teachers are not included in the analysis in the Findings or Discussion chapters of this dissertation.

Overview of the research design. This was a qualitative case study examining the work of three coaches with their teachers. The unit of analysis for the case was the RTC coach. Data collection and analysis painted a picture of teacher-coach relationships through an open-ended questionnaire, document analysis, observations of coaches with their teachers, and individual interviews with coaches and their teachers.

These data were analyzed and discussed to provide a rich description of teacher-coach relationships in RTC coaching to give insight to what makes it an effective model of math coaching, thus providing a meaningful contribution to knowledge about math coaching in general and, in particular, RTC.

Significance of the Research

Significance of the study. This study contributes to the literature on the important feature of relationship building in coaching and fills a gap by focusing on the teacher-coach

relationship in an emerging and under-studied mathematics coaching model, the RTC. Additionally, the findings and conclusions from this study will be shared with the team working on the CREATE Project. Conclusions based on the data gathered for this study will aid in the training of RTC coaches. Identifying key features of the coaching relationship as it develops in RTC coaching can help shape impactful training and scale up this effective coaching model.

Those already involved in RTC coach training are not the only interested stakeholders. As schools turn to math coaching to improve teacher practices and, in turn, student outcomes, school leaders will be interested to know how teacher-coach relationships develop in the context of an innovative math coaching model. They can use this information to form effective coaching programs, targeting the training and development of coaches toward effective practices. Finally, this study has significance for math coaches seeking to build positive relationships with their teachers.

Public engagement. I will present the results of my aggregate findings to CREATE Project participants and RTC trainers. Additionally, I will communicate findings to the administration at my own charter school. Preliminary findings have been published and presented as a conference paper for the annual meeting of the American Educational Research Association. Wider dissemination of the study may be achieved through conferences with pertinent organizations, such as the National Council of Teachers of Mathematics and the Association of Mathematics Teacher Educators, each of which has an open call for proposals to present at their annual conferences.

Chapter Two

Literature Review

Research demonstrates the important role of conceptual understanding in learning the complex subject of mathematics (NCTM, 2000). Proven practices for teaching math for understanding are not translating into classrooms, and students continue to experience mathematics as it was taught more than 30 years ago (Frykholm, 1999; Gainsburg, 2012; Hiebert, Morris, & Glass, 2003). The need for PD in this area is clear. Research supports coaching as an effective means of PD for teachers that results in changes to classroom practice (Neuman & Cunningham, 2009) and improvements in student outcomes (Biancarosa et al., 2010; Campbell & Malkus, 2011). RTC is an innovative coaching model that places students at the center of attention and has shown promising results for changing teacher practices and improving student outcomes (Cheng, 2010; Cheng, Ainsworth, Applerouth, Xie, & Moreno, 2018; Cheng et al., 2013). Given a novel coaching model that has been empirically examined in multiple studies, this study aimed to better understand what makes RTC coaches effective to aid in replication of the coaching model. Through qualitative methods, this study describes the development of teacher-coach relationships within teacher-coach teams engaged in RTC as a part of a grant-funded project.

This review of the literature begins with a brief overview of American mathematics teaching to inform the current state of K-12 mathematics. The rapid rise in the importance that our society ascribes to mathematics education is echoed in shifting priorities in K-12 math initiatives. Then I examine the existing teacher preparation methods for middle school mathematics teachers to understand the challenges of learning to teach math at this level. Having examined math education and teacher preparation, we follow the arc of teachers' professional

growth and turn to the arena of teacher PD to highlight various interventions aimed at improving the teaching of mathematics. Next, we look at coaching in mathematics as a relatively new form of PD for middle school math teachers. The literature describes different models for coaching as well as roles, actions, and attributes of effective coaches. Finally, we arrive at a description of the RTC and the i3 CREATE Project that utilized this approach in supporting teachers of eighth grade mathematics.

Overview of Math Education in the United States

How and even *whether* to teach math in U.S. K-12 schools has been an issue of debate since the founding of the country. Over the course of the history of the United States, a national emphasis on mathematics education has fluctuated. Historical events and social contexts have influenced the purpose and societal value attached to mathematics education, with implications for K-12 teachers and students.

Significant changes in the priorities of math curriculum nearly every decade all but ensure that teachers will be teaching a curriculum that is dissimilar to their own experience. The New Math Reform movement of the 1950s and 60s pressured an increase in rigor of mathematics at lower levels of education in response to the perceived threat of the Soviet Union (Kilpatrick, 2014; Stanic & Kilpatrick, 1992). Criticized as being too abstract, the subsequent decade witnessed the implementation of Back to Basics, a movement that called on schools to focus on teaching arithmetic through rote memorization of procedural algorithms (Kilpatrick, 2014).

In the 1980s, the National Council of Teachers of Mathematics (NCTM) published several influential reports which outline an emphasis on problem solving, the use of calculators and computers, and a widening of the view of math as procedural arithmetic (NCTM, 1980, 1989, 1991, 1995, 2000). Although the debate over math education has not been entirely

resolved, the Common Core State Standards for Mathematics, adopted by 42 states since 2010, further the aim of the NCTM by focusing on a depth of understanding about fewer topics rather than surface-level knowledge of many. Today, the level of mathematics and problem solving needed for a quickly changing workplace is greater than it has ever been (NCTM, 2000; Winthrop & McGivney, 2016), and the mathematics taught in schools is struggling to keep pace.

Teaching Middle School Mathematics

At least three circumstances make teaching middle school mathematics a complex pursuit: the developmental needs of 10-14-year olds, the high level of math content and pedagogy knowledge needed to teach the curriculum, and the high stakes nature of middle school mathematics—specifically algebra.

Meeting developmental needs of young adolescents. At any stage of learning, it is important for teachers to be aware of their students' developmental needs (Horowitz et al., 2007). The early adolescent years mark a period of great change in a person's life, physiologically, cognitively, and emotionally. With a membership of nearly 50,000 middle grades educators, the Association for Middle Level Education[2] (AMLE), advocates for successful schools for young adolescents that are designed to meet their unique strengths, needs and interests (Association for Middle Level Education [AMLE], n.d.). In its position paper, AMLE (2010) notes that young adolescents have a multitude of developmental needs— intellectual, physical, social-emotional, psychological, and moral—that must be considered in order to foster academic success. Middle grade teachers need to have a deep understanding of the

---

[2] Formerly the National Middle School Association.

rapid and varying change in their students at this developmental stage to adequately meet their needs and promote academic success.

Middle school math content and pedagogy knowledge. Professional knowledge required for teaching mathematics includes subject matter knowledge as well as pedagogical content knowledge (Loewenberg Ball, Thames, & Phelps, 2008; Shulman, 1987). Programs that prepare middle school math teachers could do more to fully train pupils in these areas.

Top performing countries have programs that offer higher levels of math content balanced with opportunities to learn about teaching math (Schmidt et al., 2007). These countries have teacher training programs with "focused and rigorous curriculum as well as teachers who have been trained with extensive educational opportunities in mathematics and in the practical aspects of teaching mathematics to students in the middle grades" (Schmidt et al., 2007, p. 2). Although many districts in the U.S. have increased the rigor and coherence of middle school mathematics curriculum over the years (Domina, Hanselman, Hwang, & McEachin, 2016; Dougherty, Goodman, Hill, Litke, & Page, 2015; Rosin, Barondess, & Leichty, 2009), training for middle school teachers consists of little opportunity for higher levels of mathematics content and modest opportunities to learn math content pedagogy (Schmidt et al., 2008).

Intensified curriculum. The drive to achieve advanced mathematics courses in high school has intensified the middle school math curriculum. Once a ninth-grade course, Algebra has been pushed to eighth and sometimes seventh grade. As a prerequisite to higher level math courses in a sequenced course path, algebra is often called a *gatekeeper course*. Nationally, the percentage of eighth graders enrolled in algebra or other advanced math has nearly doubled from 1990 to 2011, when with 35% of eighth graders taking algebra and an additional 9% taking geometry or higher (Domina, 2014). From 2003 to 2013, the proportion of students enrolled in

eighth grade algebra in California jumped from 35% to 65% (Domina et al., 2016). This rapid change was not paired with revised credential requirements or teacher training meet the new demands (Rosin et al., 2009).

Certification and preparedness for middle grades teaching. With no middle grades-specific certification (Howell et al., 2016), California middle school teachers are certified with either a K-12 multiple-subjects credential or a single-subject secondary credential. To teach high school level math in California, a single-subject credential with documented training in the subject area is required (California Commission on Teacher Credentialing, 2016). Typically, elementary teachers are licensed with a multiple-subjects K-12 credential. By its nature, a multiple-subjects preparation program will spend less time on math content and pedagogy than a single-subject math program (California Council on Science and Technology, Center for the Future Teaching and Learning, 2007).

In 2004-05,[3] less than half (44%) of California's middle school math teachers held a single-subject math credential, and 37% held a multiple-subjects credential. The remaining 19% held either no credential or a credential in a field other than mathematics (California Council on Science and Technology, Center for the Future Teaching and Learning, 2007). Research has shown that a teacher having a credential, as well as the type of credential, has a positive impact on student learning (Darling-Hammond, 2000).

The fact that middle school math teachers can have either a multiple-subjects or a single-subject credential is significant. Middle school teachers who have some experience teaching high school or who have obtained a mathematics-specific credential demonstrate higher content

---

[3] 2004-05 is the most recent year for which I could find credential information for California middle school math teachers.

knowledge (Hill, 2007; Schmidt et al., 2007). Using a nationally representative sample of middle school math teachers, Hill (2007) surveyed teachers to determine their mathematics teaching knowledge and compared scores to selected teacher characteristics, including mathematics coursework and type of credential. Hill's assessment measured content knowledge and content pedagogy.[4] Middle school teachers with high school experience or a high school credential scored significantly higher on both measures than their counterparts without high school experience or credential. Still, teachers with a high school background tended to have lower content pedagogy when compared to their content knowledge, indicating that content pedagogy is a relative weakness. Further, preparation through a middle grades-specific program can have an impact. Mertens, Flowers, and Mulhall (2005) found greater implementation of research-based practices in classrooms of middle grade teachers who had been prepared in programs specific to their level.

Middle school math teachers in California may have arrived at their position from a variety of paths and are unlikely to have had their preparation tailored for teaching their age span and content. Whether they hold a single-subject credential, multiple-subjects credential, or an interim permit, teachers of middle school mathematics can benefit from on-the-job PD due to a lack of specialized training in their pre-service preparations.

The Need for Professional Development

Despite reforms, the teaching of mathematics in U.S. classrooms still reflects traditional teaching methods (Frykholm, 1999; Gainsburg, 2012; Hiebert et al., 2003). Novice teachers

---

[4] Hill (2007) called content knowledge "common content knowledge" and content pedagogy "specialized content knowledge" or SCK. SCK questions were questions designed to elicit explanations for various math content.

implement the same teaching strategies they see in their mentor teachers, most of whom use traditional methods (Frykholm, 1999).

Gainsburg (2012) observed and interviewed 19 in-service teachers who were graduates of the same single-subject mathematics credential program. She found that typical graduates of the program employ mainly traditional methods in the classroom despite the reform focus in their pre-service training. Teachers reported that they did not feel entirely comfortable teaching with reform practices and would benefit from more practical tools for immediate implementation. It follows that sustained PD with modeling, practice, and feedback on reform methods of teaching is warranted for math educators.

Teacher Professional Development

Adult learning theory. According to one view, teacher PD is the continuing education of adult professionals. Adult learning theory, or andragogy, then, provides an appropriate theoretical framework for considering the design of teacher PD. Cox (2015) brings together Knowles's (1978) concepts of andragogy with Mezirow's (1997) transformative learning theory to the realm of coaching. Adult learners have far-reaching prior knowledge that they bring, are self-directed, and are motivated by solving problems in the context of their own settings (Knowles, 1978). Mezirow emphasizes the role of adults' prior experience and how it influences their current beliefs and practices (Cox, 2015). Adult educators can facilitate a transformation in these beliefs by helping adults "become aware and critical of their own and others' assumptions" (Mezirow, 1997, p. 10).

Teachers have a wealth of prior experience and knowledge stemming from different sources. A teacher's formal training in education as well as his/her own experiences as a student influence her approach to teaching. The influence of a person's experience as a student is evident

in mathematics classrooms across the country where, despite strong efforts to teach reform mathematics pedagogy in teacher preparation programs, pupils are experiencing mathematics as it was taught prior to these reforms (Frykholm, 1999; Gainsburg, 2012; Hiebert et al., 2003). The task of teacher educators, then, is to help teachers understand their own assumptions and evaluate whether their practices that stem from these assumptions are aptly serving students. A *disorienting dilemma* that causes teachers to see a disjunction between their assumptions and their stated goals presents an opportunity for transformative learning to occur (Cox, 2015; Mezirow, 1997).

As an independent, autonomous individual, the adult learner has a need to be self-directed (Knowles, 1978). When teachers are in charge of their own PD, teachers view the PD as relevant and therefore, more effective (Ball, 1996). However, as Ball (1996) points out, there is an inherent dilemma in teachers having full ownership of the PD agenda when reform is the goal. The reform encompasses new ways of approaching teaching of learning that are as yet unknown to the teacher, so it will be difficult for teachers to plot their own course for development in a new arena. The facilitator of this learning recognizes that PD "needs to be driven by the learner's individual agenda" (Cox, 2015, p. 37). A knowledgeable guide who can work alongside a teacher to co-create an agenda for professional learning is one path to reform.

Additionally, adults' readiness to learn arises from context and is driven by a need to solve a problem or find an answer within that context (Knowles, 1978). Meaningful PD opportunities will consider the current processes within a school and classroom from which teachers will institute theory into practice (Cohen & Ball, 1999; Elmore, 2002; Little, 1993). PD experiences for teachers can be made relevant and applicable when situated in the appropriate setting and activity (Putnam & Borko, 2000). It is from the teacher's own context that she will

identify problems of practice and find relevance in opportunities to learn that address those problems.

Teacher PD that is informed with the adult learner in mind acknowledges teachers as professionals coming with significant prior knowledge and provides a framework for design of relevant and meaningful learning experiences. Teacher PD is a well-researched topic, and several components that make PD effective have been identified.

Elements of effective teacher professional development. In advance of detailing the features of PD that make it effective, we must first consider what effective PD is. Increased teacher knowledge, changes to teacher beliefs, changes to teacher practice, and improvements in student outcomes have all been noted as aims of PD and measures of effectiveness (Desimone, 2009). Darling-Hammond et al. (2009) combined these aims in their definition of teacher PD, describing it as experiences that may "increase teachers' knowledge and change their instructional practice in ways that support student learning" (2009, p. 1) resulting in professional leaning. Teacher PD, then, is effective when it results in professional learning (Darling-Hammond et al., 2009).

Some studies on the effectiveness of PD incorporate multiple measures, but few examine the direct link between teacher PD and student outcomes. Yoon, Duncan, Lee, Scarloss, and Shapley (2007) reviewed more than 1,300 studies on teacher PD and found just nine that rigorously studied the impact of teacher PD on student outcomes. Within this context and amid a wealth of both qualitative and quantitative studies on teacher PD, Desimone (2009) found "that we have reached a consensus that [certain] core features play an important role in determining the effectiveness of professional development" (p. 183). These core features are: content focus, active learning, coherence, duration, and collective participation.

Teacher PD with a *content focus* refers to PD that aims to enhance content knowledge within the discipline. *Active learning* involves teachers in hands-on or practical work, feedback, or interaction. Next, *coherence* refers to two aspects of consistency: one of that with the teacher's own knowledge and beliefs and secondly, an alignment of school, district, and state priorities. Both the number of total hours as well as over what span of time a PD takes place have been shown impact on effectiveness (Desimone, 2009). While there is no consensus on the exact appropriate *duration*, research reviewed by Desimone (2009) supports the finding that 20 hours or more spread over a semester as more likely to be effective. Finally, *collective participation* means that PD involves some form of collaboration or cooperative experience between and amongst teachers. These themes resonate as we turn to coaching as PD for mathematics educators.

Coaching as Teacher Professional Development

Mathematics coaching is a model that incorporates several components of effective PD. It is localized to the context in which teachers work, it is of sustained duration, it is content specific, and it can be designed as hands-on, collaborative work. Coaching can support sustained changes to teacher practice based on Guskey's (2002) model for teacher change. Professional training may lead teachers to implement new practices, and when teachers see that these changes to practice result in improved student learning, this will in turn lead to change in teachers' beliefs. It is the change in teacher beliefs that will promote lasting change as teachers incorporate proven practices into their repertoire. In Guskey's model, changes to teacher beliefs occur after successful implementation of the practice, so regular support and feedback following the implementation of a new practice is important. Emerging research in mathematics coaching

shows promising results for its impact on teachers and on student outcomes (Campbell &

Malkus, 2011; Kohler, Crilley, & Shearer, 1997; Neuberger, 2012; Obara & Sloan, 2009).

Campbell and Malkus (2011) conducted a randomized control study across 36 schools in

Virginia to determine the effects of elementary math specialists (coaches) on test scores for third-

fifth grade students. The study compared three years of test scores for each grade level at schools

with math specialists to schools with no math specialists on staff. The coaches in the study

participated in intensive PD for their role as coaches. The significant and positive impact on

scores was not present the first year, but it was present in years two and three, indicating that the

coaching becomes more effective over time.

Descriptive qualitative study designs have examined math coaching and found positive

outcomes for improving teacher practice (Neuberger, 2012; Obara & Sloan, 2009; Polly, 2012).

Neuberger's 2012 study on a mathematics coach working with an elementary teacher found a

change in teacher beliefs that translated to changes in that teacher's practices. In their study of a

coach working with three sixth grade teachers, Obara and Sloan (2009) found that coached

teachers were more likely to implement innovative strategies. Polly (2012) documented his

experience coaching four elementary school teachers and recorded an increased occurrence of

high-level mathematics tasks implemented by teachers.

Some quantitative studies designed to find relationships between PD that involves

coaching and teacher and student outcomes show mixed results. In studies spearheaded by

Michael Garet (Garet et al., 2010, 2011, 2016) coaching was one component of intensive PD

programs but not specified as a unit of analysis making it difficult to pinpoint the impact of

coaching in these studies. Garet and his research teams used an experimental design to examine

the impact of PD in elementary (Garet et al., 2016) and middle school math (Garet et al., 2010,

2011). In the studies, Garet et al. performed a randomized control process to examine the impact of intensive PD that included coaching. The elementary study (Garet et al., 2016) included 165 fourth grade teachers randomly assigned to treatment or control groups. The study showed an increase in teacher content knowledge and improved teaching practices, but no impact on student achievement (Garet et al., 2016). The PD for the middle school study that spanned 2 years (Garet et al., 2010, 2011) focused on increasing teachers' specialized knowledge for teaching mathematics and included 92 teachers across 39 schools. This study showed no statistically significant impact on overall teacher knowledge or student performance after 2 years of implementation (Garet et al., 2011). The PD did have a significant impact on one teaching practice (*elicits student thinking*) but not on the other two practices measured (*uses representations*, *focuses on mathematical reasoning*) after the first year of implementation (Garet et al., 2010).

In a mixed methods study, Murray, Ma, and Mazur (2009) examined the impact of a peer coaching program on math achievement with 14 teachers of seventh through ninth grade students in six schools. Nine teachers were in the treatment group and five were in the control group. Although teachers considered the experience to be positive, there was no significant difference in student math scores between the treatment and control teachers. The researchers do not conclude that peer-coaching is ineffective, rather the authors attribute the lack of impact in part to undefined roles and lack of structure for post-observation conferences. Murray et al. describe post-conferences between peers as absent of reflective or analytic conversations and not challenging or questioning one another's practices. Killion (2009) termed this *coaching light*, and while it may help build relationships, more is needed to improve instruction.

As the aforementioned studies show, coaching can have a positive impact on teachers and students. Coaching, however, can take many forms. Math coaching can be generalized as collaborative work "with a teacher to improve that teacher's practice and content knowledge, with the ultimate goal of affecting student achievement" (Sutton, Burroughs, & Yopp, 2011, p. 15), yet there are different methods for implementing that work.

Background and models of coaching. Coaching as a PD strategy has been in the literature for nearly 40 years. Joyce and Showers (1980) put forth the notion of peer coaching as means of teacher training and subsequently performed studies to test its effectiveness. Showers found greater sustained changes to teacher practice and increased knowledge following training when teachers worked with a peer coach or an outside expert than when teachers attended training with no follow-up support (Showers, 1982, 1984). In a 1982 study, Showers proposed that the coach should have more expertise than the teacher being coached and that the coach could plan, observe, and provide feedback on an new teaching practice.

In the mid-1980s, Joyce and Showers shifted their focus to school improvement and how peer coaching could impact school wide initiatives (Joyce & Showers, 1995). In this work, Joyce and Showers (1995) reduced the emphasis on feedback in the *peer coaching* model in favor a heightened focus on collaborative planning and found equally impactful results as in their prior studies. Another shift they made was a change in the definition of *coach,* wherein the observed teacher was the coach and the observing teacher was the coached.

Since Joyce and Showers brought coaching into the teacher PD domain, different models of coaching have emerged. *Cognitive coaching*, developed in 1984 by Costa and Garmston, was designed as a means for school leaders to develop habits of mind in their teachers that support productive decision making in the classroom (Costa & Garmston, 1985; Ellison & Hayes, 2009).

23

Cognitive coaching cycles, like most coaching cycles, involve a preconference, an observation, and a post-conference (Bengo, 2016). A coach employing *cognitive coaching* asks probing questions and paraphrases back to the teacher to help the teacher gain clarity and move toward a self-directed process of reflection (Bengo, 2016; Costa & Garmston, 1985). *Cognitive coaching* is rooted in the philosophy that teachers' beliefs and perceptions influence their instructional decisions, and the *cognitive coaching* cycle will help elucidate those beliefs for teachers (Ellison & Hayes, 2009).

Content-focused coaching is another approach to coaching that is often used in mathematics. In this model, the coach designs lessons in collaboration with teacher. "In Content-Focused Coaching, theory-based conceptual tools assist coaches and teachers in deciding what to focus on in coaching conversations and how to guide such conversations" (Staub, West, & Bickel, 2003, p. 2). Lessons are adapted or co-constructed in pre-lesson conferences; the coach is present for the teaching of the lesson and may intervene to support student learning (Staub et al., 2003). Post-lesson conferences cover how well the lesson was implemented, any problems, and whether students learned the intended content. Staub et al. (2003) described an observation cycle in which curricular standards, lesson planning, and execution are the focus. Student acquisition of new skills is considered but is not the primary focus of the coaching cycle. *Content coaching* "focuses specifically on the pedagogical content knowledge needed for a particular domain" (West, 2009, p. 119). Staub et al. likened *content coaching* to a master-apprentice model wherein the master/coach observes the apprentice/teacher and offers feedback "aimed at bettering their performance" (p. 2).

Yet another model described by Knight (2009b) is *instructional coaching*, which utilizes a partnership philosophy that has seven principles: equality, choice, voice, dialogue, reflection,

24

praxis, and reciprocity. *Instructional coaching* is a collaboration between the teacher and coach where each party is an equal partner, teachers have voice and choice in their professional goals and learning, teacher and coach engage in reflective dialogue, and learning is reciprocal in that both teacher and coach gain from the collaboration (Knight, 2009b). Instructional coaches provide intense and differentiated support so that teachers "are able to implement proven practices" (Knight, 2009b, p. 30). These coaches collaborate with teachers on instructional planning, demonstrate model lessons, observe teachers, and conference about classroom observations. Knight refers to a framework coined "The Big Four" as a construct for identifying where to start in coaching teachers. Coaches can start by assessing teacher needs in one of four areas: classroom management, content, instruction, or formative assessment. Knight outlined several questions for a coach to consider regarding the teacher's practice, and most questions start with, *Does the teacher…* Next, the coach explains a best practice to the teacher. After modeling and/or observing the teacher, the teacher and coach engage in dialogue about the data from the lesson collected by the coach.

These models, while distinct in their philosophy, share in their approaches a focus on improving or correcting teacher behavior, practice, and/or beliefs. Another commonality of all math coaching is that the ultimate goal of coaching is to increase student achievement (Sutton et al., 2011). Research has characterized various roles and responsibilities of coaches regardless of the coaching model, and the preceding coaching models—*peer coaching*, *cognitive coaching*, *content-focused,* and *instructional coaching*—dominate the literature in mathematics coaching.

Roles of a coach. A mathematics coach is "an individual who is well versed in mathematics content and pedagogy and who works directly with classroom teachers to improve student learning of mathematics" (Hull et al., 2009, p. 3). Although the aim to improve student

learning is widely accepted, the role of math coach is often ill-defined and responsibilities are not always clear (Hull et al., 2009; Obara & Sloan, 2009).

The literature identifies several roles and responsibilities of a coach (Hull et al., 2009; Killion, 2009; Polly, Mraz, & Algozzine, 2013). A coach may be a: data coach, resource provider, mentor, curriculum specialist, instructional specialist, classroom supporter, learning facilitator, school leaders, catalyst for change, or learner (Killion, 2009). A *data coach* helps the teacher interpret and analyze student data to inform instruction (Hull et al., 2009; Killion, 2009). In the role of *resource provider*, the coach will find and cultivate resources requested by teachers, be it for their training and development or use in their classrooms (Killion, 2009; Polly et al., 2013). A coach may be a *mentor* to new teachers or new-to-the-school teachers (Killion, 2009). As *curriculum specialists*, coaches lend expertise on the organization, sequence, and implementation of the curriculum (Hull et al., 2009; Killion, 2009; Obara & Sloan, 2009); and as *instructional specialists*, coaches support teachers in selecting and using appropriate instructional strategies (Killion, 2009; Obara & Sloan, 2009). The coach as *classroom supporter* models, observes, provides feedback, and facilitates reflective conversation about teaching (Obara & Sloan, 2009; Polly et al., 2013; Staub et al., 2003). A *learning facilitator* coordinates, designs, and facilitates learning opportunities for teachers (Hull et al., 2009; Killion, 2009; Obara & Sloan, 2009). Coaches may also be *school leaders,* contributing to school wide teaching and learning reforms (Killion, 2009). As *catalysts for change*, coaches instigate change for school improvement (Hull et al., 2009; Killion, 2009). Finally, coaches are *learners* always seeking to improve and become more knowledgeable about coaching (Killion, 2009).

Killion (2009) noted that coaches carry out multiple roles and each role requires a different set of skills and knowledge to complement it. A strategic focus on roles can result in a

greater impact on teaching and learning, and when a coach takes on too many roles, it can dilute his/her impact. Considering the abundance of possible roles, systematic observation of coaches as they go about their work is essential to better understanding the position.

Effective Coaching

Measuring effectiveness of coaching. The literature suggests multiple measures for examining the impact of coaching that are aligned with the aims of PD in general. Studies designed to measure the impact of coaching have measured: student achievement (Campbell & Malkus, 2011; Garet et al., 2010, 2011, 2016; Murray et al., 2009), teacher beliefs and perceptions (Campbell & Malkus, 2011; McGee, Wang, & Polly, 2013), pedagogical content knowledge (Garet et al., 2010, 2011), math content knowledge (Garet et al., 2016), instructional practices (McGee et al., 2013; Neuberger, 2012; Polly, 2012; Polly & Hannafin, 2011), and teacher collaboration (Murray et al., 2009). Guskey (2002) described three major outcomes desired for PD: change to teachers' practices, change to teachers' beliefs, and improvements in student outcomes.

Killion (2009) described approaches to coaching that may be more likely to result in the desired changes. She contrasted *coaching heavy* and *coaching light* to illustrate differences between effective coaching and less effective coaching. The distinguishing factor, Killion wrote, lies in the motivations of the coach. Although the practices of coaches who are coaching light and coaching heavy may look the same, the motivations and the impact of the coaching are different. Coaching light is driven by the desire to be liked by staff, whereas coaching heavy is driven by the motivation to increase student learning. Coaching light may feel supportive to teachers as coaches provide resources and avoid challenging conversations, whereas coaching heavy involves "high-stakes interactions between coaches and teachers, such as curriculum

27

analysis, data analysis, instruction, assessment, and personal and professional beliefs and how they influence practice" (Killion, 2009, p. 23). In coaching light, the focus is on teacher behavior rather than on student learning. Coaching heavy involves discussions about teaching and student learning (Killion, 2009). The ability to embark on effective coaching, coaching heavy, requires individuals be adept in several key areas.

  Practices, skills, and knowledge for effective coaching. To coach effectively and have an impact on teaching and learning, the research suggests effective practices and requisite skills and knowledge of coaches. Effective coaching practices include: focusing the coaching discussion on mathematics; attending to student learning; redirecting teachers' questions; providing positive feedback; using questioning to engage teachers in reflecting; and facilitating the coaching session (Barlow, Burroughs, Harmon, Sutton, & Yopp, 2014). Additionally, recent research has honed in on skills and knowledge for effective math coaching: effective communication skills, leadership skills, pedagogical content knowledge, content knowledge, curriculum knowledge, and knowledge of andragogy (Bengo, 2016; Hull et al., 2009; Knight, 2009a; Staub et al., 2003). Sutton et al. (2011) used a Delphi method[5] to aggregate information from various experts in the field of math coaching to define mathematics coaching knowledge. They identified eight domains: assessment, communication, leadership, relationships, student learning, teacher development, teacher learning, and teacher practice. The prominence of relational skills emerges as a common theme among several of these identified elements of effective coaching.

---

[5] Delphi method refers to a systematic collection of information from identified experts on a topic (Clayton, 1997). Sutton et al. (2011) engaged 12 experts to provide input on mathematics coaching knowledge through electronic means over a period of 18 days.

The Coaching Relationship

Several studies (e.g., Anderson, Feldman, & Minstrell, 2014; Lowenhaupt et al., 2014; Poglinco et al., 2003; Smith, 2012) as well as leading educational coaching theorists (Costa & Garmston, 2002; Hull et al., 2009; Knight, 2007) note the importance of building relationships with teachers to effective coaching, with trust being frequently cited as a key component of sound relationships. As Knight (2007) put it, "Coaching is about building relationships with teachers as much as it is about instruction" (p. 33).

Describing trust in the coaching relationship is a complex endeavor because trust lacks a singular definition in the literature. Adding to the complexity, developing relationships and developing trust are sometimes used interchangeably. This area of the coaching literature is still unfolding, and trust in schools and in coaching relationships has been the focus of a number of qualitative studies (e.g., Anderson et al., 2014; Bryk & Schneider, 2003; Hartman, 2013; L'Allier, Elish-Piper, & Bean, 2010; Mangin, 2005).

Context, content, and dynamics of the coaching relationship. Qualitative studies on literacy and math coaches provide rich descriptions of coaching and are drawn upon here to provide a definition for the coaching relationship. The *interpersonal context* of a coaching relationship can take different forms depending on the position of the coach—a coach may be a fellow teacher, may work onsite outside of the classroom, could be newly hired from outside the district, or have some other outsider status with respect to her coachees. Studies that mention the effect that the insider/outsider status may have on developing the coaching relationship state that either status may have a positive or a negative impact on the relationship. For example, in their report based on their extensive qualitative research on coaching, Neufeld and Roper (2003) stated that an insider may start from a position of trust with colleagues; however, it may be

challenging to transition from peer to observer. In another qualitative study of coaching in 27 schools across the nation, Poglinco et al. (2003) also found that existing relationships could either provide an advantage or strain the relationship as teachers become coaches. Lowenhaupt et al. (2014) also confirmed the difficulty of navigating this new relationship in a qualitative study of three literacy coaches who were colleagues of coached teachers. The role of coach was viewed by some teachers as being supervisory, which became a barrier for coaches (Lowenhaupt et al., 2014; Poglinco et al., 2003).

On the other hand, coming into the coaching relationship as an outsider can create a barrier, as coaches may face initial resistance from teachers due to being outsiders (Poglinco et al., 2003). Mangin (2005) conducted a qualitative study of 12 elementary math coordinators or *teacher leaders*, four of whom were hired from outside the district for their positions. One of the *outsider* teacher leaders was quoted as attributing her difficulty in gaining entry to the classroom as related to not having a history with the teachers. Mangin described (but did not provide evidence for) outsider status as a potential benefit in that teachers will not have preconceived notions about the outsider. Drawing on constructs deemed influential in the coaching relationship, interpersonal context, then, may be defined as the nature and history of the relationship between the coach and teacher, including the insider/outsider stance of the coach, the duration of the acquaintance between teacher and coach, and the presence or absence of a pre-existing relationship.

In a qualitative case study of seven elementary math coaches, Mudzumiri et al. (2014) utilized two constructs helpful in defining the coaching relationship: *content* and *dynamics*. In their examination of math coaches, Mudzumiri et al. shadowed coaches for 1 or 2 days, categorizing their data into three areas: roles and responsibilities assumed by coaches, content of

coaching sessions, and dynamics of coaching interactions. *Roles and responsibilities* included

elements of the pre-conference, observation and post-conference coaching cycle, and other

coaching and administrative duties. Mudzumiri et al. defined the content of coaching sessions as

"the topics, issues, questions, and materials that form the narrative of a coaching session" (p. 15),

as well as the strategies and techniques the coach employs during the session. Dynamics of

coaching interactions include:

> ways the coach and teacher communicate; what the coach and teacher communicate
> about; what role the coach and teacher demonstrate (e.g., active, passive, collaborative,
> directive); ways that respect is demonstrated between the coach and teacher; what
> relationships are presented (e.g., collegial or hierarchical); and what levels and type of
> engagement are present in coach and teacher interactions. (p. 10)

The authors state that elements of *demonstrated respect* and *levels and types of engagement* were

not captured through observation in the study due to constraints of the protocol used and the

inherent subjectivity of these elements.

As informed by the aforementioned literature, definitions for *interpersonal context*,

content, and *dynamics* for my study are provided as follows. *Interpersonal context* means the

nature and history of the relationship between the coach and teacher, including the

insider/outsider stance of the coach, the duration of the acquaintance between teacher and coach,

and the presence or absence of a pre-existing relationship. *Content* is the first part of Mudzimiri

et al.'s (2014) definition: "the topics, issues, questions, and materials that form the narrative of a

coaching session" (p. 15). Finally, the *dynamics* of the coaching relationship are adapted from

Mudzimiri et al. to mean the strategies a coach employs and how the teacher and coach

communicate. Taken together, interpersonal context along with content and dynamics observed

in coaching sessions define the coaching relationship.

Defining trust. Trust has been characterized as multi-layered and multi-faceted in the literature. Based on their analysis of definitions in a comprehensive review of the trust literature across multiple disciplines, Tschannen-Moran and Hoy (2000) defined trust as "one party's willingness to be vulnerable to another party based on the confidence that the latter party is (a) benevolent, (b) reliable, (c) competent, (d) honest and (e) open" (p. 554). Tschannen-Moran and Hoy found these facets (a-e) of trust across various disciplines, and found each of them to be important in school relations. They also found that interdependence, or reliance on another to achieve one's own interests, is a necessary condition for trust. Tschannen-Moran and Hoy added that trust is dynamic in that it "depends on what one expects of another on the basis of norms of behavior or role expectations" (p. 570). These elements are also present in Bryk and Schneider's (2002) conceptualization of what they term *relational trust,* based on a decade of research in Chicago public schools.

Bryk and Schneider's (2002) seminal work on trust in schools comprises 10 years of qualitative and quantitative research in 12 public elementary schools during reforms in the 1990s. Bryk and Schneider posited that the discernment of trust is evaluated by individuals through four lenses: respect, competence, personal regard for others, and integrity. Tschannen-Moran and Hoy (2000) and Bryk and Schneider concur that trust can be found when a party demonstrates competence, benevolence (personal regard for others), and consistency in behavior[6]. Bryk and Schneider's definition of trust centers on role expectations among various roles pertinent to schools: teachers, students, parents, and the principal. Each party has certain expectations about the obligations of others in their roles, and relational trust is built when one

---

[6] Tschannen-Moran and Hoy (2000) and Bryk and Schneider (2002) used the same description, *consistency in behavior*, to define *reliability* and *integrity*, respectively.

party fulfills the other's expectations. The authors conceptualize relational trust as having three levels: first, interpersonal is the discernment of another's intentions; second, intrapersonal is the role relations, expectations and obligations around different roles; and last is the organizational level at which the school as whole has more effective decision making, more support for innovation, and more "efficient social control of adults' work" (p. 22).

Tschannen-Moran and Hoy (2000) discussed the presence of uneven trust in multi-faceted relationships. "The importance of each of the facets [of trust] depends on the referent of trust (who is being trusted) and the nature of the interdependence between the parties" (p. 558). Depending on the context of the trust relationship, different facets may be of greater or lesser importance. The researchers found some facets of trust—benevolence, openness, and honesty—to be more influential in teachers' judgment of trust in their colleagues than other facets. Additionally, the researchers predicted that competence would rise in importance as collaboration between colleagues also rose. Tschannen-Moran and Hoy posited, "A high level of confidence in all facets may not be necessary for trust to form, but, rather, only confidence in those areas in which there is critical interdependence" (p. 563).

Finally, Tschannen-Moran and Hoy (2000) add to our understanding of trust that the basis for trust may change over time as a history between individuals develops; a relevant consideration for coaches who begin with an *outsider* status. The basis for trust in a relationship may begin as institution-based, wherein "trust is supported by formal social structures that confer trust, such as having a license or certification to practice a profession" (p. 562). Over time, this can change to knowledge-based trust, wherein the history of exchanges between two parties becomes the primary source of trust.

In a longitudinal mixed methods study of the relationships of science coaches with teachers, Anderson et al. (2014) synthesized definitions of trust from Bryk and Schneider (2002) and earlier work from Hoy and Tschannen-Moran (1999) as a basis for their analysis. Anderson et al. defined trust using four components, providing context for each component as it relates to coaching: *personal regard*, *respect*, *competence*, and *integrity.* As defined by Anderson et al., personal regard is the demonstration of consideration for another person, willingness to "go the extra yard," and, "in the context of coaching, action taken by the coach to create a 'safe' environment for sharing ideas and practice" (p. 9). Respect is showing interest in another person's point of view and having "regard for the dignity and worth of another," listening to the teacher's concerns, and having teachers set the agenda for the coaching work (Anderson et al., 2014, p. 8). One's ability to perform his/her role, competence, was illustrated by the coach's content knowledge and teaching experience. Finally, integrity refers to honesty, transparency, and reliability, which coaches in the Anderson et al. study demonstrated "when their actions were consistent with their talk" (p. 12).

The definition of trust in my study is drawn from Anderson et al.'s application of preceding literature on trust relationships to the context of coaching. The definition of trust that guided the analysis of data collected in my study is: a teacher's willingness to be vulnerable to his/her coach with confidence that the coach demonstrates personal regard, respect, competence, and integrity (Anderson et al., 2014; Bryk & Schneider, 2002; Hoy & Tschannen-Moran, 1999; Tschannen-Moran & Hoy, 2000).

Developing trust. The literature on developing trust is somewhat obscured by the confluence of the constructs of relationships and trust, although this may be inescapable because trust is an integral component of relationships. *Developing trust* and *developing relationships* are

sometimes used interchangeably and at times concurrently, as in *developing trusting relationships*. Nonetheless, several studies on coaching discuss factors that influence the development of trust and/or the development of the coaching relationship.

Coaching theorists and researchers concur that coaches need strong human relations and communication skills to build relationships (Bengo, 2016; Hull et al., 2009; Knight, 2007; Lowenhaupt et al., 2014; Poglinco et al., 2003; Sutton et al., 2011), thereby demonstrating *personal regard* for teachers as a means to gain the trust of teachers. Anderson et al. (2014) found that personal regard is a significant component of trust, as it was the most common feature teachers used to describe their coaches, often mentioning coaches' accessibility and describing coaches as likeable or friendly. Lowenhaupt et al. (2014) described *symbolic gestures* as acts carried out by coaches for their teachers that are outside of their official coach capacity. Coaches sought to build trust and strengthen relationships with teachers by being available to teachers (Poglinco et al., 2003) and by being willing to do activities or tasks outside the coaching role (Lowenhaupt et al., 2014; Mangin, 2005).

Additionally, when coaches take measures to ensure a safe space in which teachers can take risks, they are demonstrating personal regard for teachers' well-being. Coaches in the Lowenhaupt et al. (2014) study found neutral and welcoming spaces to interact with teachers. One coach demonstrated lessons in the library; another was attuned to maintaining a neutral approach to the teacher's classroom. Lowenhaupt et al. identified that coaches also maintained neutrality in the content of their conversations with teachers; coaches tended to focus on curricular goals rather than teaching style or particular instructional practices. Coaches in the aforementioned studies showed personal regard for their teachers by acting above and beyond

35

their role as coaches and by maintaining neutrality to establish safe environments in which to do the work of coaching.

Respect is shown when coaches recognize teachers' professional expertise and listen to teachers. Consistent with adult learning theory, honoring the wealth of knowledge and expertise that teachers have as professionals is a means for coaches to develop trust with teachers. Knight (2009c) pointed out the difficulty of commenting on or criticizing a teacher's work, noting that teaching is a highly personal practice. Based on more than 200 interviews with teachers, Knight reported that teachers are critical of and feel demeaned by professional developers who do not recognize their expertise. In addition to honoring teachers' professionalism, coaches can show respect for teachers by listening intently. Coaching theorists include listening strategies as explicit components of the coaching model, noting the importance of listening to understand the teacher's point of view (Costa & Garmston, 2002; Hull et al., 2009; Knight, 2007). Teachers in the Anderson et al. (2014) study reported a shift from feeling that the coach was there to spy on them to a productive and collaborative effort when the coach made it a point to listen to teachers rather than insist on a particular protocol. The coach garnered trust by listening to teachers instead of touting district directives.

When coaches demonstrate that they have the knowledge and skills necessary to fulfill their role as coach, they display their *competence*. Hull et al. (2009) maintained that having sufficient content knowledge, including knowledge of the mathematics as well as instructional strategies, helps build trust with teachers. Marsh et al. (2008) added that coaches also need knowledge of current reforms in education. In Marsh et al.'s mixed methods study of middle school reading coaches in Florida, the researchers found a positive relationship between teachers' perception of the influence of their coach and time spent with coaches analyzing

student assessment. Analyzing student data effectively takes a great deal of skill, and the teachers' positive perception of positive influence is indicative of the coach's knowledge in this area. Anderson et al. (2014) found that teachers' impression of coaches' knowledge of teaching and learning science established the coaches' professional credibility with teachers.

Finally, research finds that coaches can develop trust with teachers through demonstrating *integrity* in their words and actions. Maintaining confidentiality and following through with commitments contribute to a coach's integrity. In two qualitative case studies, one with a literacy coach and one with a math coach, researchers found that the coach's maintaining confidentiality of information shared by teachers contributed to teachers' feeling of trust in her (Hartman, 2013; Rainville & Jones, 2008). Hull et al. (2009) and L'Allier et al. (2010) cited maintaining personal and professional confidences as part of building trust with teachers. The fact that coaches do not report evaluative feedback to administrators lessens the professional risk to teachers and facilitates the development of a trusting relationship (Lowenhaupt et al., 2014; Poglinco et al., 2003; Smith, 2012). Conversely, Poglinco et al. (2003) reported that the teacher-coach relationship was impaired when teachers were reprimanded by their principal, presumably making the connection that it was based on information from coaches. L'Allier et al. (2010) also stated that following through on one's commitments is a guiding principle for coaches as they establish collaborative relationships. Of the four facets of trust identified by Anderson et al. (2014), the authors found integrity to be the most difficult of which to find examples in their data. Anderson et al. posited that this may be because follow-through would need to be observed across multiple scenarios.

An emerging coaching model, *student-centered coaching*, is formed on the premise of placing student learning at fore (Sweeney, 2011). With the focus of coaching on student learning,

this model both provides a backdrop for Killion's (2009) coaching heavy and a neutral ground to develop positive coaching relationships.

New Framework for Coaching: Student-centered Coaching

According to Guskey (2000), focusing on learners in PD mobilizes teachers to make significant changes, makes it easy to identify, assess, and collect evidence of success, and helps prevent administration and teachers from being distracted from the work of improving learning. *Student-centered coaching* is distinct from *content-focused* and *instructional coaching* in that it predominantly focuses on the student rather than the teacher. In *instructional coaching* and *content coaching* the teacher's understanding of instruction or content frame the conversation and are enhanced by the coach. Alternatively, student-centered coaching focuses on student learning as the centerpiece of coaching conversations. Drawn from her experience teaching and supporting teachers and school leaders, Sweeney (2011) presents a student-centered coaching model in her book which serves as a guide for practitioners. Shifting the focus from teacher to learner lessens the affective impact that may make some teachers resistant to coaching, and it opens the conversation in an area of expertise primarily held by the teacher—that of her students' level of understanding.

The stages of a student-centered coaching cycle as defined by Sweeney (2011) are as follows: (a) set a standards-based goal for students, (b) assess students in their understanding of the goal, (c) implement instruction, and (d) re-assess to determine if students met the goal. After re-assessment (stage 4), the cycle starts over at setting a standards-based goal. Teachers and coaches focus on interpreting student work and data to determine where students are in their mathematical understandings and to craft appropriate instruction to meet their needs.

38

Sweeny (2011) outlined traits for coaches to exhibit in order to effectively realize student-centered coaching. Coaches understand and implement student-centered coaching through conversations that are consistently informed by student data and aptly make connections to factors that influence student learning. Further, student-centered coaches understand how to work well with adult learners and build relationships with teachers. In a student-centered coaching model, coaches have knowledge of effective teaching practices and standards and are skilled at facilitation in small and large groups. Finally, the coach maintains a stance as learner rather than expert, promotes reflective dialogue, and has a productive relationship with the school leader.

Evaluation of student learning, Guskey's (2000) highest level of PD evaluation, is embedded in the student-centered coaching cycle. Guskey detailed five levels of PD evaluation: (a) participants' reactions, (b) participants' learning, (c) organization support and change, (d) participants' use of new knowledge and skills, and (e) student learning outcomes. Most PD, Guskey ascertained, is evaluated only at the level of teacher reaction to and learning from the PD activity. Sweeney (2013) noted that relationship-driven coaching (akin to Killion's [2009] *coaching light*) is concerned with teachers' attitudes about the coaching. Teacher-centered coaching involves Guskey's fourth level of evaluation, that of the application and use of new knowledge or changes to teacher practice. Student-centered coaching cycles are based on student assessment data and pre- and post-assessment information is collected and analyzed to inform subsequent coaching cycles, thus reaching Guskey's highest level of PD evaluation.

The Responsive Teaching Cycle

A coaching model that places student learning as the focal point and has demonstrated effectiveness on teaching practice and student outcomes is the RTC (Cheng, 2010; Cheng et al.,

2018; Cheng et al., 2013). RTC is drawn from *Cognitively Guided Instruction* (CGI; Carpenter, Fennema, Franke, Levi, & Empson, 2000; Fennema, Carpenter, Franke, Levi, Jacobs, & Empson, 1996), a PD model that hones teachers' skills to focus on identifying students' prior mathematical thinking to inform instruction. RTC extends the application of CGI principles from elementary to the middle school setting. RTC coaches adopt "a blend of *peer coaching*…that focuses on innovations in curriculum and instruction, and *cognitive coaching*… which helps teachers improve their practice through reflection" (Cheng, 2014, p. 13).

Sweeney (2011) noted that the fundamental difference between student-centered and content-focused or instructional coaching is a focus on the student rather than the teacher. One way the RTC model removes examination of the teacher from the coaching context is by excluding classroom observation, which is a staple of other coaching models. This marks a significant difference between RTC and coaching that involves a classroom component. In RTC, the coach is not collecting data on student or teacher behaviors for teachers to reflect on. Teachers are bringing student data for the coach and teacher to reflect and act upon together.

Collaboration, shown to have a positive impact on student outcomes (Goddard, Goddard, & Tschannen-Moran, 2007), is a key element of the RTC model. In RTC, frequent teacher-coach collaboration is focused on planning and refining lessons based on student understanding for immediate classroom application (Cheng, 2010). Unlike the cyclical process of lesson study to shape a single lesson (Stigler & Hiebert, 1999), RTC involves modifying prior lessons or creating new ones to keep pace with the development of student learning. The cycle in RTC is based on the Plan-Do-Check-Act cycle of inquiry (Wilms, 1990), with the subject of inquiry being the students' mathematical thinking. Students engage in learning activities designed in RTC coaching sessions, and evidence of student learning informs planning for the next lesson.

The RTC model has been implemented in projects headed by Dr. Ivan Cheng with positive student results. In a study involving eighth grade teachers and students at three middle school sites, in just one semester of involvement in RTC, students' standardized math scores significantly increased after controlling for pre-existing differences in ability. With teachers engaged in RTC for three semesters, gains were even higher. Notably, the achievement gap between Latino students and the overall district decreased over 4 years and was erased by the end of the study (Cheng et al., 2013).

How is RTC different? RTC is drawn from cognitive coaching in that coaches utilize probing questions to prompt teacher reflection. RTC, however, situates questions and reflection in the context of students' mathematical understandings rather than the coach's observation of a teacher's instruction. Questioning strategies draw out of teachers their observations of student thinking and subsequent creation of a task aligned to their misconceptions.

Like RTC, content coaching involves the design of standards-based lessons. However, content coaching involves an observation cycle and is predicated on the coach as the content expert. In the RTC sessions I observed, teachers collaborated with and at times overrode their coaches to expertly design tasks and lessons for their students. Coaches ensured that their teachers' perspectives and opinions were included in the tasks created.

Instructional coaching shares with RTC the partnership philosophy of collaboration. Instructional coaching, however, involves the coach assessing the teacher, explaining best practices to teachers and modeling or observing in the classroom.

Grant-funded RTC project. A project underway contemporaneously with my study involving the implementation of RTC that is the subject of this dissertation, Collaboration Resulting in Educators Applying Technology Effectively (CREATE), spans from 2015-2018.

41

The aim of the CREATE Project was to improve student outcomes by enhancing the teaching of mathematics for understanding aligned with the Common Core Standards for Mathematics (CCSSM). CREATE teachers used technology to facilitate the pedagogical approach of guided discovery as mathematics teachers plan learning activities for eighth grade students in collaboration with RTC-trained coaches. Teachers developed learning tasks and engaged in reflective practice through PD in a community of practice alongside an RTC coach (Cheng, 2014). Teachers' ability to effectively teach CCSSM and design engaging learning activities "requires a constant application of professional knowledge—from intentionally sequencing specific examples to explain a concept, to assessing the pupils' understanding of the concept, to responding to the learning trajectories of the pupils" (Cheng, 2014, p. 4). RTC coaches provided ongoing support for teachers in developing learning tasks that facilitated students' understanding of math concepts, and coaches engaged teachers in reflective conversations that developed teachers' capacity to assess and respond to student learning.

This 4-year study began in 2015 with a pilot study field test of a discovery-learning iPad application, a platform on which teachers could develop CCSSM-aligned learning activities. RTC coaches involved in the CREATE Project either had experience with Dr. Cheng on prior RTC project(s) or were recruited from the pilot study. CREATE-recruited coaches experienced RTC as a coachee during a summer school session and subsequently participated in PD for RTC coaching (Cheng, 2014).

Treatment and control groups comprising 47 teachers ($n_{treatment} = 26$; $n_{control} = 21$) received the RTC intervention as cohorts in staggered years, with the first cohort (treatment group) engaging in RTC summer training and ongoing support throughout the 2016-17 school year, and the control group, cohort two, engaging in the intervention the following year. Treatment began

42

in the summer as teachers engaged in RTC while they taught summer school. Teachers from middle schools geographically near each other were randomly assigned to work together during the summer session. These small groups of two or three teachers continued to work together with a common RTC coach throughout the academic year in a community of practice. RTC coaches met with these teachers at least once a week for 30 weeks during the fall and spring to develop learning tasks for students (Cheng, 2014).

The CREATE Project was also evaluated by a team of external evaluators led by Dr. Andrew Ainsworth. The evaluation quantitatively examined outcome measures of student achievement and applied mixed methods to process questions that evaluated the fidelity of implementation (Cheng, 2014). The results of this dissertation will be shared with the evaluation team and will help answer one of the process evaluation questions, "What is the nature of collaboration among teachers and student teachers in RTC groups" (Cheng, 2014, p. 25)?

Conclusion

RTC, an innovative model for coaching with demonstrated effectiveness, remains under-researched. A greater understanding of how coaches operate within RTC will be of use to those interested in scaling up the coaching model and improving student outcomes in math. This study examines coaches engaged in RTC with eighth grade math teachers to uncover and describe the elements of the coaching relationship, a key component of effective coaching.

Chapter Three

Methodology

Middle grade math teachers tend to earn certification through elementary or secondary preparation programs, neither of which adequately covers the pedagogical content knowledge and developmental needs of pre-adolescents (California Council on Science and Technology, Center for the Future Teaching and Learning, 2007; Howell et al., 2016; NCTM, 2000). The need for PD in this area is clear. Research supports coaching as an effective means of PD for teachers that results in positive changes to classroom practice (Neuman & Cunningham, 2009) and improvements for student outcomes (Biancarosa et al., 2010; Campbell & Malkus, 2011). The relationship between a coach and teacher has been shown to be an important factor in effective coaching (Anderson et al., 2014; Lowenhaupt et al., 2014; Poglinco et al., 2003). The coaching relationship, also called teacher-coach relationship, is defined here as the *interpersonal context* along with *content* and *dynamics* observed in coaching sessions. An innovative coaching model that places student understanding rather than lack of teacher knowledge at the fore, which may increase the likelihood of establishing a productive coach-teacher relationship, is the RTC (Cheng, 2010). Given an innovative coaching model with documented effectiveness (Cheng, 2010), this study describes the actions and behaviors of coaches and the teacher-coach relationship to better understand what may make the model successful to aid in the training and development of RTC math coaches. To that end, this study asked:

1. What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?

2. What does trust look like in RTC coaching sessions?

3. To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?

Research Design and Rationale

These questions were answered using a qualitative case study design. The principle goal of this study was to better understand and explain how trust can be observed and how it develops between a teacher and coach in the context of RTC coaching. A quantitative approach would not have been appropriate because this was an exploratory study that investigated the practices of RTC coaches and their relationships with teachers. A case study is appropriate when the researcher seeks to explain a contemporary phenomenon in depth and has little to no control over the events being studied (Yin, 2014). In this case, the actions of coaches were not controlled as they engage with teachers in RTC coaching. This case study examined a bounded system, with the unit of analysis being an RTC coach (Merriam & Tisdell, 2016; Yin, 2014).

Coaches were studied through self-reports, their interactions with teachers in coaching sessions, and interviews with their teachers. The case study had particularistic and heuristic qualities. It was particularistic in that it "focuse[d] on a particular situation," namely coaching relationships, and the case was "important for what it reveal[ed] about the phenomenon and for what it might represent" (Merriam, 1998, p. 29). Heuristic case studies seek to "explain why an innovation worked" (Merriam, 1998, p. 31), which was the aim of the current study: to determine what coaches do that may contribute to the success of the RTC model.

Data were collected in stages through questionnaires, document analysis, observations, and interviews. First, the creator of RTC was interviewed to collect information about the constructs of the RTC coaching model that are intended to support the development of a trusting relationship between coaches and teachers. Next, a brief interview with CREATE Project staff

45

informed participant selection. A questionnaire for teachers coached by coach-participants collected information about their feelings of trust in the coaching relationship early in the development of the relationship. Document analysis of coaching logs provided information about the context and content of coaching. A series of observations of RTC coaching sessions were carried out and transcripts and field notes were analyzed to describe teacher-coach relationships. Finally, interviews with teachers and coaches provided richer descriptions of the nature of trust in teacher-coach relationships in RTC.

Strategies of Inquiry

    Site and participants. Dr. Cheng, creator of the RTC model and principal investigator of the CREATE Project, expressed interest in the study of the RTC model, and thus was open to research on the RTC model. The CREATE Project was carried out in nine school districts across Central and Southern California. It involves nine coaches working with two cohorts of approximately 50 teachers at 44 school sites, serving more than 4,400 students. From these CREATE coaches came a selection of three coaches and their respective teachers to participate in this study.

    Purposeful sampling (Creswell, 2014) was used to select coaches with varying background knowledge and experience in the RTC coaching model. It stands to reason that a coach's knowledge of and experience with RTC influences their approach to coaching in the RTC model. Coaches were selected to ensure a breadth of experiences with RTC. The extent of coaches' experience with RTC was ascertained from the CREATE Project director. CREATE Project coaches' RTC experience ranges from individuals whose first experience with RTC is the CREATE Project, to coaches who have worked with Dr. Cheng on previous RTC projects, to one coach who was involved with Dr. Cheng from the inception of the coaching model. All RTC

coaches are experienced or former math teachers with varying degrees of math coaching (RTC and otherwise) experience and training. Participant coaches for this study vary in their math coaching experience and knowledge of RTC, as subsequently described. Details about coaches' backgrounds were obtained from participant interviews. For the 2017-2018 academic year, the year in which I studied, coaches worked with the second cohort of CREATE's teachers.

The interpersonal context and makeup of the coaching teams examined herein varied significantly between the coaches, Anna, Larina, and Sarah[7]. Coach Anna taught at Cottonwood Junior High School (CJHS) with the teachers she coached, Teacher Sylvia and Teacher Carla, and they were coached jointly by her. Coaches Larina and Sarah coached two teachers each, in one-on-one settings with each teacher. Neither Larina nor Sarah had a pre-existing relationship with their pair of teachers, Vanessa and Daria and Camille and Lisa, respectively.

Data collection as described subsequently was carried out for all three coaches. After a preliminary analysis, I determined that Sarah was not implementing the RTC coaching model. The coaching I observed in Sarah's sessions had greater alignment with content and instructional coaching than with RTC. Sarah was like a content coach in that she was positioned as the expert. When she solicited information from teachers about their instructional decisions, it was often followed with suggestions or justifications for how to do it differently. Her conversations with teachers more frequently addressed teachers' instruction than they did student thinking. Questions about students were not commonplace as they were in Anna's sessions. Sarah did not co-create activities with teachers like Anna and Larina did with their teachers. For these reasons,

---

[7] To maintain participants' confidentiality, pseudonyms were used for names of coaches, teachers and schools.

Sarah's work with Camille and Lisa is not included in the analysis in the Findings chapter or the discussion in Chapter Five of this dissertation.

Coach Anna and Teachers Sylvia, and Carla. Anna had been teaching middle school math for over 10 years and had been teaching at CJHS for 3 years. She was the CJHS math department chair. In addition to her work on the CREATE Project, Anna had prior experience working with Dr. Cheng for 3 years in a state-funded math coaching PD initiative for which Dr. Cheng was the coaching developer. As training for CREATE, Anna participated in a summer of teaching middle school math as she was coached by Dr. Cheng and an experienced colleague who facilitated RTC sessions. During the fall after teaching summer school, Anna also continued practicing RTC within the context of the other PD project.

Anna coached Sylvia and Carla who also taught at CJHS. Prior to teaching at CJHS, Sylvia worked at a non-public school for 2 years, and then began teaching at CJHS where she had been for five years. Sylvia had always taught seventh and eighth grades in Special Education at CJHS. At the time of her participation in the CREATE Project, she taught math and science along with functional, social emotional, and behavioral skills. Anna and Sylvia co-taught one period of eighth grade math. About one third of the students in the class were Sylvia's special education caseload, while the remaining were Anna's students. Sylvia reported that she joined CREATE for the opportunity to collaborate with a general education teacher and gain knowledge of grade-level curriculum.

Carla had been teaching seventh and eighth grade math for 16 years, with 10 years at CJHS. Carla reported that she usually teaches "newcomers" who speak very little or no English. Carla stated that she opted to participate in CREATE after hearing Anna present to the board for

approval of the school to be involved in the project and after meeting Dr. Cheng, who met with teachers from two schools to give an overview of the CREATE Project.

CJHS had approximately 400 students per grade with a total enrollment of over 1,300 students in grades six through eight for the 2016-17 school year, the most recent school year available for which data were available. More than 90% of students were eligible for free and reduced lunch, greater than the district's 86.3% rate. The school was predominantly Latino, representing approximately 89% of the student body (CDE, n.d.). In the spring of 2017, 22.1% of students met or exceeded the standard on the year-end state assessment in mathematics. For comparison, in the home district of CJHS, 20% of students met or exceeded the standard in 2017 and 37.6% in the state of California. English language arts proficiency was higher than that of math in each context, with 34% of CJHS students meeting or exceeding the standard; 28.5% in the district; and 48.6% across California (CDE, 2017).

The neighborhood surrounding the school was largely single-family homes. Most yards looked recently tended with mowed lawns or otherwise kempt arrangements. A few homes had freshly renovated facades, though most had some visible wear of the paint or stucco. The school was easy to find, with a visible marquee out front. Upon parking, the office was well-marked and easy to find. Entry to the school grounds appeared secure, with the only unlocked entryway being access through the main office.

Coach Larina and Teachers Vanessa and Daria. Larina had been a middle school math teacher for 10 years and out of the classroom in a coordinator role for 2 years. In the coordinator role, she serves as testing and data coordinator, and she works closely with math teachers to help run the department. The CREATE Project was her first experience coaching math. Larina participated in the same summer school teaching-training for RTC coaching as Anna. Because

Larina met with her teachers virtually, I did not visit their school sites. As such, visual descriptions of the schools are not presented; however, demographic and achievement data are public data and are presented subsequently. Vanessa and Daria were teaching at different schools in the same large urban school district.

Vanessa had been teaching for 21 years, in public, private, and charter schools. She taught fifth through 12th grade math and English, as well as AVID (college readiness program) and creative writing. She had been teaching at Wildemarsh Middle School (WMS) for 9 years. Vanessa said she joined the CREATE Project upon the recommendation of her math coordinator. Another math teacher at WMS was a Cohort 1 teacher with CREATE, and Vanessa reported that she did not know much about the project because she was prohibited from talking to him about it.

WMS serves students in grades six through eight and had an enrollment of 835 in the 2016-17 school year. Nearly 90% of students were eligible for free and reduced lunch, while 77% were in the same category for the district. Approximately one quarter of the students were English learners, almost all of whom (99%) had Spanish listed as their non-English language (CDE, n.d.). Over 95% of the student body was Latino. According to the Department of Education's California School Dashboard, which rates performance in five categories on a five point scale, WMS's math performance was in the second to lowest band while English Language Arts was in the middle. On the 2017 standardized state exams, about 27% of WMS students met or exceeded the standard in mathematics, while 34% met or exceeded in English language arts. The district percentages were slightly higher, with 29.9% and 39.6% in math and English, respectively (CDE, 2017).

Daria had worked in education for 18 years. She started in a private school in upper elementary, and then worked nearly full time as a substitute teacher for 7 years. She then got her credentials and had been teaching seventh and eighth grade math for 10 years. She was at Brightrock Middle School (BMS) for 7 years. Daria reported that she joined the CREATE Project because of a positive experience with a prior CSUN program, STEM Learning Opportunities Providing Equity (SLOPE), also headed by Dr. Cheng. She added that she sought professional growth and benefits for her students.

BMS, a part of the same district at WMS, was slightly larger than WMS with almost 1,100 total enrollment for sixth through eighth grades (CDE, n.d.). The majority (88%) of students were eligible for free and reduced lunch. A little over one fifth of the BMS student body were English learners, with more than 90% of this population having Spanish language in their background. Students were predominantly Latino and represented 82.4% of the school. The next two largest groups were White (8%) and African American (3.6%). About one quarter of students met or exceeded the standard for English on the Spring 2017 state test, while just 16.5% met or exceeded the standard for math (CDE, 2017).

Coach Sarah and Teachers Camille, and Lisa. Sarah was a retired high school math teacher and coach. For 34 years, she taught math and was also a district math coach at her school site. For CREATE, she coached one teacher each at two different school sites, and first met each of the teachers at their first joint summer institute. She had known Dr. Cheng as a colleague, as they both taught and coached in the same district. Even though Sarah had been trained in cognitive coaching, CREATE was her first experience coaching in the RTC model. Because of Sarah's prior coaching experience, she was not required to participate in the same summer school teaching and RTC training program as other CREATE coaches. However, she did

participate in an abridged version of the training. Sarah's teachers, Camille and Lisa, taught at different schools in the same district as Vanessa and Daria.

Camille was a teacher with 19 years of experience teaching math at Blue Jay Middle School (BJMS). BJMS was her first and only place of work as a credentialed teacher. At the time of her participation in the CREATE Project, Camille taught three levels of math in a STEM magnet program at BJMS: Math Seven Accelerated, Math Eight, and Algebra. Camille reported that she joined the CREATE project for the financial incentive with hopes that she would bring something back to her classroom.

BJMS is located in an urban area of Los Angeles on a busy boulevard. Along the boulevard are shops and other retail businesses. Behind the school are mostly single-family homes. Cars parked in driveways and on the street are of older model years. The façade of the buildings looks like a large public school, painted cream, with signs hanging that advertise the name of the school and its magnet programs. The enrollment for sixth through eighth grades was approximately 730 in the 2016-17 school year. About 90% of students were eligible for free and reduced lunch. The two greatest ethnic groups represented at the school were Latino at 72% and Asian at 25% (CDE, n.d.). In 2017, 32.9% of students met or exceeded state standards in English, and 29% met or exceeded state standards in math (CDE, 2017).

At the time of this study, Lisa was in her 20th year in education with the same district. She had taught and coached middle school math. She was a teacher for 7 years before being assigned as a math coach to one middle school for 4 years. She then returned to teaching and was in the classroom at the same school where she coached for 1 year, prior to being hired at Coastal City Magnet (CCM), where she has been teaching seventh and eighth grade math ever since.

Lisa taught in the same district as Camille, but in a different town. Lisa's school, CCM, was a K-8 campus with slightly under 400 students just steps away from the beach in an affluent neighborhood. Although the median household income of just over $100,000 is about double that of the BJMS neighborhood, and the surrounding city is over 70% White (U.S. Census Bureau, 2016), CCM serves a population that is predominantly Latino (58.2%) and African American (25%), with 80% of students qualifying for free and reduced lunch (CDE, n.d.). In math, CCM students in testing grades (grades 3-8) met or exceeded the standard in math at a rate of 31.4% and in English language arts at 53.8% (CDE, 2017).

Access. It is my belief that Dr. Cheng's credibility with participants as the founder of RTC and principal investigator of the CREATE Project was extended to me as a researcher, as he introduced me to study participants. Although he gave me initial access to participants, I was conscious of maintaining trust amongst teachers and coaches throughout the study, being flexible to meet their scheduling needs and following through with commitments and arriving on time to observations and interviews. I informed prospective participants that I am both a former teacher and current coach seeking to better understand RTC to help establish my own credibility and common connection with them.

Data collection methods. Through the data collected and analyzed in this qualitative case study, I describe how trust manifests in coaches' relationships with teachers to better understand how trust can be studied in the field as well as how it can be developed within the context of this professional relationship. Table 1 shows an overview of data collection methods used to answer each question.

Table 1

Research Questions and Data Sources

Research Questions	Data Sources
1. What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?	Coded interview with RTC model creator
2. What does trust look like in RTC coaching sessions?	Coded observations of coaching sessions Coded interviews with participant coaches
3. To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?	Coded interviews with participant teachers Coded questionnaire responses from participant teachers Document analysis – Coaching logs

Interviews. All interviews were audio recorded, transcribed by a transcription service, and stored electronically on an encrypted, password-protected server. Transcripts were coded so that no identifying information was on the transcripts.

The first stage of data collection was a semi-structured interview with RTC's creator, Dr. Cheng, to answer RQ#1 regarding aspects of the RTC model designed to promote trust between coach and teacher. The interview occurred in person at Dr. Cheng's place of work and lasted approximately 1 hour. Dr. Cheng was asked questions about the elements of RTC that were designed to promote a trusting relationship between coaches and teachers. Additionally, he was asked about training and PD for RTC coaches that were specific to building trust with teachers. Dr. Cheng was asked about the extent of experience that each of the CREATE coaches had with RTC, thus informing a purposeful sample of coaches with a range of RTC coaching experience. Additional information about RTC coaching experience was gathered in a brief interview with the i3 CREATE Project director.

After observations (described subsequently), individual semi-structured interviews with each coach and each teacher, approximately 1 hour in length, took place in person, over the phone, or via an online video conference at a time and place convenient to interviewees. The

purpose of the interviews with coaches was to gather information to answer RQ #2 and #3 through questions about the actions coaches reported they take to build trust with teachers. A typical *grand tour question* (Spradley, 1979) asked them to describe how they establish and build trust with teachers. They were also asked about specific events observed in coaching sessions to provide insight and clarification to explain their actions. See protocol in Appendix B.

Teachers were asked questions about their feelings of trust with coaches to answer RQ #2 and #3. They were asked which of their coach's actions helped facilitate or break trust in the relationship. Additionally, teachers were asked about events that transpired in coaching sessions to find out whether the events had an influence on their perception of trust toward their coach. See protocol in Appendix B.

Questionnaire. A brief electronic questionnaire was distributed to each of the teachers coached by participant-coaches to record their feelings of trust in the coaching relationship prior to the commencement of observations. Teachers completed the questionnaire that asked them to rate feelings of trust in the coaching relationship. One question with a scaled response asked teachers to quantify the level of trust in the relationship. An open-ended question asked teachers to describe the actions of their coaches that have influenced the level of trust they indicate as present in the relationship. The questionnaire was not anonymous, as data collected from the questionnaire was considered alongside data collected from the same subject through other means described herein.

Documents. For the CREATE Project, coaches and teachers maintained coaching logs to record the number of hours spent with each of their teachers. The logs include the dates, times, duration, and content of coaching sessions. Logs were collected and reviewed for each coach regarding their work with teachers included in this study through the winter of 2018.

Observations. Data regarding what trust looks like (RQ #2) and what types of coaches'

actions result in trust (RQ #3) were collected through a series of observations of each coach

working with their teachers. In the RTC model, coaches meet frequently with teachers in a

collaborative setting to plan for the subsequent day or days' lessons. In these successive sessions,

a coach and their teacher(s) work together to plan activities that build upon what has already

been done with students and modify activities based on student response. As such, richer

information can be gathered through observations of consecutive sessions.

Eleven observations of RTC coaching sessions were carried out with Anna, Larina, and

Sarah. Anna was observed in three sequential coaching sessions, once a week for 3 weeks,

wherein Anna, Sylvia and Carla were present each time. Anna met with her teachers in her

classroom each time. Larina and Sarah met with each of their two teachers separately and I

observed each coach for four consecutive coaching sessions, two with each teacher. Larina met

twice with each teacher via an online video conference over the span of 1 month, and I was

invited to join each meeting electronically. I observed Larina in two consecutive sessions with

Vanessa and then in two consecutive sessions with Daria. I observed Sarah once a week over the

course of a month, alternating between Camille and Lisa. She met with Camille first at a coffee

shop, and for the second session in her classroom. Both meetings with Lisa occurred in Lisa's

classroom. Sarah did not meet with either teacher in the intervening time between recorded

observations.

Coaching sessions were audio recorded, transcribed using a transcription service, and

saved on an encrypted, password-protected server. Additionally, observation field notes were

recorded and electronically saved in a similar fashion. Field notes were captured as a running

record of the content of conversation and observable dynamics between the parties. Moreover,

56

electronic content and instructional materials shared during the sessions was captured in handwritten field notes, or, when possible, as screen shots of the content recorded in electronic transcriptions of field notes.

Data analysis. The majority of data for this study were analyzed in two cycles. First cycle coding was *provisional coding,* wherein I used a predetermined list of elements I expected to find based on the literature and the knowledge of an informed participant, the creator of RTC (Saldaña, 2009). Second cycle coding was *elaborative coding* that involved reviewing the data for each predetermined element to further describe "support, strengthen, modify or disconfirm findings from previous research" (Saldaña, 2009, p. 120). Additionally, I employed *magnitude coding* to describe the frequency of coded elements. Finally, I also used *attribute coding* to describe participants, the sites, and the context of the coaching sessions (Saldaña, 2009).

Interview analysis. The interview transcript with Dr. Cheng was coded and analyzed to identify trust-building elements of the RTC model. From data collected in this interview, a coding scheme was developed and applied in subsequent observations and interviews.

Teacher and coach interviews were used to provide a robust description of the coaching sessions. Coaches' and teachers' explanations and interpretations of events from the coaching sessions and their descriptions of the teacher-coach relationship provided context and texture that would not have been available through observations alone.

Interview transcripts were coded to identify two series of trust-building elements. One series of elements is drawn from the literature of trust in schools, and the other is the elements identified by Dr. Cheng in his interview. Once both series of elements were coded, the two coding schemes were compared to describe what trust looks like in RTC coaching sessions, to

illuminate coach behaviors that may result in trust, and to discriminate between coaches' actions that are specified by the RTC model and those that are outside the model's design.

Questionnaire analysis. Responses to the questionnaire were addressed in teacher interviews. The scaled question and short constructed response provided a starting point to ask for more contextual information from teachers regarding their responses.

Document analysis. Coaching logs provided information about each teacher-coach team to indicate how many hours they had worked together and provide an overview of the topics discussed, contributing information to explain the context in which RTC coaching occurs.

Observation analysis. As with the teacher and coach interviews, transcripts from coaching session observations were coded for elements of the RTC model that were identified by Dr. Cheng as trust-building as well as elements of trust identified in the literature. This coding and analysis illuminated a coach's actions that may contribute to trust that are specified by the RTC model and those that are outside the model's design. Additionally, transcripts were coded for exchanges between teachers and coaches that were indicative of a trusting relationship, based on definitions and examples of trust found in the literature.

Ethical Issues

To preserve participants' confidentiality, pseudonyms for their names and school names are used. Participation was voluntary, and teachers or coaches were made aware of their option to withdraw at any time. Electronic data collection records including field notes on the observations and interview transcripts were kept in secure locations on password-protected servers accessible only by the primary researcher. Printed materials did not have identifying information.

Other than Dr. Cheng's introduction, I had no personal or professional connection to the study's participants. This limited my exposure to internal politics at school sites, for better or for worse. As an external researcher, I am less likely to be associated with in-groups or out-groups and presented as a neutral party.

Credibility and Trustworthiness

One potential threat to credibility is the small sample size. By design, a case study is limited to few participants. Unlike a quantitative study with a representative sample which pursues *statistical generalizations*, case studies afford the opportunity for *analytic generalizations* (Yin, 2014). Analytic generalizations are at the conceptual level of theory, aiming to generalize findings to other concrete situations. As such, this study contributes to the theoretical framework of trust-building in teacher-coach relationships and is applicable to teacher-coach relationships beyond the specific ones observed herein.

Although the number of coach-participants is few, this was countered by spending a significant amount of time with each coach in observations of her sessions with teachers as well as in interviews. Multiple observations of successive coaching sessions with each teacher-coach team allowed for coaches and teachers to become acquainted with me, and my presence became normalized.

Studying more than one coach helped minimize unique site and participant factors that may result from a single case study (Yin, 2014). Patterns were observed across the teacher-coach teams as they engaged in RTC coaching. The diversity in school sites, districts, and coaches' background knowledge of RTC in the sample generated richness in information collected, bolstering the credibility of findings of themes found amongst the RTC coaches.

Design elements of my study contribute to its transferability to similar settings. Transferability refers to when "readers feel as though the story of the research overlaps with their own situation" and is, therefore, transferable to their own setting (Tracy, 2010, p. 845). Math coaches, trainers of math coaches, and teachers who are coaches will resonate with the coaching stories described here, regardless of their coaching model.

Triangulation of data from more than one source and multiple methods of data collection lends credibility to the description of coaching sessions and the coaching relationship. Coaching logs give some basic information about coaching sessions while observations of coaching sessions provide details for a thick description (Merriam & Tisdell, 2016). Finally, individual teacher and coach interviews afford descriptions of the perceived influence the coaching relationship from two perspectives.

Chapter Four

Data Analysis and Findings

In this chapter, the findings from two RTC coaches, Anna and Larina, are presented. Findings from Sarah, a third CREATE Project coach I observed, are not included here. These data are excluded because my research questions explored the development of trust in the context of RTC coaching, and she did not implement the RTC coaching model.

The chapter begins with an overview and descriptions of coaching sessions to provide the reader with an understanding of the nature of RTC sessions and teacher-coach interactions. Then, the analysis of trust in RTC coaching sessions is provided, through the lens of the literature-based definition of trust presented in Chapter Two and through the lens of trust-building elements described by Dr. Cheng, the creator of RTC. The presentation of evidence from Dr. Cheng's interview addresses the study question: "What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?" An analysis of trust-building elements and whether they were carried out within the context of the RTC coaching model addresses the question: "To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?" Taken together, the descriptions and subsequent analysis address the question: "What does trust look like in RTC coaching sessions?"

Description of RTC Coaching Sessions

Coach Anna: Student-focused peer-coaching.

Teachers Sylvia and Carla. Anna and her teachers were observed in their fifth, sixth, and seventh joint coaching sessions. All three coaching sessions took place in Anna's classroom at approximately 3:00 p.m., immediately following dismissal of students. Anna's room was

arranged with built-in desks, with five U-shaped configurations with student chairs arranged on the inside of each U. On the walls hung posters with messages about growth mindset for math and other affirming messages. There was one round table with four chairs at the front of the room. Above a white board at the front was a large LCD screen mounted on the wall. To the right as one faces the screen was a computer charging cart. When seated facing the computer screen at her desk, Anna's back was to the wall with the mounted LCD screen and facing student seats.

Before the coaching session started, Anna said that she had a class that was 50% students with special needs and that the other half presented behavior concerns. As Anna started to describe the co-teaching model in her shared class with Sylvia, Sylvia walked into the classroom and immediately joined the conversation. Sylvia complimented Anna for her ability to make math engaging for students on her (Sylvia's) caseload. Sylvia stated that she had learned a lot from Anna by teaching with her, and Anna returned the compliment, saying that she had learned from Sylvia's expertise in special education. Sylvia explained that she was more comfortable teaching science than math. Carla arrived a few minutes later, at approximately 10 minutes past 3pm. As soon as Carla entered, she took at seat with Anna and Sylvia at the round table in front of the room and the coaching session began promptly.

After briefly apologizing because she had been out for a while, Anna thanked Sylvia and Carla for their patience. Anna then focused the coaching session on what the teachers wanted to discuss, asking them how it was going in their classrooms. Carla stated that she administered an

Interim Assessment Block[8] (IAB), and together, Anna, Sylvia, and Carla reviewed the results. After they saw the results, Anna asked Carla if she wanted to work on an activity to revisit content that students did not master based on the IAB results. Carla responded saying that she needed to move on to cover different content. Anna took her lead and posed questions to Carla in search of something around which they could design an activity, asking what she was currently doing with her students.

Carla shared that she had been working on exponents, the same content that Anna and Sylvia were covering with their class. Anna asked Carla and Sylvia what they had noticed of students as they worked on exponents. Both Carla and Sylvia shared the mistakes they had seen students make, and Anna occasionally confirmed Sylvia's observations or told Carla that her students had similar struggles. After additional questioning by Anna and discussion among the three teachers, they came to an understanding that students were making mistakes around using expansion to simplify exponent expressions.

Anna consistently kept the topic of conversation on students' mathematical thinking without delving into questions about teachers' instructional strategies. In her interview, Anna characterized it this way, "I'm never insulting their teaching styles or teaching, it's just the students, 'What mistakes are the students making? Why are they making these mistakes?' Not, 'What mistake are you making? Why are you doing this?' It's not judgmental."

Anna regularly solicited Carla's and Sylvia's opinions, input, or agreement on content and form as they went about constructing a learning task. Before they embarked on creating the

---

[8] An Interim Assessment Block is part of the California Assessment of Student Performance and Progress system of assessments and may be used by teachers in preparation for the summative Smarter Balanced Assessment at the end of the year.

activity, Anna asked the teachers if they wanted to focus on expansions with exponents. Sylvia and Carla agreed, and over two coaching sessions, the three teachers co-created an activity that centered on exponents in expanded form using the online tool *Desmos*.

For every problem they developed as they created the activity, Anna asked Sylvia and Carla for their input. She asked them what values to use for coefficients and exponents, the language for the question prompts, and the preferred format and type for each question. Anna explained in her interview, "I want [the activity] to be a reflection of them and what they created."

In addition to establishing the teachers as creators and collaborators, Anna's questioning encouraged teachers to think through the implications for students on each part of the activity. In one exchange, Carla suggested presenting an answer choice that contained content that had not yet been introduced—multiplying exponents—to students. Anna questioned Carla's suggestion, challenging her to defend her thinking and justify its inclusion in the activity. Carla provided her reasoning and conceded that the expression would be better placed later in the problem rather than as the second option. In the end, her suggestion was incorporated, and she was afforded the opportunity to reflect on why it should be there as well as the best placement for it from the perspective of the student.

Toward the end of the second coaching session, the teachers completed the activity and discussed that they would administer it with students prior to the following week's coaching session. Sylvia expressed some hesitation about implementing it with the class. Anna asked why she was nervous, and Sylvia responded that she felt she needed to spend more time looking at it. At this point, the teachers had been in the coaching session for 1 hour and 20 minutes after school on a Friday afternoon, and Anna had previously expressed that she was tired. Despite this,

Anna utilized this opportunity to build Sylvia's content knowledge and reviewed each part of the problem about which Sylvia was nervous. The problem asked students to select all expressions equivalent to $36x^{12}y^{14}$. For each answer option, Anna asked what it would reveal about a student's thinking if they did or didn't select it.

> *Anna*: If a student checks this box $[20x^8y^{10} \cdot 16x^4y^4]$, what's the misunderstanding that they have?
> *Sylvia*: Adding.
> *Anna*: They're adding what?
> *Sylvia*: They're adding the 20 and 16...
> *Anna*: Good...so if someone checks this, we need to help them because they're adding coefficients. They need to recognize that this is multiplying. Okay, so if they check this one...

Carla also participated in the conversation. Each teacher verbalized or heard from their peer the mathematical thinking they could infer based on potential student responses to each option.

In the third and final coaching session I observed, the first topic of conversation was student results from the activity they created during the first two sessions. Carla brought hard copies of the activity on which students had written their responses. Anna suggested that they separate the student work into three stacks so that Anna, Sylvia, and Carla could each look at a few. All three examined the papers and commented on mistakes made by students and the misconceptions students might have about using expansion with exponents. Anna displayed her and Sylvia's students' responses from the activity on the mounted LCD screen. Their students completed the task online using the student interface of *Desmos*. They reviewed and discussed mistakes made by Anna and Sylvia's students, and Anna pointed out some of the similar errors made by students in both classes.

The fact that Carla had printed out the activity came as a surprise to Anna, although she did not express this during the coaching session. In her interview, Anna shared, "Oh goodness, like we spent all that time making that *Desmos* activity that's interactive on the computer with

technology and then she came in with the paper and she printed them." Anna continued that she felt that although Carla didn't administer the activity online, the content of the questions was an improvement from traditional direct instruction. Anna recognized that in honoring the work that Carla had done, she showed respect for Carla's professionalism.

After they analyzed student mistakes, Anna asked the teachers what they saw as the biggest student misconception so that they could create an activity to address that need. As they discussed, Anna left it up to the teachers to verbalize the misconceptions they observed. Anna asked questions and affirmed the teachers' observations more often than she made her own observations.

Anna and her teachers created another activity to address the student need they identified, which had to do with the notation students used as they expanded exponential expressions. Co-creation of the activity during the third session differed from the previous sessions because they utilized a different technology tool with varied collaboration capabilities. The platform used in the third session (Google Slides) allowed all three teachers to contribute to a single file at the same time. When they used Desmos in the first two sessions, each teacher created her own file, and they followed along with one another so that the content of each of their activities was identical. Still, the process of creating the Google Slides activity was similar to that of the first two coaching sessions. Anna asked Carla and Sylvia for their input on the form and content of the task, and they also discussed how students would receive and interact with the material. They collaborated on a slide deck, creating a task that asked students to match an exponential expression to its equivalent expression in expanded form.

Across the three coaching sessions with Anna, Sylvia and Carla, I observed them collaborate to create two tasks based on student needs identified by the teachers. Throughout

66

each session, Anna questioned teachers to solicit their knowledge about student understanding and to develop their expertise in creating tasks based on student need. Although Anna met and saw her teachers in person on a regular basis, Larina usually met with her teachers using online video conferencing.

Coach Larina: Virtually building trust.

Teacher Vanessa. Larina and Vanessa typically met via Google Hangouts, which was the format for the two sessions I observed. The observed sessions were the seventh and eighth meetings between Larina and Vanessa since the start of the school year. Larina emailed me one day prior to the coaching session to let me know of the date and time. At the appointed time, she called me using Google Hangout's video call feature. She and I exchanged greetings and pleasantries for less than five minutes before Vanessa joined the call. At first, Vanessa's connection was poor, and she had to reconnect. Once connected, Vanessa and Larina exchanged a warm greeting and Larina introduced me. I explained my research and that I would be recording the session. Neither party had questions, and the coaching session began.

The first meeting I observed was the first one to take place in approximately two months, after fall and winter breaks, and Vanessa spent about half an hour of the 90-minute session describing to Larina what had transpired since then. Vanessa shared the collaboration she had done with fellow math teachers, including one who was a part of the CREATE Project in the first cohort of teachers. Throughout this part of the session, both parties spoke excitedly. Vanessa was visibly and audibly enthused to share her updates, and Larina was often complimentary of Vanessa. After Vanessa shared about the district IT person observing and endorsing the use of a two-to-one technology ratio in her classroom, Larina excitedly replied, "That's like a testament! I need to record you…Ivan [Cheng] needs to hear that."

Vanessa shared about collaboration with the site literacy coach and her math department regarding preparation of students for state testing. The math department did a rigorous lesson study, observing one another as they implemented a Close Reading activity that used math problems on Desmos. Vanessa reported that an English teacher also used Desmos to do a similar activity with his students. Larina was pleasantly surprised and complimentary about the use of Desmos in English classes because it was designed as a web application for math.

After receiving these updates from Vanessa, Larina shifted the conversation to what was happening in Vanessa's classroom when she asked what she wanted to work on or create for use with students. Vanessa said that they were about to start a unit on transformations from an online curriculum, *Illustrative Math*. She then asked about Larina's familiarity with various web applications for classroom use. Larina did not have much experience with the applications mentioned by Vanessa, but she was aware of a few of them. Larina asked Vanessa if she wanted to explore using any of the applications, demonstrating that she was open to learning about it if that was what Vanessa wanted. Vanessa substantiated this quality of Larina's in her interview when asked to describe a positive interaction with her coach. Vanessa said of Larina, "If there's something she's heard about or seen someone else do, but she's never worked with it, she's…willing to try something new."

Vanessa told Larina that she wanted to transform an assessment from Illustrative Math into a digital format that students could take two times; once at the start of the unit and again at the end so that students could review their answers and make any changes. Vanessa asked Larina about the ability to review and change answers on Google Forms, Google Docs, Google Slides, and Desmos. Larina talked about the technical capabilities of each. Vanessa then shared her screen with Larina as they looked through the pre-assessment questions on Illustrative Math, and

they discussed how students would need to answer and which application would be most conducive to the types of questions asked. Vanessa then opened the end of unit assessment. Vanessa decided that she would give the pre-assessment on Google Forms to find out what students know, and she would give the end of unit assessment at the start and end of the unit, allowing students to review and change answers at the end.

Vanessa created and shared a Google Form with Larina, and they worked on different problems, each cutting and pasting diagrams from the Illustrative Math pre-assessment onto the Google Form. Occasionally, they discussed how to manipulate or alter a question to make it fit the format for questions on the Google Form. For example, one question asked students to plot points on a coordinate plane. Vanessa said she already knew who could and couldn't plot points from a recent assessment, so Larina eliminated the requirement to plot points by creating and pasting in an image with the points already on the plane. By the end of the session, they had finished creating the pre-assessment on Google Forms. Vanessa said that on her own she would create the end of unit assessment in a Google Slides file.

The second session I observed was 4 days later. I was online at the appointed time awaiting the call. Approximately 10 minutes past the scheduled time, I emailed Larina to let her know I was waiting. She emailed back to say she had forgotten and would be online in 20 minutes to start the session. Larina called me on a Google Hangout, and we waited a few minutes for Vanessa to join. When Vanessa joined, Larina and she greeted each other with enthusiasm and warm smiles. Vanessa said that she had used Google Docs to create the end of unit assessment for students so that they could use the *suggesting* feature to track their changes when they take it the second time. Vanessa shared the document with Larina and myself, and they reviewed and discussed the problems therein.

69

After they looked over the end of unit assessment, Vanessa shared that she gave a test on volume that week and that 90% of the students were proficient. She said she needed to go back and reteach the 10% of students who were not proficient. Larina asked if she wanted to look up some activities on volume, and Vanessa agreed.

Larina had an activity in mind that she searched for and sent the link to Vanessa. They discussed the standards that were applicable and kept looking for different resources. After they looked at a few more activities, Vanessa found one she wanted to use as a model. It was an activity that involved comparing the volumes of different shapes by filling them with popcorn. Vanessa and Larina talked through the steps to have students create a problem-based inquiry around volume, similar to an activity they found online.

The overall tone of both coaching sessions was friendly and familiar, and both parties laughed and smiled frequently as each spoke and listened. In her interview, Vanessa described Larina as friendly and as someone with a great sense of humor. Larina also spoke to the nature of their interactions in her interview when she said that she and Vanessa "hit it off pretty much right away," and that they had developed "a really friendly relationship."

Teacher Daria. Larina typically met with Daria via Google Hangouts. At times, Larina and Daria met with a small group of teachers from the same school, but the other teachers were not full participants of the CREATE Project[9]. The sessions I observed were the eighth and ninth sessions between Larina and Daria, two of which had involved additional teachers from BMS.

---

[9] Up two three additional teachers from Brightrock meet with Larina and Daria at times. The additional teachers are not part of either cohort, do not submit participation logs, and are not compensated for their participation; nor is their students' test data being collected and analyzed for the Project. Because of Daria's full participation in the CREATE Project, I observed sessions between her and Larina.

In the first session, Larina called me via Google Hangouts, and Daria was already on the call with her. After brief introductions, I described my research, answered Daria's questions about participation, and the coaching session began. Daria mentioned that they were going to meet with other teachers from Brightrock later that afternoon, and she asked Larina if they should talk about what they were going to cover in that session. Larina said they didn't have to talk about that now and instead could talk about Daria's context. Daria proceeded to share that the math department had been doing a professional reading of Jo Boaler's (2016) *Mathematical Mindsets*. The remainder of this 50-minute session primarily centered around the content of the Boaler book and each talked about applications of ideas in the book to classroom practice. Both Daria and Larina shared examples from their own classrooms that were relevant to the topics of the book. For example, Larina described thoroughly her process for allowing students to retake exams, and Daria shared that her process was quite similar.

About 40 minutes into the session, Daria raised the prospect of creating an activity. Larina asked where Daria was in chapter six of the math curriculum, and Daria shared which lessons she had taught and which were upcoming. Larina stated that she had looked up some tasks and activities on transformation, and Daria stated that they could look at those during the group session scheduled for later that day. At this time, I interjected that I had a time constraint and would have to leave the session. Daria then stated that she didn't know what I wanted to see in the session, the creation of an activity, "or just a conversation of planning and talking about classes." I expressed that I wanted to see their interaction in a typical coaching session. Shortly after this, the coaching session ended.

The second session started much the same as the first, with Daria already on the call with Larina. Almost as soon as I joined, Daria stated that she wanted to create an assignment on

dilations to use the next day because she had just finished a lesson with students on the topic. She outlined that she wanted to have four questions with increasing difficulty. Larina affirmed this idea, and Daria held up her textbook stating that they could use some examples from the book. Daria again detailed how she wanted each of the problems to progress, and she said that they should start a Google Doc to create the assignment. Larina stated that she had done some research in advance of the call and proceeded to give examples of what the different levels of questions could be.

Larina created and shared a Google Doc with Daria and myself. I was able to follow along with the creation of the activity, watching real time progress on the Google Doc as I also observed the coach and teacher in their communications. Larina suggested finding a simple figure to use for the questions and asked Daria if she wanted to use the same figure for all questions or a different figure. Daria expressed a willingness to go along with Larina's suggestions when she responded with, "Whatever we want…I'm fine with anything." As the session progressed, however, Daria conveyed a more rigid perspective.

The construction of the first question of the activity was illustrative of the collaboration I observed between Larina and Daria in this coaching session. For the first problem, Larina suggested a scale factor of two and students responding with new coordinates for point. Daria asked if they should break down the concept more and instead begin by asking students what a scale factor is. Larina displayed on her screen a possible question involving figures and suggested showing two figures and asking what the scale factor was. Daria said that might be too hard for her students. In response, Larina sounded surprised when she asked, "That one's too hard?... On scale factor? That's not quite dilation yet. Okay…You want to ask them literally to define scale factor?" Daria replied that she thought asking them to define scale factor would be

72

good and also asked if it was too easy. Without waiting for a reply from Larina, she continued to describe the instruction she had given in class and anticipated how students might get stuck on the initial question proposed by Larina. Rather than push her own agenda, Larina acquiesced and told Daria that she knew her students best, and, it was implied, knew the most appropriate question with which to begin. Larina asked Daria how to word the problem, and after Daria iterated a question, she again expressed an open-minded approach when she said, "I don't know, whatever you think." As Larina typed, Daria interjected, directing Larina on detailed verbiage, and they settled on: "Given a scale factor of 2, how will you determine the new coordinates/number pairs of (x,y)? Explain (what will you do mathematically)." Some of Daria's suggestions were to include the phrase *number pairs* with coordinates, not to put a space between x and y, and add the question in parenthesis after *explain*.

Throughout the remainder of the session, Larina did all of the typing on the document. Both parties brought ideas for each question, and while some of each were incorporated, typically, Daria insisted on including her own notions over Larina's. When asked in her interview about a disagreement they had over another problem on the task wherein Daria's idea prevailed, Daria shared,

> Usually, if she says something, then I will, maybe 80% of the time, go with what she wants. But there are cases where I will say, "No, I think this is better because I know where my kids are at."

Larina echoed this in her interview, however, she expressed a greater degree of Daria pushing for her own opinions on the activities. Larina stated that she felt that Daria has her own agenda and knows her students, therefore, leaving Larina to "suggest, and usually she [Daria] kind of wants it a certain way."

Given the aforementioned descriptions of coaching sessions, I now present an analysis that examines the manifestation of trust in these relationships.

Trust in the Coaching Relationship

As we consider the presence of trust in the coaching relationship, the context in which the trust relationships arose is important to consider. First, it cannot be overlooked that each teacher voluntarily elected to enter the coaching relationship. In their interviews, most teachers stated that they joined for PD reasons. Even as they started the project, they had a confidence that their involvement would be a benefit to them. In this way, coaches benefited from teachers' positive assumptions that coaches would provide some added value to their practice.

Second, a factor that likely hedged institutional trust between teachers and coaches was the CREATE Project itself. The association with Dr. Cheng and a well-known public university extended credibility to each coach in advance of developing the coaching relationship. Daria and Carla expressly mentioned Dr. Cheng when asked why they chose to participate in the CREATE Project. Although trust may have initiated as institutionally derived, Larina and Anna's teachers reported that over time, feelings of trust in their coach increased. The longer they worked with the coach the more they had reason to trust them. Daria added that her trust in Larina grew because of the absence of actions that would negatively impact the relationship.

All participants explicitly confirmed the presence of trust in the coaching relationship. Each teacher responded to the questionnaire that they strongly agreed with the statement, "I have a trusting relationship with my coach," and teachers stated in their interviews that they trusted their coaches. Sylvia stated that her having taught in front of Anna demonstrated the "depth of her trust" because she was "putting herself out there" in front of Anna. Carla said that she had great professional trust for Anna. Vanessa stated that she trusted Larina because she could ask

her questions or tell her about mishaps and not feel judged by Larina. Similarly, Daria said she trusted Larina in part because she knew Larina would not talk about Daria without her knowledge.

The coaches also confirmed that they felt each teacher had a degree of trust in them. When asked to describe her trust with Sylvia, Anna said immediately, "I think she completely trusts me." However, Carla reported a higher degree of trust in Anna than Anna reported to feel from her. Anna said she knew Carla had become more comfortable with her, but that, perhaps due to cultural differences between them, she wasn't sure where she stood with Carla. Carla stated that it takes a long time for someone to build trust with her, and that she did not seek to build personal relationships with colleagues. Larina reported that she felt a high level of trust from Vanessa. Larina reported the trust she feels that Daria has in her is different, but, she continued, Daria does in fact trust Larina.

Having established that trust exists in each teacher-coach relationship, we now turn to what trust looked like in the coaching sessions with each teacher. I begin by presenting findings as related to elements of trust extracted from the literature on trust on in schools, then describe trust-building elements of the RTC coaching model and how they presented in the coaching sessions. In doing so, I answer the research questions:

- What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship? and

- What does trust look like in RTC coaching sessions?

Finally, I analyze the ways in which trust is built outside the context of the RTC model, thus addressing the question, "To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?"

75

Literature-Based Trust Building Elements

The definition of trust herein is *a teacher's willingness to be vulnerable to his/her coach with confidence that the coach demonstrates personal regard, respect, competence, and integrity* (Anderson et al., 2014; Bryk & Schneider, 2002; Hoy & Tschannen-Moran, 1999; Tschannen-Moran & Hoy, 2000). All four elements—personal regard, respect, competence and integrity—were present to some degree in the coaching sessions. Subsequently, I examine how coaches demonstrated each of the aforementioned elements, with evidence from observations and interviews.

Personal regard. Personal regard is a demonstration by the coach of consideration for the teacher's well-being. Coaches were considerate of the emotional needs of their teachers in multiple ways. In two instances, Anna's teachers expressed feeling anxious about an aspect of teaching, and both times Anna took steps to address their anxiety and process it in an encouraging way. At the start of the first coaching session, Carla said that she had not looked at her students' IAB results because she was nervous, and Anna suggested that they look through it together. As they reviewed the results, Anna made supportive remarks such as, "Those [scores] are good. Those are really good, Carla." Anna was similarly reassuring toward Sylvia in an instance previously described wherein Sylvia expressed a lack of self-confidence to deliver the instructional activity to students. Anna aptly interpreted Sylvia's reluctance and thoroughly reviewed the math content until Sylvia felt comfortable with it.

Contributing to her personal regard for teachers was Larina's affect and openness. Both of Larina's teachers mentioned in their interviews that Larina was friendly and non-judgmental. Vanessa expressed that she could be vulnerable with Larina by asking questions and openly admitting fault because she knew Larina would not judge her negatively for it. In her interview,

Larina said she felt that her flexibility with teachers' schedules contributed to building trust with them. Daria confirmed this in her interview when she shared her appreciation that despite Larina's busy schedule, she was accommodating to Daria's schedule.

Another aspect of personal regard, actions taken outside the role of coaching in an effort to establish trust, was less pronounced. In her interview, Larina mentioned that she sought to establish a relationship with her teachers during the retreat where they first met by spending time outside the sessions with them. Neither teacher registered this as having an impact on their relationship at the time of their interview. When asked specifically about actions outside the context of coaching that influenced trust, no teacher described acts that could be described as above and beyond the role of coach.

Anna and Larina found ways to show their regard for the emotional well-being of their teachers within the context of supporting them as teachers. Next, we examine how Larina and Anna demonstrated regard for their teachers' professionalism.

Respect. Respect, showing interest in another person's point of view and having "regard for the dignity and worth of another" (Anderson et al., 2014, p. 8), was the most prevalent element of trust present in the coaching sessions in that it was the element coded with greatest frequency. Throughout each of Anna's coaching sessions, she regularly demonstrated respect by honoring teachers' own knowledge of students and their ideas to construct a unique learning activity. Both coaches also showed respect for their teachers by having teachers set the agenda for the coaching meetings and making efforts to partner with teachers in a collaborative setting. Additionally, Larina showed an interest in the professional knowledge her teachers.

Anna predominantly used two strategies as she demonstrated respect for her teachers. First, she asked teachers to describe their students' mathematical thinking, thereby recognizing

77

the teacher as the expert on student needs and strengths. Second, Anna incorporated teachers' input to design the learning activity, both through questioning to solicit their ideas and by adding or changing content as suggested by the teacher. At the outset of the first coaching session, Anna questioned Carla and Sylvia about their students' understandings until they identified a misconception that they could address with an instructional activity. While Anna was driving the conversation by questioning the teachers, Carla and Sylvia set the agenda for coaching as they identified the content they would address and the type of activity they would create.

Anna invited teachers to craft the content for the learning activities as well as the format, and when she made a suggestion, Anna was sure to ask if each teacher agreed with her. Anna posed questions to Sylvia and Carla about their students until they identified a student need around which they could build a classroom activity. Less than 20 minutes into the 75-minute session, they had identified a student need and spent the remainder of the first session and the second session co-constructing an activity. The third session consisted of identifying a need based on student results of the aforementioned activity and collaborating to create another activity. In both cycles, Anna questioned teachers to find the need they would address.

Anna facilitated the process of creating activities by asking teachers to produce content for the task. As they embarked on co-construction the second activity, Anna asked Carla, "How do you think we should start?" Anna consistently asked Carla and Sylvia to share their ideas to develop the tasks. Carla and Sylvia alluded to Anna coming to the sessions without an agenda. "I don't think she tried to persuade or change my mind," said Carla. Sylvia commented, "It's not about two people coming in and worrying about their own thing, but two people coming together and coming up with new things together."

Larina showed that she respected her teachers' point of view and honored their worth by asking them to share professional knowledge and, like Anna, asking for input or consensus on aspects of the learning task. She deployed the former more often with Vanessa and the latter to a greater degree with Daria. During the first session, as Vanessa shared her updates of what had transpired since their last coaching session, Larina regularly interjected with questions seeking Vanessa's perspective on curriculum and assessment or wanting to know more about Vanessa's instructional practices. In one case, Larina asked how Vanessa graded students when she employed online tasks with them, and she explained that she was working with other teachers who struggled with grading online content. Larina sought to learn about Vanessa's practices in order to better support other professionals. In her interview, Larina expressed that she sees Vanessa as a resource, stating that Vanessa "shares with me or I share with her. So it's very mutual as far as what we get from each other."

When Larina worked with Daria to create an assessment on dilation, Larina asked for Daria's approval or input as they constructed the problems. For example, Larina asked Daria to share how she wanted to word problems, and Larina typed as Daria dictated. There was an instance in which Larina expressed a clear preference for the type of problem, and the two debated their perspectives as Daria's wishes ultimately prevailed. One such example was a problem where Larina stated, "I'm trying to create a word problem that gives you an answer of a fraction of a scale factor, not a whole number scale factor." Daria replied that such a problem would not work in that case because students were not familiar with what Larina had suggested. In this exchange, Larina tried to get Daria to challenge students with a different type of problem, but Daria wanted to construct a problem similar to what they had experienced in class. Larina shared in her interview that Daria "kind of sticks to what she's been doing." Larina expressed

that she meets the teacher where she is, "So my support is more so how can I help her within what…she's willing to change in her instruction." Daria also spoke to her unwillingness to stray from the adopted curriculum, and the confidence that Larina has built in her to trust her own professional discretion to do so. Daria stated that the practice of replacing lessons from the textbook with teacher- and coach-made materials "come[s] out of having a coach, talking to someone like Larina, and feeling confident that it's okay."

Both Anna and Larina took measures to show respect for the professionalism of the teachers they worked with. They asked questions to draw out of teachers their professional knowledge with respect to students, curriculum, and instruction. In these ways, Anna and Larina demonstrated a confidence in teachers' competence. In addition to honoring the abilities and knowledge of their teachers, Anna and Larina garnered trust when they showed that they could effectively fulfill the role of math coach.

Competence. Coaches demonstrated competence for the math coaching role, both in their subject-matter knowledge and knowledge of teaching math (content pedagogy). When Anna exhibited competence, it was in the context of developing the classroom activities. Both coaches showed their knowledge for teaching math to a greater degree than they expressed subject matter competence, although subject matter competence may also be conveyed through content pedagogy.

Anna gave her opinion or asked questions to encourage teachers to think about when to introduce a concept in the task, provided suggestions on classroom implementation of the task, and on a few occasions gave a suggestion for an appropriate problem in the task. For example, Anna said to Carla and Sylvia, "So I think we need to kind of mix it up a little bit now. What do you guys think about doing another multi-select where we give them the answer and we give

80

them several problems?" Anna only explicitly showed her knowledge of math content a couple of times by talking about knowledge of the standards and in explaining the rationale for a problem involving an exponent with several factors.

In terms of their knowledge for teaching math, both Anna and Larina displayed knowledge of relevant and novel educational technology. They were able to navigate the platforms each used with their teachers to create activities and provide suggestions for additional applications they might want to explore. Although Larina demonstrated a strong knowledge for technology, she also readily admitted when she didn't know something. Vanessa had asked if Larina knew how to use an application, *Geogebra,* and Larina responded that she was not familiar with creating activities in it.

All four teachers expressed a confidence in their coach's competence in their interviews. Carla, Vanessa, and Daria commented that saw their coaches as a resource for content knowledge and/or pedagogy, and Sylvia said she goes to Anna for her expertise. For example, Vanessa said of Larina, "She definitely understands what she's doing as far as the math curriculum and getting people to step out of their comfort zones and try new things."

Teachers felt secure knowing that their coaches had the requisite expertise to support their PD. In this way, coaches were a reliable resource for teachers, thus contributing to the integrity of each coach.

Integrity. The element of integrity, defined as honesty, transparency, reliability, and confidentiality, was least prevalent in the coaching sessions, but did come up in the interviews. Both coaches stated that they are open and honest with their teachers. Larina said that she is an open person and added, "What you see is what you get." Additionally, one of each of their teachers confirmed this quality in their coaches. Sylvia described Anna as consistent in her

demeanor and approach to students and colleagues. Daria talked about the absence of negative qualities when she described Larina. Daria said that Larina "doesn't talk behind my back or go around and share with other people" judgments of Daria. Although integrity was difficult to pinpoint in the coaching sessions, comments from teachers and coaches indicate that coaches did possess this quality.

The aforementioned literature-based elements of trust were observed in coaching sessions with two RTC coaches that had varying degrees of experience with coaching and with the RTC model. Next, I define and present aspects of the RTC coaching model that are intended to contribute to developing a trusting teacher-coach relationship.

Trust-Building Elements of RTC Coaching

When asked how the design of RTC helps foster the development of trust in the coaching relationship, the creator of the model, Dr. Cheng, identified five components: RTC honors teachers' experiences and professional expertise, the coach approaches sessions without a pre-determined agenda, competent coaches build credibility with teachers, RTC is student-focused, and discussions are *just in time*, germane to teachers' current classroom needs. *Teacher's professional expertise* is honored when teachers drive the conversation as experts of their students' understanding and collaborate in a professional setting to develop pertinent learning activities. RTC coaches approach teachers without curriculum, district, or site goals in mind; rather the agenda is set by the teacher's identification of student needs. *Competent* coaches are experienced and former math teachers who have engaged in thorough training for RTC coaching. The centerpiece of RTC coaching conversations is *students' mathematical understanding* and the development of inquiry-based learning tasks designed to develop students' conceptual

understanding. Tasks are created just in time, when the teacher needs them, in direct response to what they have identified as relevant for students.

These tenets of RTC are intended to coalesce to create an open, non-judgmental space where teachers have a voice, and their opinions and observations are valid starting points for improving student learning. Each of these elements was observed in coaching sessions facilitated by Anna and Larina. In Table 2, a summary of the evidence for elements of trust—literature-based and RTC-based—examined in this study is provided. Evidence in Table 2 formatted in italics is in unique to literature-based or RTC-based trust elements. Subsequently, qualitative evidence gathered from each coach is compared and contrasted with the literature-based trust elements of personal regard, respect, competence, and integrity.

RTC trust-building elements that overlap with literature. Three trust-building elements of RTC bear a strong resemblance to two elements from the literature. Coding for RTC-based elements honors teacher's professional expertise and teachers drive the agenda almost entirely mirrored coding for literature-based element of respect. This makes sense, given the definitions of each. Part of the definition of respect is having "regard for the dignity and worth of another" (Anderson et al., 2014, p. 8). Another way to state that is to say that coaches honor teachers' professional expertise. Teachers setting the agenda for the work of the coaching session is an embedded component of the literature-based definition of respect. In addition, the element competence appears in literature, and was also identified by Dr. Cheng as key to building trust with teachers.

Table 2

Summary of Evidence of Trust-Building Elements Amongst Coaches

Literature-Based Element	Coach	Summary of evidence	RTC-Based Element	Coach	Summary of evidence
Competence	Anna	Demonstrated content knowledge, pedagogy, knowledge of educational technology	Competence	Anna	Demonstrated content knowledge, pedagogy, knowledge of educational technology
	Larina	Demonstrated content knowledge, pedagogy, knowledge of educational technology		Larina	Demonstrated content knowledge, pedagogy, knowledge of educational technology
Respect	Anna	Solicited teachers' knowledge of students and ideas to construct a unique learning activity. Coach steered coaching sessions toward creation of an activity responsive to student needs; teachers selected content and form of activity.	Honors teacher's professional expertise	Anna	Solicited teachers' knowledge of students and ideas to construct a unique learning activity
	Larina	Teacher selected math content for learning activity and steered session to creation of an activity. *Praise for instructional resources used or decisions made*		Larina	Teacher selected math content for learning activity
Personal Regard	Anna	*Offered and provided assistance. Checked for understanding, progress, comfort level, opinion. Teachers reported coach remains non-judgmental.*	Teachers drive agenda	Anna	Coach steered coaching sessions toward creation of an activity responsive to student needs; teachers selected content and form of activity
	Larina	*Coach accommodated teachers' schedules when scheduling coaching sessions. Teachers reported coach remains non-judgmental.*		Larina	Teacher identified curricular sequence and steered coaching session to creation of an activity
Integrity	Anna	*Consistency in demeanor, approach*	*Student-focused*	Anna	*Conversation tightly focused on student understanding and misunderstanding, led to co-creation of learning tasks to meet student needs*
	Larina	*Coach maintains confidentiality*		Larina	*Student needs were considered when adapting curricular materials to co-create learning tasks*

Literature-Based Element	Coach	Summary of evidence	RTC-Based Element	Coach	Summary of evidence
			Just in time	Anna	*Conversation about students' current needs linked to creation of an activity that teachers used immediately*
				Larina	*Current curriculum sequence linked to creation of learning activity that teachers used immediately*

Note: Evidence in *italics* is present in Literature-Based *or* RTC-Based Trust-Building Elements, not in both

RTC trust-building elements outside the literature. Two elements were found to build trust in the coaching relationship that are not demarcated in the literature-based definition of trust—student-focus and just in time. These were defined by Dr. Cheng in his interview as RTC design elements that also build trust with teachers. Dr. Cheng identified the student-focus of the model as both a primary design element of RTC and "the primary factor in the trust aspect [because] the focus is not on fixing the teacher." The student-focused nature of RTC eliminates the defensiveness of teachers because coaches are not there to find fault with a teacher's practice. Dr. Cheng also shared that the just in time support provided by RTC coaches generates buy-in from teachers and, it can be inferred, enhances a teacher's trust that the coaching will be relevant to their context and needs.

Student-focus. A primary component of RTC is that coaching conversations are centered around students' strengths and needs toward the goal of developing appropriate learning tasks that support their development of math concepts. Student-focused conversations were more prevalent in Anna's coaching sessions than in Larina's.

Anna's conversations were tightly focused on student understanding (and misunderstanding) around the topic that teachers were presently teaching: exponents. Anna frequently asked teachers to share their impressions of their students' math understanding of concepts they were currently covering. After soliciting information from Carla about what content she was covering in class, Anna asked, "What did you notice, what did you see? Are they getting it?" Later in the session, Anna asked questions of Carla and Sylvia about student misconceptions, then paraphrased their observations and shifted the conversation toward a learning activity that would be appropriate to address the misconceptions. The student-focused conversations moved from misconception to co-creation of instructional materials. In her

interview, Anna stated that she is deliberate about the focus of the conversation; "I need to make sure that they're looking at student errors and misconception." Carla expressed that she understood this focus as well. Carla shared that her involvement in RTC in the CREATE Project gave her a new direction for instructional planning that is responsive to students' levels of understanding.

Larina only rarely asked teachers about their students, and she did not make a direct connection between student needs and a learning activity. This is not to say that student-focus was absent from the coaching sessions. The first activity that Larina and Vanessa worked on was a pre-assessment for a new unit, so it makes sense that student understandings did not drive this conversation; the purpose of the activity was to determine student needs for the upcoming unit. The activity they created in the second session was tied to the needs of students who did not demonstrate proficiency on the prior unit on volume. Larina did not steer this conversation toward student understandings; rather, Vanessa came to the session with an idea in mind of a student need to meet. I observed Larina co-construct a third activity during a session with Daria. The impetus for this activity was the scope and sequence of Daria's curriculum rather than a concept development task based on student need. As they developed the task, Daria regularly raised the notion of student readiness for proposed problems. To the extent that student-focus was present in Larina's coaching sessions, it was established by teachers rather than driven by the coach.

The student-focused nature of Anna's coaching sessions was immediately obvious and a precursor the work of the coaching session—that of developing a task to support student learning. This element was less present in the sessions I observed of Larina. In observations of

both coaches, however, teachers walked away with timely tasks they could implement immediately in their classrooms.

Just in time. The element of the coaching being just in time was evident in the coaches' discussions with teachers about what had recently occurred in their classrooms. Additionally, conversations about topics being taught currently were linked to the creation of activities that teachers used right away.

Anna solicited from teachers the content they were teaching at the time, what mathematical understandings and misconceptions students had about the content, and subsequently created a learning activity to address the student need described. The first question Anna asked in the first session I observed was, "What are you doing in your classroom, Carla?" From this prompt flowed a conversation about her teachers' perceptions of student understandings on current classroom topics. Once a student misconception was identified, Anna, Carla, and Sylvia started crafting an activity to address that misconception. After two sessions, the activity was complete and both teachers implemented it in their classrooms before the third session. The first topic of conversation during the third session was student performance on the activity. After they analyzed student mistakes, Anna and her teachers created another activity to address a student need they had identified.

In a session with Vanessa, Larina deployed the same questioning strategy as Anna to elicit the relevant content with which they could design a task. She asked Vanessa what she had done recently in the classroom and what she wanted to create. Daria described her experience of creating activities with Larina as positive and relevant. She said,

> It's designed exactly the way I want it for my class and my students, where they're at in their level. It's nice to have someone to help you with it and quickly put it together, and you feel productive…What I like is it makes my job easier.

Daria expressed confidence that work she did with Larina would be applicable to her setting and that this was beneficial to her.

The just in time nature of the coaching sessions started with what had happened in the classroom recently, was linked to how teachers could address it with a learning task, and then fed back into the classroom for immediate use. All four teachers expressed that working with their coach resulted in useful classroom applications that they implemented immediately and would use again.

I have scrutinized the manifestation of trust elements in RTC coaching sessions through the lens of the literature as well as elements of the RTC model design that were intended to develop trust. Next, I present the ways in which trust was established as a result of a coach's actions or behaviors that were outside the scope of the prescribed coaching model.
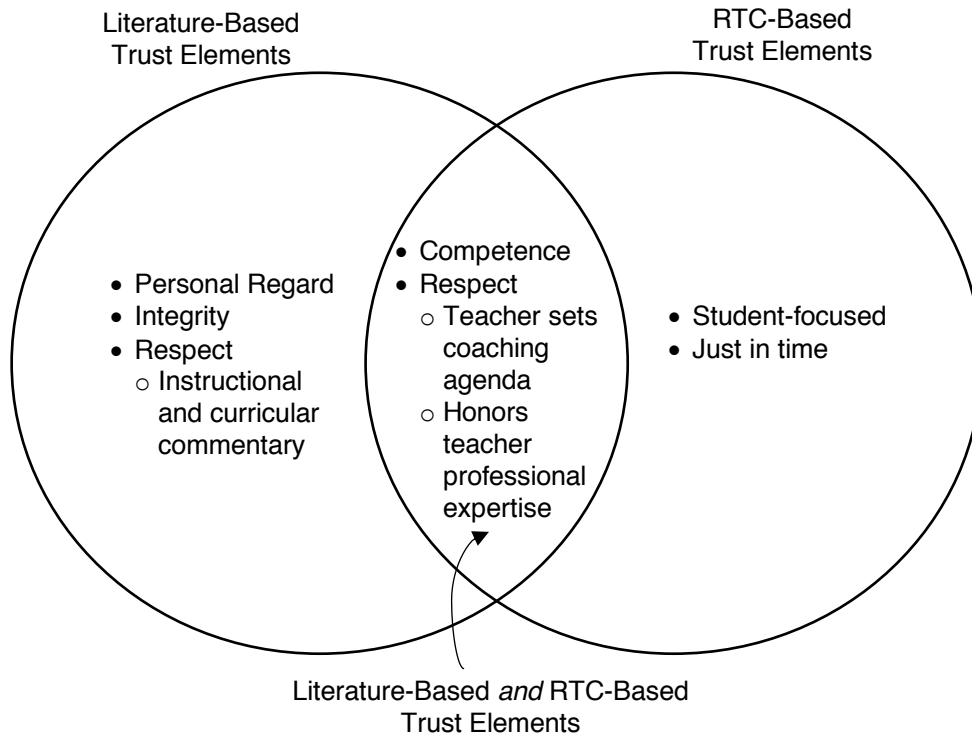
Building Trust Beyond the Scope of the RTC Model

This section addresses the study question, "To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?" Before detailing findings that address this question, I will clarify what is meant by "beyond what the coaching model specifies." First, an element may be considered outside the RTC coaching model if it is demonstrated in a context that is not expressly part of the RTC model. RTC involves an inquiry cycle facilitated by the coach that starts with an examination of student thinking, co-creation of an activity to address student need, then reconvening to assess student thinking after implementation of the task and repeating the cycle. Select data from coaching sessions and participant interviews conveyed particular actions of coaches that contributed to trust which occurred outside the context of the RTC model.

Next, an element known to build trust that is identified in the literature but not mentioned by Dr. Cheng as part of trust- or relationship-building in RTC is considered outside the scope of RTC. Dr. Cheng listed five elements: RTC honors teachers' experiences and professional expertise, the coach approaches sessions without a pre-determined agenda, competent coaches build credibility with teachers, RTC is student-focused, and discussions are just in time. It is noted that Dr. Cheng prefaced his description of trust-building RTC components with, "The way trust is established, besides all of the research and literature on how to build trust," and went on to list the five elements analyzed herein. For analysis here, only the five components described by Dr. Cheng are considered within the scope of RTC.

Finally, if a trust-building element was not part of training for RTC, it is considered outside the bounds of RTC. Trust-building elements that meet any of these criteria are considered "beyond what the coaching model specifies."

Aspects of three literature-based elements of trust that are outside the scope of the RTC coaching model were observed in coaching sessions: personal regard, integrity, as well as a sub-category of respect—conversation on teachers' instructional and curricular decisions. See Figure 1 for a comparison of trust-building elements observed in coaching sessions.

```
        Literature-Based                    RTC-Based
        Trust Elements                      Trust Elements


                          • Competence
        • Personal Regard • Respect
        • Integrity          o Teacher sets
        • Respect              coaching        • Student-focused
           o Instructional     agenda          • Just in time
             and curricular  o Honors
             commentary         teacher
                               professional
                               expertise


                    Literature-Based and RTC-Based
                            Trust Elements
```

Figure 1. Comparison of literature-based and RTC-based elements of trust observed in coaching sessions and interviews. All elements were observed in coaching sessions. Elements on the far left and far right are drawn from either the literature or from the RTC model, respectively. Elements in the center are represented in literature and RTC.

Personal regard. Both coaches demonstrated personal regard, an element not specified in the RTC coaching model, for their teachers. At times personal regard was shown within the context of the coaching model, and at times coaches exemplified personal regard beyond the scope of the model.

Anna exemplified personal regard within the context of the RTC model. She made encouraging remarks to Carla as they reviewed students' IAB results at the start of the first coaching session I observed. Anna was coaching within the RTC model as they were having a student-focused conversation in an effort to find a content area in which to create an activity. Further, in her interview, Anna talked about the ways in which she needed to make her teachers "feel comfortable." With one teacher, she said, "I had to get her to feel comfortable being honest

and open and know that I'm not going to judge her for that." Anna spoke to the need to address the emotional well-being of teachers, and she did so as she facilitated the RTC inquiry cycle.

Larina also embodied personal regard, but she did so in a context not associated with the RTC coaching model. Larina's teachers each described Larina as maintaining a neutral stance. Vanessa explained Larina's neutrality as being able to tell her about her instructional weaknesses, and Daria described Larina as someone who won't judge her. Daria also mentioned Larina's willingness to accommodate her schedule to meet for coaching sessions. Larina was explicit about her strategies to build trust as being outside of coaching, sharing in her interview that she took steps to let teachers know she was not just there to "do the coaching hours and get out of the way." Larina went on to mention "getting personal" with teachers, letting them vent and share what is going on at their schools even when it doesn't have to do with coaching.

The RTC coaches examined herein demonstrated a literature-based trust-building element, personal regard, that is not a specified component of the RTC model. Although personal regard stands outside the scope of RTC because it is not specified component, it does not contradict the model, and coaches displayed personal regard both within and outside the context of the RTC inquiry cycle. The respect subcategory of conversation around teachers' instructional and curricular decisions contradicts the student-focused nature of RTC coaching when such conversation does not stem from student-focused topics.

Respect: Instructional and curricular commentary. Praise for instructional decisions and inquiring about a teacher's knowledge of curriculum were considered "regard for the dignity worth of another" (Anderson et al., 2014, p. 8) and, therefore, coded as respect. Giving praise shows regard for someone's worth and inquiring about a teacher's professional knowledge

demonstrates a positive assumption about the teachers' expertise. Evidence of this nature was prevalent in Larina's coaching sessions with Vanessa.

Larina praised instructional resources used or decisions made by Vanessa and asked her to share her knowledge about curriculum and instruction. Conversations about teachers' instruction are not prohibited in RTC; rather, they may be a byproduct of conversations around student understanding. In Larina's coaching sessions, her positive commentary on instruction was not linked to discussion of student thinking. Larina's comments about Vanessa's instruction or professional knowledge were mainly situated during the initial part of the first coaching session I observed when Vanessa shared what had occurred since their previous coaching session.

Although Dr. Cheng identified respect as inherent to building trust in RTC, showing respect in the context of discussions centered on teacher behaviors is not. The appearance of this sub-category of respect was present with just one coach and teacher; however, its prevalence in that exchange was notable.

Like personal regard and instructional- and curricular-focused conversations, integrity is a quality that was not expressly mentioned by Dr. Cheng as part of the RTC model, as part of trust- or relationship-building, or as part of training for RTC.

Integrity. Of all the trust-building elements raised herein, integrity was coded least in transcripts of observations and interviews. It did not present in observations at all, but it was was raised by one teacher of each coach in their interviews. When teachers described their coaches as having integrity, they mentioned consistency of character or maintaining confidentiality. These personal characteristics of the coaches are not an explicit part of the RTC model.

Conclusion

The RTC coaching model has trust-building elements inherent in its design. When one coaches according to the RTC model, it would be nearly impossible not to deploy these strategies. The RTC model is dependent upon student-focused conversations in which a skilled coach draws out teachers' knowledge of students and mathematics to design relevant activities. These features of RTC also contribute to trusting teacher-coach relationships.

In addition, the literature on trust in schools defines trust-building elements. Literature-based and RTC-based trust-building elements were present in the RTC coaching sessions I observed. Data from observations and interviews demonstrated an overlap in elements from the literature with RTC trust-building elements—coach competence, honoring teachers' professional expertise, and teachers setting the agenda for coaching. There are also elements of trust unique to RTC, namely that is it student-focused and provides just-in-time support for teachers. Finally, the evidence collected shows trust-building elements defined in the literature that were not described by Dr. Cheng as part of RTC: personal regard, integrity, and a sub-category of respect, commentary on curriculum and instruction that is not linked to student need. Next, a discussion of the findings is presented.

Chapter Five

Discussion, Recommendations, and Conclusions

The dedication to students and math education was strikingly clear in each observation and interview conducted for this study. The common pursuit of increasing student achievement in math was unmistakable. In the examination of three coaches with different backgrounds and levels of experience, I observed varying conditions under which trust was cultivated and groomed.

In this chapter, I draw connections from my findings to the literature and discuss new understandings of the RTC coaching model. I explore insights into the RTC model that were not a part of this study's research design, including how RTC may support the PD of teachers, and factors that may have influenced the disparity in implementation of the model. Implications of this research for practitioners are presented, as well as limitations of the present study and, finally, recommendations for further study.

Findings Related to the Literature

Insider/outsider status. Qualitative studies on coaching relationships mention the impact that a coach's insider or outsider status may have on the development of trust in the coaching relationship (Lowenhaupt et al., 2014; Mangin, 2005; Neufeld & Roper, 2003; Poglinco et al., 2003). Of the coaches whose data is presented in Chapter Four, one was an insider, working and teaching at the same school as her teachers, and one was an outsider, having first developed a relationship in the context of the CREATE Project. The evidence collected and analyzed for this dissertation does not demonstrate insider/outsider status as having a substantial influence on trust. By definition, the relationships varied based on insider/outsider status, but there was little data to point to the influence of this status on trust within the relationships.

95

Lowenhaupt et al. (2014) found resistance in the relationship for insiders transitioning from peer to coach (insiders) whereas Poglinco et al. (2003) and Mangin (2005) found that the outsider status can instigate teacher resistance. Unique to the context of my study, the subjects in this dissertation were willing participants in the CREATE Project and elected to enter into a coaching relationship. Each teacher's propensity for resistance was likely less than under circumstances found in the aforementioned literature. This is not to say that there was no resistance observed.

Both coaches' teachers had different dispositions. Each coach had one teacher who was more open and flexible in her demeanor whereas the other was more rigid. This was evident in the coaching sessions, as the more rigid teacher was less likely to incorporate her coach's suggestions or appeared disengaged at times during the coaching sessions. Each coach confirmed in their interviews this difference in their teachers' dispositions that I had observed. As there was one insider and one outsider coach, there was no evidence to suggest that a teacher's resistance was related to the insider/outsider status of her coach.

Mangin (2005) reported coaches with outsider status found it difficult to earn trust because they did not have a history with teachers. Niether the outsider coach in my study (Larina) nor her teachers alluded to this in their interviews. Meanwhile, Neufeld and Roper (2003) stated that a peer-coach may have an advantage when they have already established trust with their teachers. Sylvia reported that Anna was trustworthy because she observed her behavior as consistent over time. This finding supports Neufeld and Roper's claim, as Sylvia could not have had such observations of Anna over time if not for their positions on the same campus.

The observations and interviews for this dissertation did not illustrate resistance from teachers, a common obstacle to building trust, based on the insider or outsider status of their

96

coach. Although resistance was not entirely absent, the opt-in status of teachers in the CREATE Project may have minimized the resistance coaches would encounter. One insider advantage was observed in Anna's case; her teacher's trust was bolstered by the duration of her exposure to Anna.

Uneven presence of trust elements. This study supports the literature finding that various elements of trust may be present to varying degrees in trust relationships (Tschannen-Moran & Hoy, 2000). Tschannen-Moran and Hoy (2000) found *benevolence*, *openness*, and *honesty* to be more influential in a teacher's determination of trust in a colleague. Translating these facets to the trust elements used in my study, Tschannen-Moran and Hoy's benevolence equates to my definition for personal regard, whereas openness and honesty may be subsumed in my definition of integrity. Personal regard was observed and raised in interviews to a greater degree than integrity, which was the least-observed element. Further, Tschannen-Moran and Hoy surmised that competence would be more important in a collaborative setting. Coaching is a collaborative endeavor, and following Tschannen-Moran and Hoy's supposition, competence was indeed observed as a dominant trust element here.

Both the quantity and quality of the coding for each element or facet of trust varied between coaches and their teachers. Interpreting the quantity of remarks that were coded for each element ought to be done judiciously. Although some elements may have a greater number of lines of transcripts coded as such, this is not necessarily a reflection of the degree of influence it may have had on trust in the relationship. Still, it is instructive to examine patterns in the prevalence of each coded element. For this reason, variance in the frequencies of trust elements is shared in comparative language rather than specific quantities.

With this in mind, it is noteworthy that the elements respect and competence had the greatest presence in observations and interviews across the coaches. A coach's competence was talked about most frequently in teacher interviews for both coaches. Anna's teachers talked about respect as often as they mentioned competence, and Larina's teachers raised personal regard with the second greatest frequency. When asked to describe their relationship, trust or a positive interaction with coaches, all teachers interviewed mentioned the personal regard they felt from their coach. Integrity was raised by one teacher of each coach in interviews. Personal regard was observed regularly amongst both coaches in their sessions, but integrity was not coded in observations. While personal regard and integrity were present, they were not as prevalent as other trust elements.

The design of my study does not ascertain whether certain elements were more or less influential; however, these findings at least partially support Tschannen-Moran and Hoy's (2000) finding that benevolence, openness, and honesty would be more influential in the determination of trust. What can be determined is that each trust element was present for each coach, and each coach had a different blend of quantity and quality in her coaching sessions and interviews, supporting this point in the literature.

Trust changes over time. The fact that trust changes over time was a point raised by Tschannen-Moran and Hoy (2000) and is supported by this study. The basis for trust may first stem from an affiliation with official organizations that are well-respected and, over time, shift to knowledge-based trust, which flows from interactions with the individual.

Connection with the university and with a well-respected researcher-practitioner in the field of math education drew teachers to the CREATE Project, and trust in these institutions was extended to coaches as affiliates. After experience with their coaches, teachers in this study

98

reported having different feelings of trust with their coaches. Both of Anna and Larina's teachers reported that over time trust in their coach increased.

Teacher-reported change in the trust relationship embodies the shift to knowledge-based trust described by Tshannen-Moran and Hoy, stimulated by interactions with coaches. Although teachers' entry into the coaching relationship was predicated on institutional trust, over time that trust shifted to a knowledge-based trust found in the coach.

Symbolic acts. Lowenhaupt et al. (2014) and Mangin (2005) found that coaches performed tasks outside the coaching role in order to build trust with teachers. Symbolic acts were not absent from the coaching sessions and interviews, but neither were they prevalent in the data. Each teacher was asked to describe actions or behaviors either within or outside the context of coaching that had influenced the trust she had in her coach. No teacher of the RTC coaches, Anna and Larina, mentioned symbolic acts, nor were they observed in coaching sessions.

Three important factors may explain the dearth of symbolic acts found in this study. First, this dissertation focuses on the formal interactions between coaches and teachers. My data collection methods centered on the coaching sessions—observations were exclusively of coaching sessions and questions in interview protocols were aimed at gaining a deeper understanding of the observations. It is possible, reasonable even, that teachers and coaches did not report or recognize informal, symbolic acts carried out by their coaches.

Second, the opt-in status of teachers who chose to engage in a coaching relationship, combined with the institutional trust from the CREATE Project and the finite nature of the relationship, set conditions for a trust relationship different than was found in the context of Lowenhaupt et al. (2014) and Mangin's (2005) research. In the aforementioned studies, researchers examined coaching relationships situated within schools where coaches were

employed by the school or district and assigned to work with teachers. It is possible that CREATE coaches were able to circumvent the need to utilize symbolic acts to gain teachers' trust in part due to the conditions under which they entered the coaching relationship.

Finally, the RTC model has trust-building elements inherent to the coaching design. The RTC trust-building elements may be enough to satisfy the establishment of a trust relationship without the need to devote time outside of coaching to symbolic acts as found in the literature.

From this exploration of trust relationships in the cases examined for this study as they relate to the literature, we turn to trust as it relates to the RTC model, how variances in implementation of the coaching model may have impacted teacher development, and my own observations of factors that influenced fidelity of RTC implementation.

The RTC Model: Embedded Risk and Inherent Trust

Elements of RTC that support the establishment of trust were explored individually in the findings chapter. The interaction of these components creates a system that involves risk-taking for teachers, support provided by coaches, and a means to build trust between the two while increasing teacher capacity.

As mentioned previously, a component of RTC that opens a space for trust to build is the student-focused nature of the model. One way RTC deviates from other models of coaching as it focuses on students is that there is no classroom observation element in which the teacher is examined by the coach. Instead, coaching activities are focused on students. Although the absence of teacher observations relieves a common barrier to trust, there is an aspect of being student-focused that may present an obstacle to trust.

When the focus is on student misconception, teachers have to be vulnerable to admit that their students do not understand the content. This in turn leads to the question, *What do we do*

now? as a means to facilitate the co-creation of a lesson in response to the student need. Inherent in this question is that teachers have the responsibility and the wherewithal to address gaps in student knowledge. It is sometimes the case that teachers will identify what their students don't know, feel helpless, and blame the students' prior teacher, or blame the student for not knowing.

In RTC, teachers take responsibility for their students' learning as they craft tasks with the aim of developing students' understanding of complex math concepts. In honoring teacher expertise, teachers' decisions are at the core of how to address student misconceptions. The cyclical nature of the RTC is such that teachers are continually supported and guided in the process with their coach. Other models of coaching share some elements of RTC, but without the student focus, they do not elevate the teacher as expert in the same way.

Anna implemented RTC with greater fidelity to the model as described by Dr. Cheng than Larina did. Under these different circumstances, all teachers and coaches reported feelings of trust in the relationship. Coaches capitalized on this trust to facilitate PD in their teachers.

RTC implementation and teacher development. Anna drew out of teachers their knowledge of student needs and applied it to the construction of related learning tasks that they implemented in their classrooms. This method of planning and teaching was new to the teachers, as was using the various technology tools Anna introduced. In the work that Anna did with her teachers, they learned and immediately utilized strategies that have an impact on teaching and learning. As Anna's teachers went through multiple RTC inquiry cycles, they practiced, applied, and refined a new approach to instructional planning to maximize student learning. Both Sylvia and Carla indicated that their teaching practice had improved as a result of working with Anna. Sylvia mentioned an increased ability to assess students in real time, and Carla reported that she could identify and address student misconceptions as a result of working with Anna.

Whereas Anna and her teachers created learning tasks based on student misconceptions, Larina's teachers created learning tasks for students drawn from their curricular resources. Larina's teachers considered their students' prior knowledge as they constructed tasks, but student understanding did not have the same center of attention as in Anna's sessions. Still, Larina's teachers gained skills to create tasks and adapt curriculum with consideration for student needs. Vanessa said that she utilized more resources to create learning experiences for students than she had prior to her work with Larina, and she regularly incorporated new activities in her classroom. Daria expressed a greater confidence to make her own instructional decisions outside the scope and sequence of the adopted curriculum and that she could better measure student learning.

Changes in Anna and Larina's teachers are shifts that have the potential to be long-lasting. Their teachers identified their professional growth as a revised approach to teaching that can sustain beyond their tenure in the coaching relationship.

Although my study was not designed to identify factors that influence fidelity to the coaching model, four possibilities arose as I carried out this research.

RTC implementation factors. A list of factors that influence the implementation of any coaching model would be long indeed. As Neufeld and Roper (2003) point out, the local context, including support and involvement of district and site administrators play a role. Additionally, the duration of coaching matters. In Campbell and Malkus (2011), greater student gains were found after the first year of a coach's tenure. Prior studies have found that teacher disposition and school culture influence coaching (Marsh et al., 2008), as well perceived authority or power held by the coach (Rainville, 2008). Atteberry and Bryk (2011) found a coach's caseload of teachers, teacher's willingness to innovate and teacher's prior experience to impact the

implementation of coaching. Here, four potential factors in the variation I observed in RTC implementation—coach's training and experience, interpersonal context, teacher disposition, and group dynamic—are described.

Coach training and experience. Marsh et al. (2008) cited the experience level of coaches as a factor in the variation of coaching activities observed. By design, RTC coaches selected for this study had varied experience, and, as in the Marsh study, differences in implementation were observed. Anna had more extensive RTC experience than did Larina, although they had similar training for the CREATE Project. Anna coached for 3 years in another project in which Dr. Cheng was the coaching developer and was implementing RTC as a coach in this concurrently with the CREATE Project. Anna and Larina experienced a full summer of RTC training under Dr. Cheng's direction. The CREATE Project was Larina's first and only coaching experience to date. Anna's deeper knowledge, training, and experience with RTC may explain in part why her coaching sessions were more structured around the tenets of the RTC inquiry cycle than were Larina's.

Interpersonal context. It cannot be overlooked that the interpersonal context differed so greatly between the coaches and their teachers. As previously examined in this chapter, researchers agree that insider/outsider status of the coach can influence the development of the coaching relationship in different ways (e.g., Lowenhaupt et al., 2014; Mangin, 2005). Additionally, as was found in previous literature (Tschannen-Moran and Hoy, 2000; Cox, 2012) and supported by my study, trust changes over time, so duration of exposure to one's coach will influence the relationship and the coaching. Anna, Sylvia, and Carla taught at the same site and saw each other more often than Larina saw her teachers. The increased presence of one another in Anna's context could establish more accountability for teachers to adhere to commitments

103

made in coaching sessions, such as agreements to implement a task. Another factor that may influence Larina's relationships with her teachers is that they typically met virtually. In-person meetings may have resulted in different forms of collaboration as the basis for the trust relationship to develop. Additionally, the fact that Anna is department chair may afford her some status in the eyes of her teachers influencing their participation, potentially increasing their engagement to enhance their standing with a colleague with a perceived higher status or authority on campus. In Cohort 1 of the CREATE Project, Larina worked with a colleague of Vanessa's in a relationship that Larina described as very positive, and her Cohort 1 teachers were referenced by Vanessa in their coaching session. This experience may have influenced a positive start for Vanessa and Larina.

Teacher disposition. As noted previously, each coach had teachers with different dispositions—one more flexible and open than the other. This would lend credibility to the assumption that disposition did not have as significant an influence on RTC implementation as other factors. There may be yet other facets of teacher disposition that facilitate or inhibit the implementation of this coaching model that drives a novel approach to teaching. Atteberry and Bryk's (2011), for example, found that teachers with a greater inclination to innovate were more likely to engage in coaching activities.

Group dynamics. Neufeld and Roper (2003) reported that small-group configurations in coaching have greater promise than one-on-one coaching. Additionally, Goddard et al. (2007) found a positive relationship between collaboration amongst teachers and student achievement. Anna and her teachers were covering similar content, which facilitated a conversation around the content to use in a learning task. All teachers had a stake in creating activities that they could use right away in their classrooms. Larina, on the other hand, worked independently with teachers at

different sites. The tasks they co-created would only be implemented by the teacher, giving that teacher a different sense of ownership for the task than if both the coach and teacher were going to utilize the task with students.

Implications for Practice

My study answered questions about RTC coaches' actions that develop trust with teachers and identified which of those actions occur as a part of the intended design of the model and which occur outside the scope of the coaching model. To a large degree, the RTC model design facilitates the building of trust with teachers. Three elements of trust were observed to have occurred outside the scope or design of the model: personal regard, integrity, and commentary or praise for teachers' instructional decisions. Two trust elements—just in time and student-focused—were identified as trust-building within the RTC model but are not among the empirically examined trust elements described in the literature on trust in the coaching relationship. What does this mean for parties interested in coaching, RTC or otherwise?

First, the importance of the embedded nature of trust-building within the model ought to be highlighted. For RTC trainers, making explicit the ways in which RTC design components are also trust-building may increase the ability of RTC coaches to actively develop trust with teachers. As coaches become aware of avenues to build trust and the intrinsic link with the RTC model, this can only make the development of trust stronger. The design of RTC embodies practices that build relationships and get to the business of coaching concurrently. Site and district decision makers looking to invest in coaching as a PD initiative ought to evaluate the means by which a coaching model is structured to build trust with teachers. Coaches and trainers of coaches should consider the ways building trust is inherent in a coaching model and make explicit the deployment of these strategies. This will develop coach's awareness and capacity for

trust-building and increase the amount of time a coach spends coaching. When the model itself serves to build trust, coaches do not need to search for ways outside of coaching to do so. We turn now to trust elements that fell outside the scope of the RTC design.

As defined by Anderson et al. (2014), personal regard includes time spent independent of the coaching role to earn teachers' trust. Aligning with the Anderson et al. study, coaches in the Lowenhaupt et al. (2014) and Mangin (2005) studies understandably felt the need take measures to establish a trusting relationship with teachers. These coaches aptly recognized that without trust, the real work of coaching—improving outcomes for students through improved teacher practice—could not happen. However, too much time spent on menial tasks that do not contribute to the development of teachers is a squandered resource and can result in the less effective version of coaching described by Killion (2009) as coaching light. RTC coaches did not spend much time on such symbolic acts. Rather, they earned teachers' trust through effective implementation of the coaching model. I am not suggesting that that showing personal regard for teachers is always a waste of time. Quite the contrary; teachers need to feel that their coaches care about them as individuals to establish trust, and there are appropriate and necessary times to build trust outside of coaching that will only serve to enhance the coaching relationship overall. Nevertheless, as demonstrated by Anna, there are ways that personal regard can be displayed within the context of coaching. She supported teachers during moments in which they exhibited vulnerability with regard to teaching. With these actions, she helped establish an environment where her teachers could feel safe to take professional risks; a condition that facilitates professional learning and growth.

Like in the Anderson et al. (2014) study, integrity was hard to pinpoint in the data. While it did surface in some interviews, the lack of data coded as integrity makes it a difficult area in

106

which to draw implications. Anderson et al. proposed potential explanations for its relative absence from the data, but ultimately found that more research was needed on the topic. I put forth the same conclusion here. Integrity as a trust-building element fell outside the scope of RTC, its role in the establishment and maintenance of trust is undefined by this study.

The third and final element of trust that is outside the bounds of the RTC design, praise for teachers' instructional decisions, is contrary to the student-focused nature of the coaching model. While conversations about teachers' curriculum and/or instructional choices may arise in RTC coaching sessions, it is not the emphasis or focus of the coaching work. In addition, this element, a subset of respect, was observed in only one of the RTC coach's interactions with one of her teachers. Yet the presence of trust was established in all four RTC coach-teacher relationships[10], supporting the conclusion that this subset of respect is not a required element to develop trust. For these reasons, I recommend against the inclusion of the element of instructional and curricular commentary as part of training for RTC. In fact, the findings herein demonstrate that conversations about teachers' instructional choices are unnecessary for building trust when the focus of conversation is instead on student thinking.

The elements of trust unique to RTC, just in time and student-focused conversations, ought to be considered as a means to bolster trust in coaching relationships. When teachers spend time—one of their most limited resources—in coaching sessions and leave with relevant, classroom-ready materials tailored to meet students' needs, trust in their coach's ability to satisfy their PD needs increases. These coaching behaviors contribute to the development of teachers while at the same time build trust in the coaching relationship.

---

[10] The four RTC teacher-coach relationships encompassed here are: (1) Anna and Sylvia, (2) Anna and Carla, (3) Larina and Vanessa, and (4) Larina and Daria.

Finally, this study offers concrete examples of abstract constructs, providing a depiction of trust in action. Coach actions and behaviors that contributed to trusting relationships were described in detail and are summarized here as guide for practitioners interested in trust in the coaching relationship. Coaches demonstrated personal regard when they used a nonjudgmental approach to support teachers who expressed vulnerabilities in their teaching practice. Competent coaches demonstrated content knowledge and content pedagogy by conveying prior teaching experiences and in discussions of appropriate sequencing of math concepts to support student learning. Coaches honored teachers as professionals when they solicited teachers' knowledge of students, content knowledge, and content pedagogy. Student-focused conversations were facilitated by coaches who steered teachers to identify and describe student misconceptions. Coaches provided just in time support as they facilitated the co-creation of classroom-ready tasks that were responsive to student needs. Coaches can examine their own practices to evaluate how well and to what extent they utilize these strategies. Additionally, future researchers can draw on these concrete examples as they observe and study coaching relationships.

Limitations

The sample in this study poses a limitation in that all coaches and teachers were voluntary participants in the CREATE Project. This makes for a unique context to establish the teacher-coach relationship. Coaches and teachers were compensated for their involvement in the study. In the school setting, teachers are not compensated for working with their coaches, and this may have influenced the relationship as teachers had a fiscal incentive to participate actively. Additionally, the opt-in status of teachers and the institutional trust facilitated by the CREATE Project set conditions for fewer barriers to trust to be present than one would encounter otherwise. This unique setting brings into question generalizability of the study.

Despite this, descriptions of coaching relationships achieve resonance (Tracy, 2010) with readers involved in coaching. Coaches and trainers of coaches can identify with the notion of building relationship with teachers, regardless of content and grade level of teachers. Just as this study draws on research from coaching in different contents and various school settings, findings regarding the development of trust in the teacher-coach relationship may be transferred to teacher-coach relationships in other contexts.

Another limitation is the assumption of causality between each trust element and trust in the relationship. While research supports the given elements as contributing to the development of trust, it remains difficult to discern a causal relationship or to pinpoint the magnitude of effect of each element. A number of the RTC trust elements were also defined in the literature, however, the elements student-focus and just in time, raised by Dr. Cheng, are as yet under-researched in the area of trust-building.

Additionally, it is possible that I excluded relevant data using provisional coding. I relied on a body of literature that defined trust elements, as well as Dr. Cheng's expertise to guide my review of the data. In doing so, I narrowed my analysis, searching for preset coding categories. Thus, I may have overlooked other factors that influence trust.

The interview and questionnaire protocols could have been improved to gather more specific information from teachers about their feelings of trust. In interviews, I avoided asking teachers directly about the identified elements of trust. I did not want to ask leading questions that could have introduced a concept that teachers simply agreed with rather than independently felt. However, follow up probes to topics raised by teachers could have been better deployed to obtain more information about teachers' feelings on the elements of trust identified in the literature and by Dr. Cheng, which were the focus of my analysis.

The questionnaire distributed to teachers at the start of this study could have gleaned richer data on teachers' feelings of trust had it been designed and administered differently. The statement teachers were asked to respond to, "I have a trusting relationship with my coach," may have been too direct in that there was only one socially desirable way to answer. In fact, all teachers marked "strongly agree" with the statement. Perhaps more subtle questions would have elicited a different response and a more nuanced view of trust could have been observed with this data collection method. The development of such an instrument would be a welcome addition to the field.

Recommendations for Further Study

A survey instrument—one designed to be completed by teachers—that measures trust in the coaching relationship would be beneficial to coaches, administrators, and researchers. Questions that hone in on the trust elements described in this study could identify the presence or absence specific components of trust in the relationship. Such a tool could pinpoint the sources of trust and the magnitude of each as well as provide the overall the level of trust in the relationship. The survey could be administered at different points in time to determine how trust may change over the life of a coaching relationship. This way, cases of increased or decreased trust could be examined to determine facilitators and inhibitors to developing trust.

In examining what facilitates a trusting relationship, the findings of this study support the literature findings; there is no one way to establish trust in a coaching relationship. Several trust elements were examined and found to varying degrees and combinations amongst the coaches studied. Additional examinations of trust could provide more insight into whether some elements are more important than others and which elements, if any, are non-negotiable. In other words, are there some elements of trust that *must* be present in order to establish trust? In addition, the

110

trust elements exclusive to RTC—just in time and student focus—should be examined further for their impact on trust and the coaching relationship. In depth, qualitative studies that involve interviews with teachers in coaching relationships across a variety of contexts could answer this question.

Another question is whether coaches and teachers place similar levels of importance on various facets of trust. In this study, for example, one coach mentioned her efforts to connect with teachers during time outside of formal coaching sessions, and her teachers did not report that as influential in their trust relationship. A qualitative, multi-case study of coaches and their teachers could add to the literature on this point. Coaches may establish trust more effectively if they are addressing the means by which their teachers feel it is impactful to do so.

Conclusion

The results of this study add to the literature and the field in important and practical ways. My study confirms prior findings on trust in that trust was found to be influenced by a number of factors in varied combinations within the examined trust relationships. Additionally, this study supports the literature finding that trust changes over time. The relative absence of trust-building symbolic acts carried out by coaches, a finding that is incongruous with the literature, represents a strength of the RTC coaching model. RTC holds promise as a coaching model that builds trust while building teacher capacity.

This study sheds light on the implementation of an under-studied, innovative coaching model with documented positive student outcomes. When implemented with fidelity, RTC coaches build trust relationships as they engage teachers in meaningful coaching conversations. Coaching practices observed and described herein can be incorporated by coaches outside the studied context. Concrete examples of manifestations of trust elements in coaching relationships

111

help inform current practice for coaches and trainers of coaches. This study of trust-building in the context of RTC coaching provided rich descriptions of trust in action that supplied valuable insights to this model as well as learnings and additional questions that extend beyond its boundaries. It is my hope that this work contributes to the improvement of student outcomes by aiding in the development teachers through expansion of a nascent coaching model.

Study Information Sheet

UNIVERSITY OF CALIFORNIA LOS ANGELES
STUDY INFORMATION SHEET

Trust in Action: An Examination of Middle School Math Coaching

Callie Moreno (███████████████████and Christina Christie (███████████████) from
the *Department of Education* at the University of California, Los Angeles (UCLA) are
conducting a research study.

You were selected as a possible participant in this study because *you are a participant in the
CREATE study and involved in RTC coaching.* Your participation in this research study is
voluntary.

Why is this study being done?

*This study examines the RTC coaching model, looking at what features of RTC coaching might
influence professional collaboration.*

What will happen if I take part in this research study?

If you volunteer to participate in this study, the researcher will ask you to do the following:

- *Participant-coaches will be asked for approximately 4 hours 15 minutes of participation as
  follows:*
    - *complete a questionnaire (~15 mins)*
    - *be observed in 3 coaching sessions (~3 hours)*
    - *one-on-one interview with the Principal Investigator regarding your professional
      development, coaching goals and coaching practices (~1 hour)*
    - *review of your coaching logs, obtained from CREATE personnel (0 mins)*

- *Participant-teachers will be asked for approximately 4 hours 15 mins of participation as
  follows:*
    - *complete a questionnaire (~15 mins)*
    - *be observed in 3 coaching sessions (~3 hours)*
    - *one-on-one interview with the Principal Investigator regarding your engagement
      with RTC coaching and the influence of coaching on your practice (~1 hour)*
    - *review of your coaching logs, obtained from CREATE personnel (0 mins)*

How long will I be in the research study?

Participation will take a total of about *4-5 hours during the fall and winter of this year.*

Are there any potential risks or discomforts that I can expect from this study?

- *In the interview, you will be asked about your professional working relationship with your RTC collaborator(s). If this makes you uncomfortable at any time, you may opt to not answer those questions.*

Are there any potential benefits if I participate?

You may benefit from the study *from consideration of questions in the interview protocol that are reflective in nature, asking you to consider your own practices and development. Additionally, coaches may benefit from findings that show insight to the development and influence of the professional relationships. Teachers may benefit from the findings that may show the value of engaging in collaboration with a coach and/or colleagues in a professional relationship.*

The results of the research may *contribute to the literature on the important feature of relationship building in coaching. Further, conclusions based on the data gathered for this study may aid in the training of RTC coaches. As schools turn to math coaching to improve teacher practices and, in turn, student outcomes, school leaders will be interested to know how teacher-coach relationships develop in the context of an innovative math coaching model. They can use this information to form effective coaching programs, targeting the training and development of coaches toward effective practices. Finally, this study has significance for math coaches seeking to build positive relationships with their teachers.*

What other choices do I have if I choose not to participate?

Participation is completely voluntary, and you may elect to not participate at any time.

Will information about me and my participation be kept confidential?

Any information that is obtained in connection with this study and that can identify you will remain confidential. It will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of ... *a key code created and securely saved by the Principal Investigator that will mask your identity on any documents with data collected during the study. The key code will only be accessible to the Principal Investigator throughout the duration of the study.*

What are my rights if I take part in this study?

- You can choose whether or not you want to be in this study, and you may withdraw your consent and discontinue participation at any time.
- Whatever decision you make, there will be no penalty to you, and no loss of benefits to which you were otherwise entitled.

- You may refuse to answer any questions that you do not want to answer and still remain in the study.

Who can I contact if I have questions about this study?

The research team:
If you have any questions, comments or concerns about the research, you can talk to the one of the researchers. Please contact:

Callie Moreno, Principal Investigator

███████ ██████████

Christina Christie, Faculty Sponsor

███████████ █████

UCLA Office of the Human Research Protection Program (OHRPP):
If you have questions about your rights as a research subject, or you have concerns or suggestions and you want to talk to someone other than the researchers, you may contact the UCLA OHRPP by phone: (310) 206-2040; by email: participants@research.ucla.edu or by mail:

Box 951406
Los Angeles, CA 90095-1406

Appendix B:

Protocols

Interview Protocol: RTC Creator

The interview will last approximately 60 minutes. You may end your participation at any time. Your identity will be kept confidential. Everything you discuss with me during this interview is strictly confidential. With your permission, I would like to digitally record it so this interview can later be transcribed verbatim. The recording will not be shared with anyone else. If there are points during the interview where you would like me to stop recording, feel free to indicate that to me so I can turn the recorder off.

Interviewee: Dr. Ivan Cheng, Creator of RTC

Format: Semi-structured interview
Estimated Length: 60 mins
RQs Addressed:
1. What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?
2. What does trust look like in RTC coaching sessions?
3. To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?

Interview Questions:
1. Describe the RTC coaching model.
   a. What components of the model contribute to the establishment of trusting relationships between teachers and coaches?
2. How are individuals trained to become RTC coaches?
   a. Does the training include specific instruction or guidance on building trust with teachers?
3. Is there anything else you would like to add?
4. Describe each coach's experience with RTC up to and including the CREATE project.

Questionnaire Protocol: Teachers

Audience: Teachers of Participant-Coaches
Format: Electronic questionnaire
Estimated Length: 15 mins
RQs Addressed:
1. What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?
2. What does trust look like in RTC coaching sessions?
3. To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?

Questionnaire

Name
When did you start working with your RTC math coach?
Approximately how many hours have you worked with your math coach from the date indicated above until today? _____
When did you first meet the person who is your RTC math coach?
Indicate how strongly you agree with the statement: I have a trusting relationship with my coach.
Agree Strongly
Agree Moderately
Agree Slightly
Disagree Slightly
Disagree Moderately
Disagree Strongly
What interactions with your coach, if any, have increased the trust you have in her or him?
What interaction with your coach, if any, have decreased the trust you have in her or him?

Observation Protocol: Coaching Sessions

Setting: RTC Coaching Sessions
Format: In-person observation with field notes
Estimated Length: Approximately 60 minutes
RQs Addressed:
  1. What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?
  2. What does trust look like in RTC coaching sessions?
  3. To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?

Field Notes Template

Context: time, place and duration of the coaching session, form of communication

    Content: topics, i.e., math content and pedagogy, classroom management, instructional strategies, student learning, student behavior, instructional resources
    Dynamics: interaction between teacher and teacher (T-T), teacher and coach (T-C): who contributes what to the conversation, who drives the conversation by maintaining or changing topics, the apparent affect and tone of each party, and strategies, such as questioning or goal setting, employed by coaches

Time	Observations	
	Content	Dynamics

Interview Protocol: Coaches

The interview will last approximately 60 minutes. You may end your participation at any time. Your identity will be kept confidential. Everything you discuss with me during this interview is strictly confidential. With your permission, I would like to digitally record it so this interview can later be transcribed verbatim. The recording will not be shared with anyone else. If there are points during the interview where you would like me to stop recording, feel free to indicate that to me so I can turn the recorder off.

Format: Semi-structured interview
Estimated Length: 60 mins
RQs Addressed:
1. What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?
2. What does trust look like in RTC coaching sessions?
3. To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?

Interview questions:
1. Describe your relationship with each of your teachers [insert names to solicit distinct responses].
2. Math coaches develop relationships with teachers in many ways. For example, I have seen you [*insert from observational data*]. Can you speak to some of the different ways you seek to build your relationship with teachers?
   a. Do you feel there is something about the RTC model that supports your ability to develop relationships with teachers?
3. Describe the ways you have found to be successful at establishing trust with teachers from this study.
4. Describe the ways you have found to not be successful at establishing trust with teachers from this study.
5. Is there anything else you would like to add?

Interview Protocol: Teachers

The interview will last approximately 60 minutes. You may end your participation at any time. Your identity will be kept confidential. Everything you discuss with me during this interview is strictly confidential. With your permission, I would like to digitally record it so this interview can later be transcribed verbatim. The recording will not be shared with anyone else. If there are points during the interview where you would like me to stop recording, feel free to indicate that to me so I can turn the recorder off.

Format: Semi-structured interview
Estimated Length: 60 mins
RQs Addressed:
1. What aspects of the RTC coaching model are intended to contribute to developing a trusting teacher-coach relationship?
2. What does trust look like in RTC coaching sessions?
3. To what extent does trust between an RTC coach and teacher result from a coach's actions that are beyond what the coaching model specifies?

Interview questions:
1. Describe your relationship with your coach.
   a. Did you know your coach before meeting her/him as part of this project? If so, what was your relationship like before s/he became your coach? How did it change once s/he started coaching you?
2. Has your relationship with your coach changed over time?
   a. How so?
3. Can you describe your feelings of trust toward your coach?
   a. Has this changed over time? How so?
4. (If applicable) Why do you feel differently now about your coach that you did before?
5. Describe a time when your coach made you feel it was safe to try something new or take a risk.
6. Describe a time with your coach when you felt unsure or unsafe so try something new.

References

Association for Middle Level Education. (n.d.). Retrieved from http://www.amle.org

Association for Middle Level Educators. (2010). *This we believe: Keys to educating young adolescents*. Westerville, OH: Association for Middle Level Educators.

Anderson, R., Feldman, S., & Minstrell, J. (2014). Understanding relationship: Maximizing the effects of science coaching. *Education Policy Analysis Archives*, *22*(50–57), 1–25. https://doi.org/10.14507/epaa.v22n54.2014

Atteberry, A., & Bryk, A. S. (2011). Analyzing teacher participation in literacy coaching activities. *The Elementary School Journal*, *112*(2), 356–382. https://doi.org/10.1086/661994

Bahr, P. R. (2010). Preparing the underprepared: An analysis of racial disparities in postsecondary mathematics remediation. *Journal of Higher Education*, *81*(2), 209–237. https://doi.org/10.1353/jhe.0.0086

Bahr, P. R. (2013). The aftermath of remedial math: Investigating the low rate of certificate completion among remedial math students. *Research in Higher Education*, *54*(2), 171–200. https://doi.org/10.1007/s11162-012-9281-4

Bailey, T., Jeong, D. W., & Cho, S.-W. (2010). Referral, enrollment, and completion in developmental education sequences in community colleges. *Economics of Education Review*, *29*(2), 255–270. https://doi.org/10.1016/j.econedurev.2009.09.002

Ball, D. L. (1996). Teacher learning and the mathematics reforms: What we think we know and what we need to learn. *The Phi Delta Kappan*, *77*(7), 500–508.

Barlow, A. T., Burroughs, E. A., Harmon, S. E., Sutton, J. T., & Yopp, D. A. (2014). Assessing

    views of coaching via a video-based tool. *ZDM*, *46*(2), 227–238.

    https://doi.org/10.1007/s11858-013-0558-7

Bengo, P. (2016). Secondary mathematics coaching: The components of effective mathematics

    coaching and implications. *Teaching and Teacher Education*, *60*, 88–96.

    https://doi.org/10.1016/j.tate.2016.07.027

Biancarosa, G., Bryk, A. S., & Dexter, E. R. (2010). Assessing the value-added effects of

    Literacy Collaborative professional development on student learning. *Elementary School*

    Journal, *111*(1), 7–34. https://doi.org/10.1086/653468

Boaler, J. (2016). *Mathematical mindsets: Unleashing students' potential through creative math,*

    inspiring messages, and innovative teaching. San Francisco, CA: Jossey-Bass.

Braun, H., Chapman, L., & Vezzu, S. (2010). The Black-White achievement gap revisited.

    Education Policy Analysis Archives, *18*(21), 1–96.

    https://doi.org/10.14507/epaa.v18n21.2010

Bryk, A. S., & Schneider, B. (2002). *Trust in schools: A core resource for school reform*. New

    York, NY: Russell Sage Foundation.

Bryk, A. S., & Schneider, B. (2003). Trust in schools: A core resource for school reform.

    Educational Leadership, *60*(6), 40–44.

California Department of Education. (n.d.). California school directory. Retrieved from

    https://www.cde.ca.gov/schooldirectory/

California Department of Education. (2016). CAASPP 2016 test results for English language

    arts/literacy and mathematics. Retrieved from

http://caaspp.cde.ca.gov/sb2016/ViewReport?ps=true&lstTestYear=2016&lstTestType=
B&lstCounty=00&lstDistrict=00000&lstSchool=0000000

California Department of Education. (2017). CAASPP 2017 test results for English language
arts/literacy and mathematics. Retrieved from https://caaspp.cde.ca.gov/sb2017/default

California Commission on Teacher Credentialing. (2016). Teaching credentials requirements.
Retrieved from https://www.ctc.ca.gov/credentials/req-teaching

California Council on Science and Technology, Center for the Future Teaching and Learning.
(2007). Critical path analysis of California's science and mathematics teacher preparation
system. Retrieved from http://ccst.us/publications/2007/2007TCPA.pdf

Campbell, P. F., & Malkus, N. N. (2011). The impact of elementary mathematics coaches on
student achievement. *The Elementary School Journal*, *111*(3), 430–454.
https://doi.org/10.1086/657654

Carpenter, T. P., Fennema, E., Franke, M. L., Levi, L., & Empson, S. B. (2000). Cognitively
Guided Instruction: A research-based teacher professional development program for
elementary school mathematics. Retrieved from https://eric.ed.gov/?id=ED470472

Center for Research in Mathematics and Science Education. (2010). Breaking the cycle: An
international comparison of U.S. mathematics teacher preparation. Retrieved from
http://www.educ.msu.edu/content/sites/usteds/documents/Breaking-the-Cycle.pdf

Cheema, J. R., & Galluzzo, G. (2013). Analyzing the gender gap in math achievement: Evidence
from a large-scale US sample. *Research in Education*, *90*(1), 98–112.
https://doi.org/10.7227/RIE.90.1.7

Cheng, I. (May 2010). *Using collaborative inquiry with student teachers to support teacher
professional development.* Paper presented at the American Educational Research

123

Association Annual Meeting, Denver, CO. Retrieved from

http://www.csun.edu/~icheng/AERA%20Paper%202010.pdf

Cheng, I. (2014). Collaboration Resulting in Educators Applying Technology Effectively (No.

U411P140401). Retrieved from

https://www2.ed.gov/programs/innovation/2014/corporation.pdf

Cheng, I., Ainsworth, A., Applerouth, S., Xie, J., & Moreno, C. (April 2018). *Equipping and*

empowering 8th grade mathematics teachers to create dynamic learning activities

promoting conceptual understanding. Paper presented at the Annual Meeting of

American Educational Research Association, New York, NY.

Cheng, I., Gainsburg, J., & Schlackman, J. (May 2013). *Closing the algebra achievement gap*

through the Responsive Teaching Cycle (RTC). Paper presented at the Annual Meeting of

the American Educational Research Association, San Francisco, CA.

Clayton, M. J. (1997). Delphi: A technique to harness expert opinion for critical decision-making

tasks in education. *Educational Psychology*, *17*(4), 373–386.

https://doi.org/10.1080/0144341970170401

Coburn, C. E., & Woulfin, S. L. (2012). Reading coaches and the relationship between policy

and practice. *Reading Research Quarterly*, *47*(1), 5–30. https://doi.org/10.1002/RRQ.008

Cohen, D., & Ball, D. L. (1999). Instruction, capacity, and improvement (RR-43, iii-41).

Retrieved from

http://repository.upenn.edu/cpre_researchreports/94?utm_source=repository.upenn.edu%

2Fcpre_researchreports%2F94&utm_medium=PDF&utm_campaign=PDFCoverPages

Costa, A. L., & Garmston, R. (1985). Supervision for intelligent teaching. *Educational*

Leadership, *42*(5).

Costa, A. L., & Garmston, R. J. (2002). *Cognitive Coaching: A foundation for renaissance schools*. Norwood, MA: Christopher-Gordon Publishers.

Cox, E. (2012). Individual and organizational trust in a reciprocal peer coaching context. *Mentoring & Tutoring: Partnership in Learning*, *20*(3), 427–443. https://doi.org/10.1080/13611267.2012.701967

Cox, E. (2015). Coaching and adult learning: Theory and practice. *New Directions for Adult and Continuing Education*, *2015* (148), 27–38. https://doi.org/10.1002/ace.20149

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed). Thousand Oaks: SAGE Publications.

D'Ambrosio, U. (2009). Some reflections on education, mathematics, and mathematics education. In R. Even & D. L. Ball (Eds.), *The professional education and development of teachers of mathematics: The 15th ICMI study* (pp. 239–244). New York, NY: Springer.

Darling-Hammond, L. (2000). Teacher quality and student achievement. *Education Policy Analysis Archives*, *8*. https://doi.org/10.14507/epaa.v8n1.2000

Darling-Hammond, L., Furger, P. S., & Sutcher, L. (2016). Addressing California's teacher shortage: An analysis of sources and solutions. Retrieved from https://learningpolicyinstitute.org/sites/default/files/product-files/LPI-Report-AddressingCA_TeacherShortage.pdf

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional learning in the learning profession: A status report on teacher development in the United States and abroad. Retrieved from http://www.learningforward.org/docs/pdf/nsdcstudy2009.pdf

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, *38*(3), 181–199. https://doi.org/10.3102/0013189X08331140

Domina, T. (2014). The link between middle school mathematics course placement and achievement. *Child Development*, *85*(5), 1948–1964. https://doi.org/10.1111/cdev.12255

Domina, T., Hanselman, P., Hwang, N., & McEachin, A. (2016). Detracking and tracking up: Mathematics course placements in California middle schools, 2003–2013. *American Educational Research Journal*, *53*(4), 1229–1266. https://doi.org/10.3102/0002831216650405

Dougherty, S. M., Goodman, J. S., Hill, D. V., Litke, E. G., & Page, L. C. (2015). Middle school math acceleration and equitable access to eighth-grade algebra: Evidence from the Wake County public school system. *Educational Evaluation and Policy Analysis*, *37*(1_suppl), 80S-101S. https://doi.org/10.3102/0162373715576076

Ellison, J., & Hayes, C. (2009). Cognitive coaching. In J. Knight (Ed.), *Coaching: Approaches and perspectives* (pp. 70–90). Thousand Oaks, CA: Corwin Press.

Elmore, R. F. (2002). Bridging the gap between standards and achievement: The imperative for professional development in education. Retrieved from http://www.shankerinstitute.org/sites/shanker/files/Bridging_Gap.pdf

Fennema, E., Carpenter, T. P., Franke, M. L., Levi, L., Jacobs, V. R., & Empson, S. B. (1996). A longitudinal study of learning to use children's thinking in mathematics instruction. *Journal for Research in Mathematics Education*, *27*(4), 403–434. https://doi.org/10.2307/749875

Frykholm, J. A. (1999). The impact of reform: Challenges for mathematics teacher preparation. *Journal of Mathematics Teacher Education*, *2*(1), 79–105. https://doi.org/10.1023/A:1009904604728

Gainsburg, J. (2012). Why new mathematics teachers do or don't use practices emphasized in their credential program. *Journal of Mathematics Teacher Education*, *15*(5), 359–379. https://doi.org/10.1007/s10857-012-9208-1

Gallucci, C., DeVoogt Van Lare, M., Yoon, I. H., & Boatright, B. (2010). Instructional coaching: Building theory about the role and organizational support for professional learning. *American Educational Research Journal*, *47*(4), 919–963. https://doi.org/10.3102/0002831210371497

Garet, M. S., Heppen, J. B., Walters, K., Parkinson, J., Smith, T. M., Song, M., … Wei, T. E. (2016). Focusing on mathematical knowledge: The impact of content-intensive teacher professional development. Retrieved from https://eric.ed.gov/?id=ED569154

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal*, *38*(4), 915–945. https://doi.org/10.3102/00028312038004915

Garet, M. S., Wayne, A. J., Stancavage, F., Taylor, J., Eaton, M., Walters, K., … Doolittle, F. (2011). Middle school mathematics professional development impact study: Findings after the second year of implementation (No. NCEE 2010-4024). Retrieved from https://eric.ed.gov/?id=ED519922

Garet, M. S., Wayne, A. J., Stancavage, F., Taylor, J., Walters, K., Song, M., … Doolittle, F. (2010). Middle school mathematics professional development impact study: Findings

after the first year of implementation (No. NCEE 2010-4009). Retrieved from https://eric.ed.gov/?id=ED509306

Goddard, Y. L., Goddard, R. D., & Tschannen-Moran, M. (2007). A theoretical and empirical investigation of teacher collaboration for school improvement and student achievement in public elementary schools. *Teachers College Record*, *104*(4), 877–896.

Goldhaber, D. (2016). In schools, teacher quality matters most. *Education Next*, *16*(2), 56–62.

Guskey, T. R. (2000). *Evaluating professional development*. Thousand Oaks, CA: Corwin Press.

Guskey, T. R. (2002). Professional development and teacher change. *Teachers & Teaching*, *8*(3/4), 381–391. https://doi.org/10.1080/135406002100000512

Hartman, S. (2013). Math coaching in a rural school: Gaining entry: A vital first step. *Journal of Education*, *193*(1), 57–67. https://doi.org/10.1177/002205741319300107

Hiebert, J., Morris, A. K., & Glass, B. (2003). Learning to learn to teach: An "experiment" model for teaching and teacher preparation in mathematics. *Journal of Mathematics Teacher Education*, *6*(3), 201–222. https://doi.org/10.1023/A:1025162108648

Hill, H. C. (2007). Mathematical knowledge of middle school teachers: Implications for the No Child Left Behind Policy Initiative. *Educational Evaluation and Policy Analysis*, *29*(2), 95–114. https://doi.org/10.3102/0162373707301711

Horowitz, F. D., Darling-Hammond, L., & Bransford, J. (2007). Educating teachers for developmentally appropriate practice. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 88–125). New York, NY: John Wiley & Sons.

Howell, P. B., Faulkner, S. A., Cook, C. M., Miller, N. C., & Thompson, N. L. (2016). Specialized preparation for middle level teachers: A national review of teacher

preparation programs. *RMLE Online*, *39*(1), 1–12.

https://doi.org/10.1080/19404476.2015.1115322

Hoy, W. K., & Tschannen-Moran, M. (1999). Five faces of trust: An empirical confirmation in

urban elementary schools. *Journal of School Leadership*, *9*, 184–208.

Hull, T. H., Balka, D. S., & Miles, R. H. (2009). *A guide to mathematics coaching*. Thousand

Oaks, CA: Corwin.

Ing, M., Webb, N. M., Franke, M. L., Turrou, A. C., Wong, J., Shin, N., & Fernandez, C. H.

(2015). Student participation in elementary mathematics classrooms: The missing link

between teacher practices and student achievement? *Educational Studies in Mathematics*,

90(3), 341–356. https://doi.org/10.1007/s10649-015-9625-z

Joyce, B., & Showers, B. (1980). Improving inservice training: The messages of

research. *Educational Leadership*, *37*(5), 379-385.

Joyce, B. R., & Showers, B. (1995). *Student achievement through staff development:

Fundamentals of school renewal*. New York, NY: Longman.

Killion, J. (2009). Coaches' roles, responsibilities, and reach. In J. Knight (Ed.), *Coaching:

Approaches and perspectives* (pp. 7–28). Thousand Oaks, CA: Corwin Press.

Kilpatrick, J. (2014). Mathematics education in the United States and Canada. In A. Karp & G.

Schubring (Eds.), *Handbook on the history of mathematics education* (pp. 323–334).

New York, NY: Springer.

Knight, J. (2007). *Instructional coaching: A partnership approach to improving instruction*.

Thousand Oaks, CA: Corwin Press. Retrieved from

http://public.eblib.com/choice/publicfullrecord.aspx?p=3032278

Knight, J. (Ed.). (2009a). *Coaching: Approaches and perspectives*. Thousand Oaks, CA: Corwin Press.

Knight, J. (2009b). Instructional coaching. In J. Knight (Ed.), *Coaching: Approaches and perspectives* (pp. 29–55). Thousand Oaks, CA: Corwin Press.

Knight, J. (2009c). What can we do about teacher resistance? *Phi Delta Kappan*, *90*(7), 508–513. https://doi.org/10.1177/003172170909000711

Knowles, M. (1978). *The adult learner: A neglected species* (2nd ed.). Houston, TX: Gulf Publishing Company.

Kohler, F. W., Crilley, K. M., & Shearer, D. D. (1997). Effects of peer coaching on teacher and student outcomes. *Journal of Educational Research*, *90*, 240–250. https://doi.org/10.1080/00220671.1997.10544578

L'Allier, S., Elish-Piper, L., & Bean, R. M. (2010). What matters for elementary literacy coaching? Guiding principles for instructional improvement and student achievement. *Reading Teacher*, *63*(7), 544–554. https://doi.org/10.1598/RT.63.7.2

Little, J. W. (1993). Teachers' professional development in a climate of educational reform. *Educational Evaluation and Policy Analysis*, *15*(2), 129–151. https://doi.org/10.3102/01623737015002129

Loewenberg Ball, D., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, *59*(5), 389–407. https://doi.org/10.1177/0022487108324554

Lowenhaupt, R., McKinney, S., & Reeves, T. (2014). Coaching in context: The role of relationships in the work of three literacy coaches. *Professional Development in Education*, *40*(5), 740–757. https://doi.org/10.1080/19415257.2013.847475

Lubienski, S. T. (2002). A closer look at Black-White mathematics gaps: Intersections of race and SES in NAEP achievement and instructional practices data. *Journal of Negro Education*, *71*(4), 269–287. https://doi.org/10.2307/3211180

Mangin, M. M. (2005). Distributed leadership and the culture of schools: Teacher leaders' strategies for gaining access to classrooms. *Journal of School Leadership, 15*(4). Retrieved from https://eric.ed.gov/?id=ED508504

Marsh, J. A., Bertrand, M., & Huguet, A. (2015). Using data to alter instructional practice: The mediating role of coaches and professional learning communities. *Teachers College Record*, *117*(4), 1–40.

Marsh, J. A., McCombs, J. S., Lockwood, R. J., Martorell, F., Gershwin, D., Naftel, S., … Crego, A. (2008). *Supporting literacy across the Sunshine State: A study of Florida middle school reading coaches*. Santa Monica, CA: RAND Corporation.

McGee, J. R., Wang, C., & Polly, D. (2013). Guiding teachers in the use of a standards-based mathematics curriculum: Teacher perceptions and subsequent instructional practices after an intensive professional development program. *School Science and Mathematics*, *113*(1), 16–28. https://doi.org/10.1111/j.1949-8594.2012.00172.x

Merriam, S. B. (1998). *Qualitative research and case study applications in education* (2nd ed.). San Francisco, CA: Jossey-Bass Publishers.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitatitve research: A guide to design and implementation* (4th ed.). San Francisco, CA: Jossey-Bass.

Mertens, S. B., Flowers, N., & Mulhall, P. F. (2005). How does middle grades teacher certification affect teacher practices and student learning? *Middle School Journal, 36*(5), 56–61. https://doi.org/10.1080/00940771.2005.11461507

Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education*, *1997*(74), 5–12. https://doi.org/10.1002/ace.7401

Mudzimiri, R., Burroughs, E. A., Luebeck, J., Sutton, J., & Yopp, D. (2014). A look inside mathematics coaching: Roles, content, and dynamics. *Education Policy Analysis Archives*, *22*(53). Retrieved from http://eric.ed.gov/?id=EJ1050391

Murray, S., Ma, X., & Mazur, J. (2009). Effects of peer coaching on teachers' collaborative interactions and students' mathematics achievement. *The Journal of Educational Research*, *102*(3), 203–212. https://doi.org/10.3200/JOER.102.3.203-212

National Assessment on Education Progress. (2015). National assessment on education progress - 2015 mathematics and reading assessments. Retrieved from http://www.nationsreportcard.gov/reading_math_2015/#mathematics?grade=4

National Association of Colleges and Employers. (2015). NACE job outlook 2016. Retrieved from https://www.mccormick.northwestern.edu/career-development/documents/getting-started/job-search/NACE%20Job%20Outlook%202016.pdf

National Council of Teachers of Mathematics. (1980). *An agenda for action: Recommendation for school mathematics of the 1980s*. Reston, VA: Author.

National Council of Teachers of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics*. Reston, VA: Author.

National Council of Teachers of Mathematics. (1991). *Professional standards for teaching mathematics*. Reston, VA: Author.

National Council of Teachers of Mathematics. (1995). *Assessment standards for school mathematics*. Reston, VA: Author.

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author.

Neuberger, J. (2012). Benefits of a teacher and coach collaboration: A case study. *Journal of Mathematical Behavior, 31*(2), 290–311. https://doi.org/10.1016/j.jmathb.2011.12.004

Neufeld, B., & Roper, D. (2003). *Coaching: A strategy for developing instructional capacity*. Washington, DC: Aspen Institute Program on Education.

Neuman, S. B., & Cunningham, L. (2009). The impact of professional development and coaching on early language and literacy instructional practices. *American Educational Research Journal, 46*(2), 532–566. https://doi.org/10.3102/0002831208328088

Obara, S. (2010). Mathematics coaching: A new kind of professional development. *Teacher Development, 14*(2), 241–251. https://doi.org/10.1080/13664530.2010.494504

Obara, S., & Sloan, M. (2009). The evolving role of a mathematics coach during the implementation of performance standards. *Professional Educator, 33*(2), 11–23.

Organisation for Economic Co-operation and Development. (2014). PISA 2012 results in focus: What 15-year-olds know and what they can do with what they know. Retrieved from http://www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf

Organisation for Economic Co-operation and Development. (2016). PISA 2015 results in focus. Retrieved from https://www.oecd.org/pisa/pisa-2015-results-in-focus.pdf

Poglinco, S., Bach, A., Hovde, K., Rosenblum, S., Saunders, M., & Supovitz, J. (2003). The heart of the matter: The coaching model in America's Choice schools. *CPRE Research Reports*. Retrieved from http://repository.upenn.edu/cpre_researchreports/35

Polly, D. (2012). Supporting mathematics instruction with an expert coaching model. *Mathematics Teacher Education and Development*, *14*(1), 78–93.

Polly, D., & Hannafin, M. J. (2011). Examining how learner-centered professional development influences teachers' espoused and enacted practices. *The Journal of Educational Research*, *104*(2), 120–130. https://doi.org/10.1080/00220671003636737

Polly, D., Mraz, M., & Algozzine, R. (2013). Implications for developing and researching elementary school mathematics coaches. *School Science & Mathematics*, *113*(6), 297–307. https://doi.org/10.1111/ssm.12029

Porter, A., McMaken, J., Hwang, J., & Yang, R. (2011). Common Core standards: The new U.S. intended curriculum. *Educational Researcher*, *40*(3), 103–116. https://doi.org/10.3102/0013189X11405038

Putnam, R. T., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher*, *29*(1), 4–15. https://doi.org/10.2307/1176586

Rainville, K. N., & Jones, S. (2008). Situated identities: Power and positioning in the work of a literacy coach. *The Reading Teacher*, *61*(6), 440–448. https://doi.org/10.1598/RT.61.6.1

Rampey, B. D., Finnegan, R., Goodman, M., Mohadjer, L., Krenzke, T., Hogan, J., & Provasnik, S. (2016). *Skills of U.S. unemployed, young, and older adults in sharper focus: Results from the Program for the International Assessment of Adult Competencies (PIAAC) 2012/2014: First look* (No. NCES 2016039REV). Washington, DC: National Center for Education Statistics. Retrieved from https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2016039rev

Rosin, M., Barondess, H., & Leichty, J. (2009). Algebra policy in California: Great expectations

    and serious challenges. Retrieved from

    http://www.noycefdn.org/documents/math/EdSourceReport0609.pdf

Saldaña, J. (2009). *The coding manual for qualitative reserachers*. Thousand Oaks, CA: SAGE

    Publications.

Schmidt, W. H., Houang, R. T., Cogan, L., Blömeke, S., Tatto, M. T., Hsieh, F. J., … Paine, L.

    (2008). Opportunity to learn in the preparation of mathematics teachers: Its structure and

    how it varies across six countries. *ZDM*, *40*(5), 735–747. https://doi.org/10.1007/s11858-

    008-0115-y

Schmidt, W. H., Tatto, M. T., Bankov, K., Blömeke, S., Cedillo, T., Cogan, L., … Schwille, J.

    (2007). The preparation gap: Teacher education for middle school mathematics in six

    countries. Retrieved from

    http://www.educ.msu.edu/content/downloads/sites/usteds/MT21Report.pdf

Showers, B. (1982). Transfer of training: The contribution of coaching. Retrieved from

    https://eric.ed.gov/?id=ED231035

Showers, B. (1984). Peer coaching: A strategy for facilitating transfer of training. Retrieved from

    https://eric.ed.gov/?id=ED271849

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard*

    Educational Review, *57*(1), 1–23. https://doi.org/10.17763/haer.57.1.j463w79r56455411

Smith, A. T. (2012). Middle grades literacy coaching from the coach's perspective. *RMLE*

    Online, *35*(5), 1–16. https://doi.org/10.1080/19404476.2012.11462088

Spradley, J. P. (1979). *The ethnographic interview*. New York, NY: Holt, Rinehart and Winston.

Stanic, G. M. A., & Kilpatrick, J. (1992). Mathematics curriculum reform in the United States: A historical perspective. *International Journal of Educational Research*, *17*(5), 407–417. https://doi.org/10.1016/S0883-0355(05)80002-3

Staub, F. C., West, L., & Bickel, D. D. (2003). What is content-focused coaching? In *Content-focused coaching: Transforming mathematics lessons* (pp. 1–17). Portsmouth, NH: Heinemann.

Stigler, J. W., & Hiebert, J. (1999). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom.* New York, NY: Free Press.

Sutton, J. T., Burroughs, E. A., & Yopp, D. A. (2011). Coaching knowledge: Domains and definitions. *Journal of Mathematics Education Leadership*, *13*(2), 12–20.

Sweeney, D. (2011). *Student-centered coaching: A guide for K-8 coaches and principals*. Thousand Oaks, CA: Corwin.

Sweeney, D. (2013). *Student-centered coaching at the secondary level*. Thousand Oaks, CA: SAGE.

Tine, M., & Gotlieb, R. (2013). Gender-, race-, and income-based stereotype threat: the effects of multiple stigmatized aspects of identity on math performance and working memory function. *Social Psychology of Education*, *16*(3), 353–376. https://doi.org/10.1007/s11218-013-9224-8

Tracy, S. J. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research. *Qualitative Inquiry*, *16*(10), 837–851. https://doi.org/10.1177/1077800410383121

Tschannen-Moran, M., & Hoy, W. K. (2000). A multidisciplinary analysis of the nature, meaning, and measurement of trust. *Review of Educational Research*, *70*(4), 547–593. https://doi.org/10.2307/1170781

U.S. Census Bureau. (2016). 2012-2016 American community survey 5-year estimates. Retrieved from https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk

West, L. (2009). Content coaching. In J. Knight (Ed.), *Coaching: Approaches and perspectives* (pp. 113–144). Thousand Oaks, CA: Corwin Press.

West, L., & Staub, F. C. (2003). *Content-focused coaching: Transforming mathematics lessons*. Portsmouth, NH: Heinemann.

Wilms, W. W. (1990). Altering the strucutre and culture of American public schools. *Phi Delta Kappan*, *84*(8), 606–615. https://doi.org/10.1177/003172170308400814

Winthrop, R., & McGivney, E. (2016). Skills for a changing world. Retrieved from https://www.brookings.edu/research/skills-for-a-changing-world/

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Los Angeles, CA: SAGE.

Yoon, K. S., Duncan, T., Lee, S. W.-Y., Scarloss, B., & Shapley, K. L. (2007). Reviewing the evidence on how teacher professional development affects student achievement (Issues & Answers Report No. REL 2007-No. 033). Retrieved from http://eric.ed.gov/?id=ED498548