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Elizabeth Hoag Carhart  
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**TEACHER BELIEFS, TEACHER CONCERNS, AND SCHOOL LEADERSHIP  
SUPPORT AS INFLUENCES ON SCHOOL READINESS FOR IMPLEMENTING A  
RESEARCH-BASED REFORM MODEL**

by

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A Dissertation Submitted to the Faculty of  
Old Dominion University in Partial Fulfillment of the  
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

EDUCATION

OLD DOMINION UNIVERSITY  
December 2013

Approved by:

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Linda Bol (Director)

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~~John~~ John A. Nunnery (Member)

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~~Steve~~ Steve Myran (Member)

## **ABSTRACT**

### **TEACHER BELIEFS, TEACHER CONCERNS, AND SCHOOL LEADERSHIP SUPPORT AS INFLUENCES ON SCHOOL READINESS FOR IMPLEMENTING A RESEARCH-BASED REFORM MODEL**

Elizabeth Hoag Carhart  
Old Dominion University, 2013  
Director: Linda Bol

Federal policy makers and school leaders increasingly recognize middle school math as a turning point in students' academic success. An i3 scale-up grant allowed grant partners to conduct a large-scale implementation of PowerTeaching (PT), a research-based reform to increase student math achievement. In a mixed-methods study during the pilot phase of the project, eight schools' readiness for reform was explored. Teacher questionnaires; interviews with project managers, school leaders, and teachers; classroom observations; and school evaluation forms were used to describe school characteristics that affected variability in initial implementation of the PT model. A cluster analysis demonstrated the relative importance of multiple factors in defining clusters of schools with varying levels of implementation. Classroom observations of teachers' instructional practices and classroom structure as well as teacher beliefs about team learning were found to be statistically significant. Fundamental to a reform's successful implementation are a stable network of strong players, and an ability by the school leader to point the organization in one direction.

For Michael  
and for my girls,  
Anna and Madeleine,  
whose smiles  
teach me joy.

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## **CHAPTER 1: INTRODUCTION**

In 2011, only about one out of every three eighth graders across the United States demonstrated proficiency in mathematics, according to the National Assessment for Educational Progress (NAEP) assessment. Although this actually represents an improvement in average scores compared to prior years, the large percentages of students who are not “proficient” (65%) or who have not achieved even “basic” knowledge of mathematics (27%) is unsettling (National Center for Education Statistics, 2011). To make matters worse, math performance has been shown to be an important predictor of future success whether in college or the workforce. Economically speaking, poor math skills have significant societal consequences (Bynner & Parsons, 2001; Rivera-Batiz, 1992; Schoon et al., 2002). Strengthening middle-school students’ math skills would result in a more prepared workforce and ultimately help the economy as a whole.

### **Background**

Policymakers and school leaders both recognize middle school math as a turning point in students’ academic success, particularly in predicting high school graduation rates. By the time students reach high school, principals acknowledge that there is little they can do to alter the students’ course trajectory. Earlier middle school math success leads to later academic success and is an important contributing factor to future learning (House & Telese, 2008; Rowan-Kenyon, Swan, & Creager, 2012). Organizations like the National Center for Dropout Prevention, What Works Clearinghouse, and America’s Promise

Alliance unanimously recommend engaging students for success in middle school instead of waiting until high school to improve math proficiency.

Low middle-school math performance has been problematic for more than a decade (Beaton et al., 1996). Middle-school years are crucial in determining whether or not students will graduate from high school, continue post-secondary education or trade training, and otherwise become productive members of society (Cleary & Chen, 2009; Ramdass & Zimmerman, 2008; Rowan-Kenyon et al., 2012; Slavin, Lake, & Groff, 2009). Eighth grade NAEP scores in 2011, although showing slight improvement over 2009, show the magnitude of the current problem – that one out of four students lacks even basic math skills (National Center for Education Statistics, 2012). When students' math skills and performance improve, the benefits are not only confined to better grades in math. Affective, social, and self-regulatory skills are shown to progress alongside middle school math improvements (Ramdass & Zimmerman, 2008; Rowan-Kenyon et al., 2012; Slavin & Karweit, 1984; Slavin, Madden, & Leavey, 1984). The clear link between these skills and math achievement is not unique to the U.S. school system (Siegler et al., 2012). Researchers in other countries have recognized intermediate level math as an indicator in their countries also (Chiu & Klassen, 2010; Eklöf, 2007; House & Telese, 2008; Perels, Dignath, & Schmitz, 2009).

It is not surprising, therefore, that when policymakers cite statistics indicating that between a quarter and a third of our nation's middle-school students lack even basic math skills (National Center for Education Statistics, 2011), these claims are often accompanied by calls for school reform. But school reform is much easier called for than actually accomplished. Institutionally and administratively the task is influenced by

countless factors, from national and state policy to local issues affecting communities, families, as well as individual students. Even reforms that have been proven by research to be effective have been difficult to implement due to a lack of long-term funding (Elmore, 2004; Nunnery, 1998; Slavin, 2008).

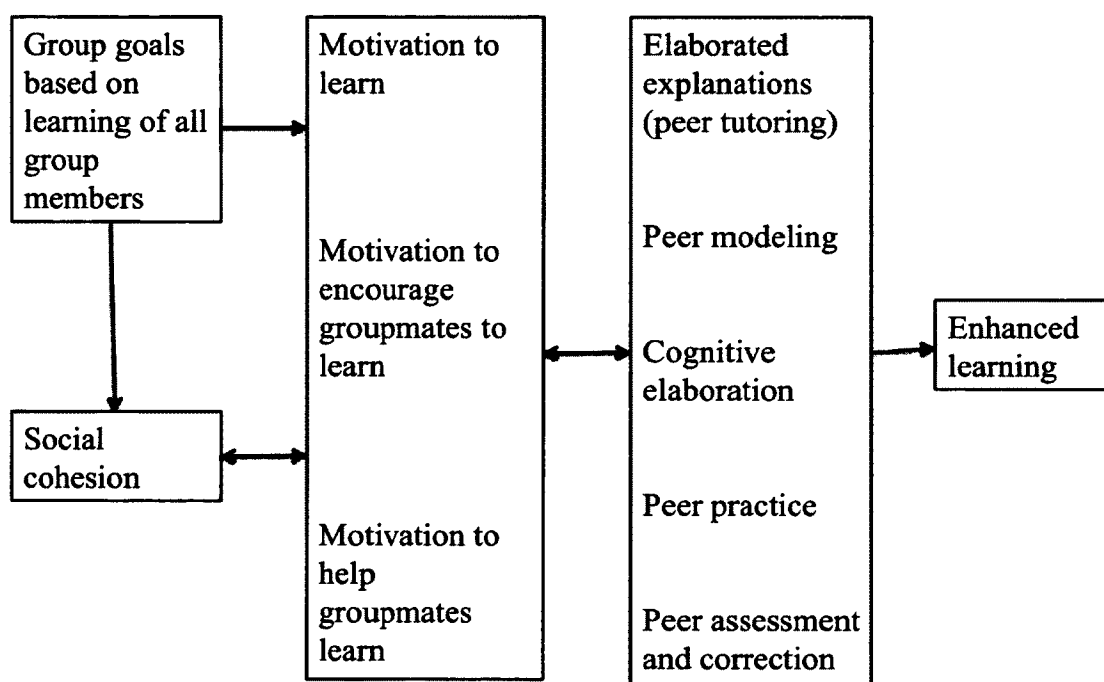
Recently, however, the U.S. government created a new series of grant opportunities to encourage school reform efforts at different stages of use. The Investing in Innovation (i3) grant program awards federal funds to worthwhile projects in development, validation, or scale-up stages. The i3 scale-up grants fund large-scale implementation of innovative reforms that are research-proven – ones that have proven positive effects on student achievement.

One such middle school math reform is PowerTeaching, a technologically enhanced form of Student Teams-Achievement Divisions (STAD) math (Barbato, 2000; Slavin et al., 2009), both initially developed at Johns Hopkins University and later implemented by the Success for All Foundation. A recent meta-analysis showed that STAD math and its emphasis on student team learning had a positive effect on secondary students' math achievement ( $d = +0.34$ ; Nunnery & Chappell, 2011).

PowerTeaching (PT) is a new framework for teaching math. During the pilot year it did not require changing the math content or curriculum. Rather, PowerTeaching changes the classroom atmosphere and activities. PowerTeaching provides a flexible framework that allows students to participate actively in their own learning. In a PT classroom, student teams share a collective goal based on the learning of the lesson content by each individual group member (Figure 1). Teams are encouraged to celebrate steps made toward this goal, and such celebrations lead to social cohesion between the

teammates and eventually to enhanced individual student learning and achievement.

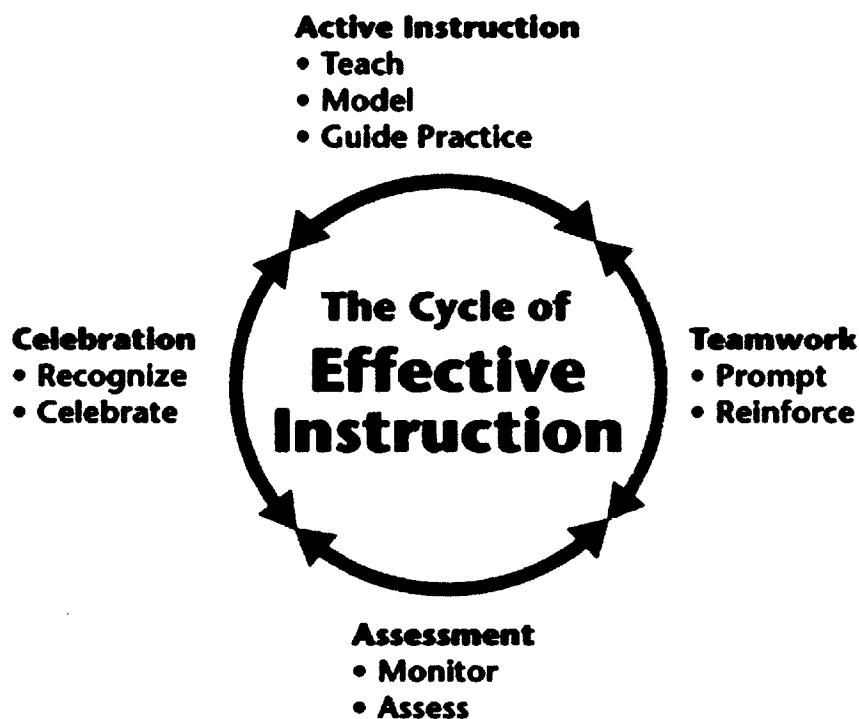
These instructional processes result in increased engagement, motivation to learn, elaborated explanations of math content, and even better cognitive regulatory skills. The reality of these outcomes and the effectiveness of the instructional processes of PowerTeaching in achieving them has been proven in over thirty years of research (Slavin & Karweit, 1984; Slavin et al., 2009; Slavin, 1995).



*Figure 1: Model of cooperative learning processes within team learning (Slavin, 1995).*

PowerTeaching math classrooms look different. Instead of the traditional passing of knowledge from teacher to student for an entire class period, perhaps followed by individual or group practice time, in the fully implemented PT classroom teachers and

students share the floor. Short periods of direct instruction are punctuated by “team huddles”, an opportunity for students to think, pair up, and share, eventually leading to individual mastery checks before students leave the room prepared to do individual homework. This give-and-take between teacher and student is called the Cycle of Effective Instruction (Figure 2). The teacher’s implementation itself is directed by objectives for pedagogy (instructional processes, IP) and classroom management (student engagement, SE). These IP and SE objectives are prioritized by SFAF and teachers are coached as they work gradually toward full implementation. The teacher might teach, model, or guide a practice problem for a few minutes and then ask students to think about a problem, pair up to write their shared answer on a team whiteboard, and then be prepared to share their answer with the class. Various strategies encourage teachers to monitor and assess the class’ understanding of the material and elaborate the team’s progress – all within the first 15 minutes of class. Arrows in the model (Figure 2) are double-headed representing the non-linear flow of the class. Focus might pass from teacher-centered to team-centered, or from modeling to assessment to celebration, many times within each class. During the pilot year this flexible framework could be used with any type of math content knowledge. Proven techniques such as student teams, regular feedback, and formative assessment are built-in to the framework (Erickson, 2007; Hattie, 2008; Success for All Foundation, 2012), as are newer technologically-facilitated enhancements.



*Figure 2: The Cycle of Effective Instruction (Success for All Foundation, 2012).<sup>1</sup>*

In late 2011 an i3 scale-up grant was awarded to The Center for Educational Partnerships at Old Dominion University (TCEP) in cooperation with the Success for All Foundation (SFAF) and the Center for Technology in Education at Johns Hopkins University (CTE) to fund scale-up of SFAF's PowerTeaching (PT) framework across 185 high-need middle schools nationwide. The first year of the grant piloted the implementation of the PT framework in 8 middle schools across the nation. TCEP's

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<sup>1</sup> *Note:* ©2012 Success for All Foundation – A Nonprofit Organization. Reprinted with permission.



formative evaluation of the implementation at the pilot schools produced initial findings on school readiness for reform. The goal of this formative evaluation was not to prove the effectiveness of the PT framework, but instead to study the complex process of implementation and bring to light characteristics of the schools' contexts and conditions of work that affect implementation. Stakeholders in the program provided unique perspectives. Numerous studies have shown that early perceptions of teachers predict successful program implementation (Desimone, 2002; Nunnery et al., 1997; Park & Datnow, 2008; Smith et al., 1997). To capture these perceptions, TCEP researchers used a variety of measurement tools, including a teacher questionnaire, classroom observations, teacher nominal groups, school leader and school-based coach interviews, and document analysis of SFAF measures. These stakeholder perceptions were then measured against the relative level of implementation of the PT framework. The formative evaluation results were reported to program developers, administrators, and other stakeholders in a cyclical and transparent manner from the initial stages of the project (Carhart et al., 2013; Nunnery, Bol, Morrison, Arnold, Chappell, et al., 2013; Nunnery, Bol, Morrison, Arnold, Perry, et al., 2013).

### **Research Objective**

Operating in the midst of this larger, grant-funded project, I used selected data from the TCEP formative evaluation process as well as collected additional data to examine the characteristics of schools and teachers who implemented the program during the pilot year. My mixed-methods study examined early levels of school-level implementation and characteristics that led to higher or lower levels of implementation in the initial phase

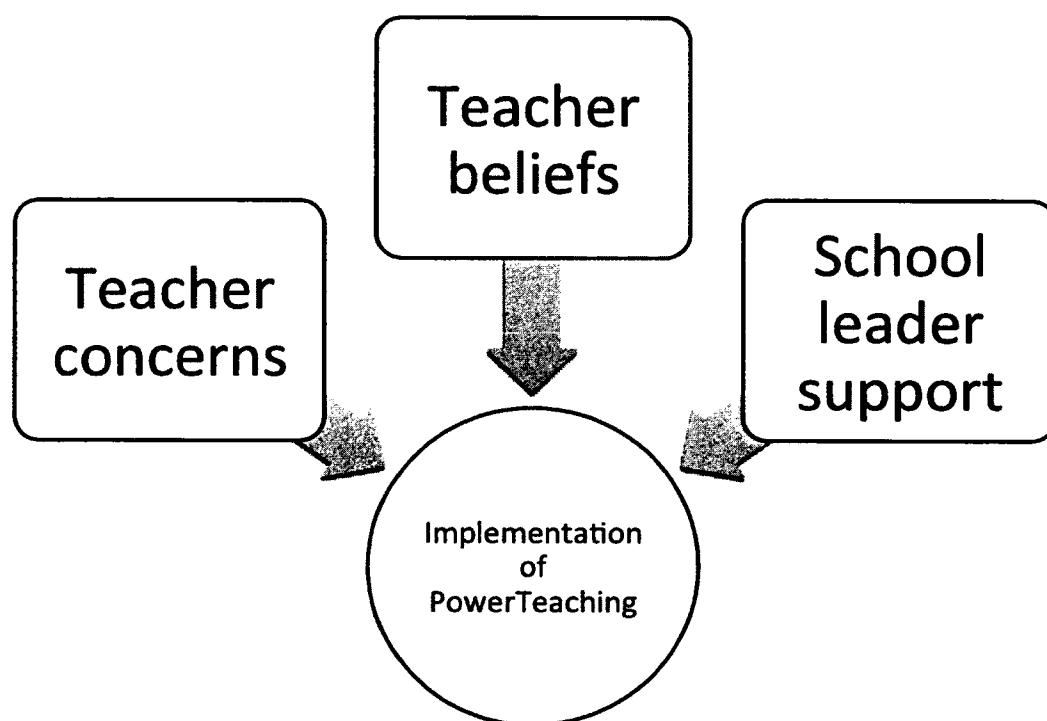
of the grant (Damanpour, 1991; Tornatzky & Klein, 1982). Diagnosing which characteristics of schools and teachers might lead to successful school change is a vital question (Demarest, 2010; Nunnery, 1998; Peurach, 2011; Slavin, 1990). Continuing to research characteristics that support reform implementation with fidelity could lead to more effective schools, more efficient use of funds for school change, and eventually provide evidence to make schools more effective. Ultimately it could help many more children succeed in middle school math classes and in secondary schooling (Demarest, 2010; Elmore, 2004; Fullan, 2007; Hargreaves, 2007; Slavin, 1990). Specifically, I examined teachers' beliefs about team learning, teachers' concerns about the implementation, and the level of support from school leaders to see how these factors related to levels of use of the PT framework. I examined other stakeholder's (school leaders and project managers) perceptions of the pilot year of implementation as well.

Because this research was limited to the pilot phase of a larger grant-funded research project, an additional purpose was to inform the stakeholders and grant participants of important factors that may influence a school's or a teacher's readiness for reform. This knowledge could help the stakeholders recruit future scale-up schools or amend professional development materials for teachers implementing the reform. Allocation of limited resources could then be directed toward those areas closely related to more effective early implementation.

### **Research Rationale**

If teachers implement the research-based program with fidelity, research suggests that the program will result in increased student performance (Datnow & Castellano,

2000; Datnow, 2000; Desimone, 2002; Park & Datnow, 2008). Some researchers have explored the characteristics of teachers, students, and schools that lead to more rapid implementation with fidelity (Nunnery et al., 1997; Smith et al., 1997). Three promising characteristics that are likely to affect successful implementation or replication of a program in school settings are worth further research. Teacher beliefs about the intervention, teacher levels of concern about the implementation, and the level of support provided by the school leader may impact the teacher's level of implementation and therefore impact student success (Figure 3).



*Figure 3: Factors influencing successful implementation of PowerTeaching.*

## **Literature Review**

Prior research on factors affecting implementation of innovations has established specific factors as important to achieving effective and sustainable school change. The teacher's beliefs about the innovation, the teacher's level of concerns about implementation, and the importance of the school leader's role as instructional leader in the school are all examined here in terms of their influence on effective implementation with fidelity. Additionally, theories of implementation and replication of reforms are presented.

### **The Centrality of Teachers in School Reform Efforts**

Teachers figure prominently in the success or failure of reform implementations (Datnow & Castellano, 2000; Datnow & Stringfield, 2000; Louis, 2007). Relatively early in the Comprehensive School Reform (CSR) movement, teachers and their reactions were seen to be central to implementation of school reform. Nunnery et al. (1997) studied reactions of teachers to the initial phase of implementation of a comprehensive school reform as part of the New American Schools program. The design of the study emphasized the centrality of the teacher in any school reform. The study consisted of two questionnaires given to teachers ( $n = 739$ ) after initial training for the specific reform and early in the reform's implementation. The measures included both closed-ended and open-ended responses and examined the teachers' perceptions of the quality of their training, the extent to which they understood the innovation, and their level of enthusiasm and confidence for the innovation. The results showed that effective training must be combined with modeling and coaching, preferably in a format and pedagogy similar to the innovation the teachers are expected to implement in their own classrooms. Although

it relied exclusively on self-reported data, it sampled a large number of teachers and was able to draw conclusions about the importance of teachers in school reforms and give insight into the teachers' concerns and understanding of an innovation.

Further research from the comprehensive school reform movement examined the importance of teacher perceptions of support on resultant levels of implementation. Bol, Nunnery, and Lowther (1998) completed a large-scale evaluation of the New American Schools movement in Memphis in the mid-1990s. Teachers' perceptions of the level of support (internal and external) were strongly related to actual changes in teaching and learning – to their actual implementation. Teachers' opinions were gathered using questionnaires ( $n = 980$ ) and a focus group in each school (34 groups of 7-10 teachers each). The questionnaire yielded both closed and open-ended responses that were analyzed separately. The teachers' ratings were shown to have moderately strong correlation with the focus-group-based ratings of the site evaluators, thus alleviating a threat to validity due to social desirability. The study concluded chiefly that because teacher perceptions of support were strongly related to effective implementation, it is important to provide adequate external professional development and training – collaboration (internal support) was not adequate even in year 2. Teachers resented having to create their own materials. Scaffolding, in the form of sample units provided by the developer, was helpful, as would be additional planning and preparation time during the school day. The nature of the school sample and its multitude of characteristics (school level, student SES, leadership quality, district support, etc.) somewhat confounds results and generalizability of the study, but in my case the study established the importance of teacher concerns and teacher perceptions of support to the

success of the reform effort.

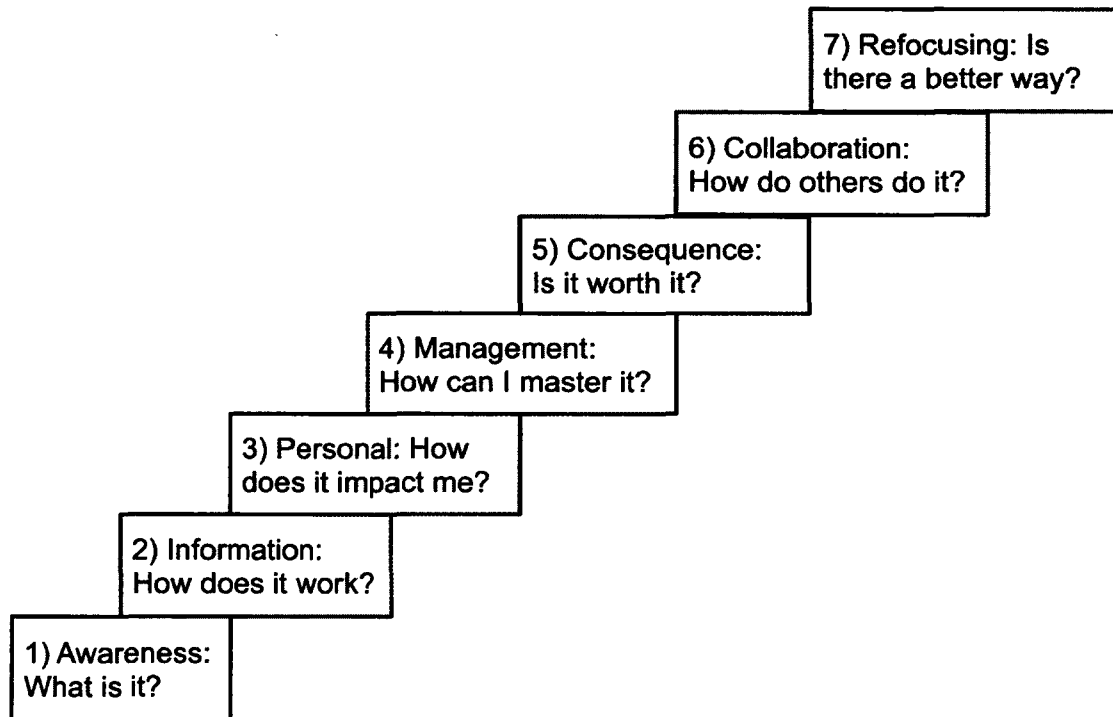
A more recent look at the importance of teachers to the reform process is the Teacher-Centered Systemic Reform Model (TCSR). A theoretical paper, it draws increased attention to the teachers as implementers of reform (Gess-Newsome, Southerland, Johnston, & Woodbury, 2003; Woodbury & Gess-Newsome, 2002). Teachers are the main link to students and student learning, and for this reason they deserve to be central to any reform effort. The TCSR model suggests that their personal theories and conceptual change can provide a framework for examining school change. A college level study showed that even eliminating barriers and providing resources and supports was a less powerful influence on changing instruction in the classroom than teachers' personal theories of learning. This being the case, the authors discuss the need for "pedagogical discontent" and dissatisfaction with school context before teachers will be receptive to new innovative approaches.

### **Teacher Concerns about Implementation**

Teachers' concerns about the reform that they are asked to implement are of great import. When teachers have strong reservations and concerns about the implementation it is typically labeled "resistance" (Beatty, 2011; Gitlin & Margonis, 1995; Knight, 2009; Thomson, 2008) and carries a negative connotation. But resistance can be a positive force in the school. If an innovation is not coherent or is ill-defined, then teacher resistance may be beneficial by preventing bad pedagogy from reaching the students. When teachers' concerns become very intense without response or alleviation, teachers rightly become frustrated. When implementing a new reform, balance must be maintained between the mandate of the reform, teachers' own self-efficacy, as well as

frustration, burnout, and unwillingness to participate fully (Evers, Brouwers, & Tomic, 2002; Geijsel, Sleegers, Van den Berg, & Kelchtermans, 2001; Mazur & Lynch, 1989). To imagine “teacher concerns” as a single construct risks over-simplifying what is acutally very complex.

Fortunately the complex of teacher concerns has been described specifically within the Concerns-Based Adoption Model and its “stages of concern” (Hall, 1977). Each stage of concern is defined by a typical concern, feeling, or perception (see Figure 4). Teachers progress through the seven stages starting at initial awareness. These stages are reflected in questions such as, “What is this reform?” and “What am I being asked to implement?” According to the model, they would then be expected to move up through each stage over time. SFAF uses Hall’s stages to define their implementation strategy. SFAF’s initial awareness programs are usually the spring before the intervention in order to move participants quickly through stages one and two. Teachers are provided training in late summer before school starts that addresses stages one through three. Then the teacher actually implements the reform during the school year and can eventually start to shape it and truly own it during the last stage of refocusing (Datnow & Castellano, 2000).



*Figure 4: The Stages of Concern in the Concerns-Based Adoption Model (Hall, 1977).*

Hall's model also includes a theory describing the Level of Use (LoU) of the innovation (Table 1). Each level of use of the reform includes a different profile of teacher implementation concerns as they learn the innovation and apply it in their classrooms. Teachers gradually progress through the stages of the LoU model as they add to their implementation of the innovation. Initially all start at "non-use" and ideally all would reach "renewal" at some point although that is unrealistic to expect during a pilot year (Hall & Hord, 1987; Hall, 1977, 2011). Roach, Kratochwill, and Frank (2009) published an informative overview and description of the CBAM model and its limitations and implications for further research from a counseling and school-facilitator



perspective.

Table 1  
*Levels of Use in the Concerns-Based Adoption Model (Hall, 1977)*

Order	Level	Level Name
Last	6	Renewal
↑	5	Integration
↑	4b	Refinement
↑	4a	Routine
↑	3	Mechanical Use
↑	2	Preparation
↑	1	Orientation
First	0	Non-use

The CBAM model has been adopted by many school leaders and districts in addition to its use in research (Holloway, 2003). Internationally, researchers used CBAM to examine the concerns of teachers during the adoption of a new math curriculum in Cyprus (Christou, Eliophotou-Menon, & Philippou, 2004). Teachers from 100 elementary schools participated ( $n = 655$ ). The authors compared teachers' years of experience with their years of involvement in the new math curriculum in order to identify any relationships between these factors and the levels of concern as reported on a modified CBAM Stages of Concern Questionnaire (SoCQ). Cronbach's alpha was calculated for the different scales (they did not use the first scale from the SoCQ) that ranged from low (.65) to high (.82). A few coefficients were comparable with that of the original test (Christou et al., 2004, p. 166). They concluded that their results underscore

the importance of attending to teacher concerns about new math curricula. However, the lack of information about method and rigor limit the generalizability of these findings.

Hollingshead used CBAM to study implementation of a character education program district-wide in 12 elementary schools, 2 middle schools, and 2 high schools (Hollingshead, 2009). The SoCQ questionnaires were analyzed by calculating a mean score for each stage of concern for each teacher. Grand means were also calculated for each stage of concern across each school. These mean scores for each level of concern were then linearly mapped in order to display a profile of the intensity of each individual teacher's concerns as well as those of each school (using the grand means). The profiles were interpreted by evaluating the overall shape of the line and not the level of intensity of each point on the line. Peaks on the school-wide profile of concerns represent strong concern in that building at that stage and valleys show lesser concerns, relatively speaking. Although somewhat simplistic, individual teachers' concern profiles were interpreted in a similar manner and categorized into four types: resisters, cooperators, ideal implementers, and overachievers (Hollingshead, 2009). Hollingshead continued to address what types of intervention were important for each teacher concern profile.

In a review of implementation models, Straub maintains that a person choosing to adopt an innovation (technological innovations in particular) is involved in a choice that includes concerns in three domains: cognitive, emotional, and contextual. Another important factor he discusses is the perceived usefulness of the innovation. He suggests that when examining implementation of innovations researchers should examine these additional domains of individual choice and consider the informal environments of the organization as well as the prescribed routines of the organization (Straub, 2009). The

CBAM framework is situated in the educational environment, and focused almost entirely on individuals' concerns.

Concerns-Based Adoption Model measures are not necessarily intended for rigorous empirical use and will be further discussed in the method section. Created for school leaders with distinct needs, researchers have adopted and used the CBAM model successfully to describe implementation of educational reforms and innovations. These studies have repeatedly shown the essential nature of the concerns of the teachers participating in the implementation. Because the CBAM model is uniquely focused on the concerns of teachers in schools undergoing change and because it is used heavily throughout the SFAF materials and routines, teachers' levels of concern are defined according to the CBAM model in my research.

### **Teacher Beliefs About Student Team Learning**

Teachers' beliefs about the reform are a primary force in any school change (Gess-Newsome et al., 2003; Nunnery et al., 1997; Woodbury & Gess-Newsome, 2002). Specifically, teachers' beliefs about student learning affect classroom pedagogy (Bol, Ross, Nunnery, & Alberg, 2002; Datnow & Castellano, 2000; S. Gibbs & Powell, 2012; Pajares, 1992; Sinatra & Kardash, 2004; Timperley & Robinson, 2001). Beliefs and personal epistemology have been well-researched and yet gaps still exist in the literature (Bendixen & Feucht, 2010; Bendixen & Rule, 2004; Elby, 2009; Hofer & Bendixen, 2012; Niessen, Abma, Widdershoven, van der Vleuten, & Akkerman, 2008; Sandoval, 2009). Some studies compared teacher's beliefs on student team learning or cooperative learning with the level of use of cooperative learning in the classroom and change in beliefs during professional development was also studied (Bredeson, 2003; Brody &

Davidson, 1998; Lumpe, Haney, & Czerniak, 1998). However, none of these studies have sought to examine the relationship between the teachers' beliefs about learning and the level of implementation of a new reform. Among the literature on teacher beliefs, studies on personal epistemology have infrequently identified beliefs with reference to implementation of reform programs – Abrami (2004) measures the “intention to implement” and Datnow and Castellano (2000) qualitatively study how beliefs shape implementation. A few studies measured impacts of teacher beliefs on the implementation of technology in the classroom although level of implementation was not addressed (Pedersen & Liu, 2003; Yerrick & Hoving, 1999).

Schommer's “embedded systemic model of epistemological beliefs” was used for this research (Schommer-Aikins, 2004). Schommer emphasizes that epistemic beliefs do not occur in a vacuum but are embedded in a context. The teacher's belief about the new implementation depends on the context as is his or her belief about student teams or about encouraging increased student engagement. Another related model is Bendixen and Rule's “integrative approach to personal epistemology” (Bendixen & Rule, 2004; Rule & Bendixen, 2010). Quantitative measurement of beliefs is very difficult but multiple inventories are being researched and refined to enhance the psychometric properties of the instruments (Bendixen & Feucht, 2010; Schommer-Aikins, 2004; Schraw, Bendixen, & Dunkle, 2012).

Few empirical studies were found that connect teacher beliefs to classroom practice and pedagogy. Bol and Nunnery researched teacher perceptions of their levels of support during the NAS implementations in their 1995 large-scale, longitudinal evaluation (Bol et al., 1998). They found that perceived level of support was strongly related to a change in

teaching and learning in the classroom, that is to say better implementation fidelity.

In a validation study of a self-reported teacher perceptions questionnaire that used related observations of the teachers, Nunnery, Ross, and Bol found that the questionnaire results were supported by observation (2008). The teachers' perceptions of change within their schools as noted on the questionnaire were borne out by the results of the observation – the questionnaire predicted the observation rankings. The authors note that this perception of the importance of change in the school is formed by multiple factors both internal (i.e. individuals' beliefs) and external (i.e. influence of leadership and cooperating organizations). The study is strong and limitations are chiefly that the population was rural elementary schools that sought out reform, not secondary or urban environments or schools where reforms were externally mandated.

Sinatra and Kardash studied whether preservice teachers' beliefs about learning (knowledge evolves, beliefs can be revised, etc.) were related to the foundational idea for a new innovation: teaching as persuasion (Sinatra & Kardash, 2004). Contextually part of the research on conceptual change, they measured the preservice teachers in terms of their openness or resistance to change. They found initial correlational evidence that teacher beliefs about learning were related to their opinions about pedagogy, but note that the measure had low reliability, suggesting further research in these areas.

Although qualitative research and evaluation have shown that teacher beliefs impact the use of an innovation in the classroom, there is a dearth of empirical evidence on the relationship between teacher beliefs and level of use of implementation. The two best examples are difficult to compare as they examined entirely different populations (in-service and pre-service teachers) and two separate contexts (implementation of

whole-school reform vs. the idea of teaching-as-persuasion). Hopefully as measures continue to be developed the use of teacher beliefs as an independent variable when studying implementation and replication will be used more often. No studies were found that addressed the teachers' beliefs specifically about team learning.

### **The Importance of School Leader Support in Implementation**

The role of the school leader in implementing an innovation is not insignificant although it is difficult to measure and effects are often indirect (Murphy & Datnow, 2003). Of the many roles of the school leader (managerial, coaching, motivating, and transforming), the one most directly tied to implementation is leadership for learning or instructional leadership. The plethora of responsibilities facing school leaders on a minute-by-minute basis means that choosing where to direct their time and attention is very difficult. A recent meta-analysis shows that school leaders who can best focus their energies on the most pressing issues in their schools have a greater positive impact on their students' achievement (Robinson, Lloyd, & Rowe, 2008). Murphy and Datnow (2003) similarly argue that giving attention to instruction and student learning is a strong single indicator of a supportive school leader. For this reason, the model of "leading for learning" was chosen to frame the leadership research for this study.

**Leading for learning.** For decades now, researchers have shown the importance of instructional leadership on school effectiveness (Hallinger, 2005). According to this research, successful principals clearly affect student achievement in addition to other school outcomes (Robinson et al., 2008). Principals have a unique ability to identify and communicate school-wide goals, hire quality teachers, allocate resources, develop necessary organizational structures, and knit together communities of learning to support

all these ends (Brewer, 1993; Davis, Darling-Hammond, LaPointe, & Meyerson, 2005; Jacob & Lefgren, 2005; Leithwood & Jantzi, 2005). Another recent review of research, funded by the Wallace foundation, demonstrates a connection between good leadership and student learning as well (Leithwood, Louis, Anderson, & Wahlstrom, 2004). There can no longer be doubt that the school leader influences student learning. To deny this copious research allows school leaders and policy makers to continue to place managerial responsibilities above instructional ones to the detriment of the students and the school community as a whole.

Successful principals influence every aspect of their schools and although the influence over student achievement may be indirect, it is not unimportant. The statistically significant relationship between leadership and student achievement described in one meta-analysis translates into student achievement scores that are 10 percentage points higher after a principal improves his or her leadership abilities. Significant correlations were found for 21 different leadership responsibilities analyzed by the researchers. In addition to these general findings, some leaders were found to influence significantly larger change (up to 20 percentage points of increase in student achievement) or even have a negative influence. Marginal effects were also present (Waters, Marzano, & McNulty, 2003).

Waters, Marzano, and McNulty discovered that two leadership factors strongly influenced student achievement. The first factor is the focus of change and whether or not school leaders could direct improvement efforts toward those variables most likely to positively impact student achievement. Secondly, a school leader's impact on student achievement is dependent on whether the leader identifies the magnitude of the change

and adjusts school and classroom practices in line with that knowledge. Not all changes equally affect the school's stakeholders, and it is important for school leaders to consider which actors will be affected to what extent before embarking on school change (Waters et al., 2003). Clearly, both of these areas can be expected to affect the school's readiness for reform.

It is important to note that there are few studies that examine the relationship between school leaders and student outcomes (Robinson et al., 2008). Quasi-experimental studies on the relationship between professional development for school leaders and student achievement are even more limited. A few studies use a leadership construct such as "principal leadership style" in analysis of implementations, teacher resistance, or burnout (Datnow, Borman, Stringfield, Overman, & Castellano, 2003; Fernet, Guay, Senécal, & Austin, 2012; Graczewski, Ruffin, Shambaugh, & Therriault, 2007; Leithwood & Montgomery, 1982). Further research in these areas is important to undertake and would provide justification for both expenditures for professional development as well as grounds for policy changes in school leadership professional development requirements and evaluation.

**Leadership during implementation of STAD and PT.** In addition to recent research suggesting that the principal has an important, if indirect role in effecting positive school change and increased student performance, researchers of the comprehensive school reform movement (CSR) found that the principal had a crucial role in implementation. This was found to be the case in schools with SFAF's school-wide reforms based on the same ideas as the PT framework. Datnow and Castellano (2001) in their study of the Success for All schools maintain that the ongoing and active support of



the school leader is very important in the successful implementation of school reforms such as Success for All. Many qualitative studies have shown that the principal can make a difference, perhaps the difference in high-implementing and low-implementing schools (Danzig, Chen, & Spencer, 2007; Datnow et al., 2003; Datnow & Castellano, 2000, 2001; Smith et al., 1997)

Indeed principals can be effective “catalysts for change” (Murphy & Datnow, 2003). In his longitudinal study of Success for All Foundation, Peurach (2011) notes the important role of the school leader and later relates the decision to combat ineffective reform (replicating the motions without fidelity) by creating a new leadership manual and set of routines for the foundation to implement with school leaders in particular.

Although the PT reform is still new, the STAD math research and comprehensive school research on SFA implementation suggests universally that the role of the school leader is crucial.

Emphatic about the crucial role that principals play in the faithful implementation of reform in the classrooms under their charge, the Success for All Foundation has written comprehensive materials including an Administrator’s Quick Reference Guide. While participating in PT, it is expected that the school leader observe participating teachers and assess their level of implementation. In awareness of the many pressures principals face, the guide offers several levels of detail, from a basic checklist, to prioritized objectives for implementation, keys to correctly observing the levels of implementation for each objective, and a wealth of hints and tips for assisting teachers in achieving better instruction and rigorous implementation (Success for All Foundation, 2012).

School leaders have a key role in implementating school reform. Although a few empirical studies are available that examine the direct or indirect role of the school leader on the instructional processes or student performance at the school (Borman et al., 2005; Robinson et al., 2008; Smith et al., 1997), these researchers call for further study. Perhaps pressure to evaluate school leaders based on their students' performance on high-stakes tests will draw more attention to this research field (J. H. Berg, Carver, & Mangin, 2013; Leithwood & Jantzi, 2005). Although this research will not likely result in causal claims, it draws attention to the importance of school leaders directing their focus to ensure that instruction is effective and student learning is enhanced.

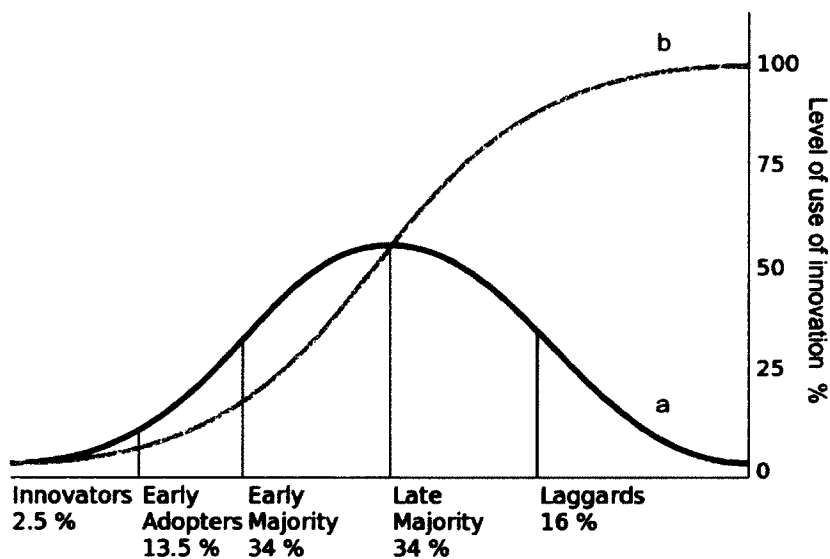
### **Theoretical Framework**

The lens through which I examined the initial implementation of PowerTeaching is Rogers's model for dissemination of innovations. Chosen for its widespread use and relative simplicity, it provided an important picture of the work as a whole. Other theories were used to enhance the views as through a different lens - in particular, Van de Ven's view of "innovation as journey" and emerging theories of replication.

### **Models of Innovation Dissemination and Replication**

**Rogers's model for dissemination of innovation.** The stages of institutional change after adopting an innovation are modeled in Everett Rogers' theory for diffusion of innovations, originally published in 1962 (Rogers, 1962). Rogers' model (see Figure 5) suggests that there are a small number of individuals who will immediately adopt an innovative practice. After a short while, other early adopters will join, eventually leading to a larger group of adopters he calls the "early majority" (Line *a*). After significant time

has elapsed since introducing the innovation, the late majority will adopt the innovation and then eventually the “laggards.” Originally developed to describe the adoption by farmers of hybrid corn, it has also been used for numerous other marketing and research ventures such as the adoption of solar energy, smartphones, and even social media. The process itself starts slowly, then moves more quickly, and eventually slows again as is shown by the slope of line *b*. The focus on *time* in Rogers’ model and the attention given to early or late implementers is useful for this study – particularly the view of the larger organization over time as its individuals participate in implementing PowerTeaching.



*Figure 5.* Rogers’ diffusion of innovation chart. This figure illustrates Rogers’ theory of how innovation occurs within an organization (adapted from *Diffusion*, n.d.).

**Van de Ven’s model of the innovation journey.** Complementing Rogers’ linear overview of the process of dissemination is Van de Ven’s imagery of the innovation

journey (Ven, Polley, Garud, & Venkataraman, 1999). An organizational behavior scholar and not an expert in schooling, the best example of his work is the longitudinal study of innovations at the 3M company (the cochlear implant invention in particular). The main point of the book, drawn after numerous longitudinal studies of innovations in varied settings, is that the process of innovation and implementation of the innovation is not particularly systematic and certainly not linear. The innovation will not succeed if the journey is random or chaotic. Van de Ven's journey is a metaphor for dynamic movement toward a common aim, with give and take between all the participants in the process. As the participants journey together, the dynamic movement is not unidirectional and not linear. Van de Ven describes a divergent-convergent cycle where the different stakeholders are in the midst of a dynamic process, a flowing stream of activity, that they cannot control but can learn to navigate by nurturing relationships and cultivating institutional routines that assist in the development and implementation of the innovation. Flexibility and relationship-building are key, as is the omnipresent view of an innovation journey that is not linear or predictable (Ven et al., 1999).

**Replication theory for educators.** Specifically for use with studies of school change and reform, Peurach and Glazer are developing a “knowledge-based model” of replication (Peurach & Glazer, 2011). Their model extends Van de Ven's idea and applies it to education. They envision a central “hub” organization (in this case the Success for All Foundation) that replicates a program (the PT framework) in a number of different “outposts” (middle school math classrooms). In a multifaceted relationship, the hub and outposts work together to replicate the program and implement it with fidelity in a way that works within their unique setting. Viewing this process as a give and take

relationship in which outposts learn programmatic routines from the hub and the hub improves and adjusts the program based on the experiences of the outposts is entirely different than the more traditional and hierarchical model of research and development in which researchers create an idea which is developed and distributed and then (only when “ready”) handed down to a separate set of people who implement the program – often inflexibly and without voice or ownership. If the goal is to replicate effectiveness of a proven program, then care must be taken to avoid the major pitfalls of “faux replication strategies” (Winter & Szulanski, 2001). Replication without fidelity has been a common problem since the early years of the comprehensive school reform (CSR) movement (Borman, Hewes, Overman, & Brown, 2003; Desimone, 2002). The problem of empty replication, creating only a pretense of the reform, has been addressed in research by attempting to measure effectiveness and fidelity when researching implementations of new programs in schools. Assumptions common under the traditional research and development model that replication must be sequential and that school reform is effective when “research-proven programs” are used “right out of the box” are untenable; Peurach notes that they rest on a further set of questionable assumptions that knowledge of the reform can be “known perfectly” by the hub prior to scale-up, that a transfer of knowledge can be “seamless,” that “effective use is transparent,” and that any problems that occur during implementation can be easily “resolved through iterative communication” (Peurach & Glazer, 2011, p. 164).

The newer model for research, development, and dissemination of an innovation uses Van de Ven’s vision of divergent and convergent learning, in this case placing special emphasis on avoiding mere replication of a technique or practice at a superficial

level and instead working to replicate the effectiveness of the practice fully and with fidelity. This more flexible, “knowledge-based” process includes the actors (hub and outlets) replicating a practice in a dynamic give and take between each other. Not only must one have the knowledge of the practice (in this case SFAF’s PT framework), but also knowledge of how to replicate the practice in different contexts. The continuous and collaborative learning by all the actors in this model is quite different than a typical hierarchical transfer of a pre-perfected technique. It does not assume that the PT framework is known and described perfectly by SFAF prior to distribution and use or that the transfer of the practice will be seamless and transparent. Instead, the routines are explored and recreated by individuals in relationships during a journey of implementation - not techniques that are mechanically replicated but developed by individuals elsewhere (Peurach & Glazer, 2011).

### **Theoretical Conclusions: Dissemination of innovations**

Rogers’s and Van de Ven’s theories are complementary lenses through which to narrate and examine the implementation of an innovation. The big picture provided by Rogers is an important focus when measuring the teacher’s concerns about the innovation. When teasing out important nuances with regard to the array of characteristics that affect implementations of innovations, Van de Ven’s innovation implementation journey and its nonlinearity is a crucial perspective through which to view the complexity surrounding these experiences.<sup>2</sup> Bruce Tuckman described this

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<sup>2</sup> The immanence of complexity and the need for researchers to be willing to live with its

group dynamic as a trajectory of change, a journey, beginning with storming, norming, and eventually performing (Bonebright, 2010; Tuckman & Jensen, 1977; Tuckman, 1965). The language proposed by these researchers is useful in navigating this more complex view of the process of implementation of innovations in school settings.

### **Theories of Implementation of Innovations in Schools**

Schools and other large institutions are difficult to change in a lasting or predictable manner (Bruner, 1996; Elmore, 2004; Fullan, 2007; Giroux, 1988; Goodlad, 1975; Hargreaves, 2007; Tyack & Cuban, 1997; Tyack, 1974). Critiques of school change are almost continuous, whether that externally imposed innovations are hegemonic, or that change from within rarely is deep, substantive, or sustainable. In his discussion of reform ideology, Nunnery (1998) maintains that we can overcome this dilemma if we not only develop well-defined innovations to implement but also provide substantive and lasting support to those who are implementing. Years before it took place, he said of the demise of the New American Schools reforms:

“If and when the NAS designs fail, as predicted by Fullan (1993), it may not be because the external development approach is an Achilles’ heel but because policy makers, administrators, and design teams failed to provide useful solutions or adequately help teachers transfer and apply this knowledge.” (Nunnery, 1998, pp. 292–3)

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discomfort is described in a longitudinal study of the comprehensive school change program, Success for All (Peurach, 2011).

External reforms can change schools and help students learn as long as reformers take care to create a well-defined reform and ensure that implementers are not left without support (Barnes, 2005; Datnow & Castellano, 2000; R. Van den Berg, Slegers, & Geysel, 2000; Wayman, 2005).

Desimone's review of factors that impact the success of comprehensive school reform models draws similar conclusions (Desimone, 2002). Using policy attributes theory she examined five attributes of the school reforms in her review. Specificity (clear definition) of the reform led to higher level of implementation with fidelity. Immediate effects of implementation on student performance were related to power of the reform. Consistency, authority, and stability of the reform influenced long-lasting and sustainable change. Stronger implementation, then, results from more specificity, consistency, power, authority, and stability.

Borman also studied comprehensive school reform: the Success for All model for elementary reading reform. After many quasi-experimental studies were completed, including his own meta-analysis (Borman et al., 2003), he led a national randomized experiment ( $n = 41$  schools) (Borman et al., 2005) to determine the effect of the model on student learning. Careful recruitment and assignment of control schools led to using 41 schools with both a treatment and control in each school. This type of design was pursued in order to provide an incentive for schools to participate, but brought a larger risk of contamination than if control groups had been in separate contexts entirely. The results upheld many of the earlier findings and showed that positive effects on student achievement were limited to one strategy, an early reading skill (therefore the pattern of effect fits the pattern of instruction). Implementation levels were found generally to be



strong, apart from issues that led to rushed implementations allowing “insufficient time for the program to become established and flourish” (Borman et al., 2005, p. 18).

Organizational change is inherently complex. The literature reviewed above suggests that externally developed reforms are usually better than internally developed reforms; that reforms need to be well-developed and well-defined; that leaders and teachers need to perceive the usefulness of the innovation (whether through pedagogical discontent or another construct); and that a successful journey is a focused journey of implementation – a tapestry of individuals working together to shape a reform and mold it to the context-at-hand (Datnow & Stringfield, 2000; Peurach & Glazer, 2011; Wilson, 1994). Lasting and sustainable change with fidelity to proven pedagogies is possible but difficult. Borman acknowledges that the challenge is to tie “together two central themes of educational research and policy today: the scaling up, or replication of school-based interventions and the development of high-quality evidence of their causal effects” (Borman et al., 2005, p. 19). The pilot year of the scale-up of PowerTeaching embraced this challenge.

### **Design Overview**

**Research Purpose.** The purpose of this study was to explore the complexity of school change, specifically implementation of a research-based middle-school math reform. Teachers, school leaders, and project managers’ perceptions about the initial stage of implementation were examined. Although during the first year substantive and lasting change cannot be expected to come to fruition, the relationships, routines, and focus points built in that first year provide a unique way to study implementation. Finally,

teacher beliefs about team learning, teacher levels of concern about PT, and school leader support for PT were considered as contributors to variation in level of implementation (level of use) of PowerTeaching.

### **Research Questions**

1. What are the project managers' perceptions of variation in implementation of PowerTeaching?
2. What are leaders' perceptions of factors important to implementation of PowerTeaching?
3. How did teachers perceive school leader's support during implementation of PowerTeaching?
4. To what extent did teacher's concerns about implementation and perceptions of leadership support relate to variation in implementation of PowerTeaching?

### **Overview of Method**

The mixed-methods study took place during the pilot year of a five-year i3 scale-up grant awarded to three program partners (TCEP, SFAF, and CTE). Participants included a nationwide sample of about 85 middle school math teachers, 8 school-based PT coaches, 3 Success for All Coaches, 8 school leaders, and a limited number of district and program personnel. As an exploratory mixed methods study, research included both quantitative and qualitative measures and methods of analysis. Secondary data analysis was completed using formative evaluation data from TCEP as well as measurements from SFAF. Strategic individual interviews of a purposeful sample of program managers helped provide context for the analysis and create a more complete picture of the results.

Measures included a teacher questionnaire, the SFAF School Snapshot, an observation protocol, and numerous interview protocols.

**Summary.** The study explores the relationships between characteristics of teachers and school leaders and variations in implementation of SFA's PT middle school math reform. Examining one of the first scale-up grants of its kind, the research here contains information about the success of federal policy in driving educational research and change. Ultimately, the main goal of this research was to understand how to help more students learn math in the middle school years.

The structure of the remainder of the document is as follows: Chapter 2 is a description of the methodology, Chapter 3 contains the findings of the study, and Chapter 4 is an interpretation of the results, discussion of their significance, and conclusion to the narrative. Appendices including unpublished measures are provided.

## **CHAPTER 2: METHOD**

The purpose of this mixed-methods study was to explore and describe factors that teachers and school leaders, and project managers perceived to be influential in implementation of a middle school math reform. A triangulation mixed-methods design was used, and data from multiple, complementary sources were collected on the topic. A teacher questionnaire was used to test the theory that teacher beliefs about team learning, teacher levels of concern about PT, and teacher perceptions of school leader support relate to variation in fidelity of implementation (level of use) of the math reform. Concurrently, qualitative interviews of teachers, school leaders, and project managers explored the participants' perceptions of factors influencing variation in implementation of the program. Qualitative document analysis, interviews, and a scale on the quantitative questionnaire were all used to measure and describe levels of use of the middle school math implementation. Collecting both qualitative and quantitative data combined the strengths of both methods. The in-depth nature of the qualitative interviews and the ability to reach more individual participants with quantitative questionnaires enriched the research project and allowed for a more complete portrait.

### **Research Questions**

1. *What are the project managers' perceptions of variation in implementation of PowerTeaching?*
2. *What are leaders' perceptions of factors important to implementation of PowerTeaching?*

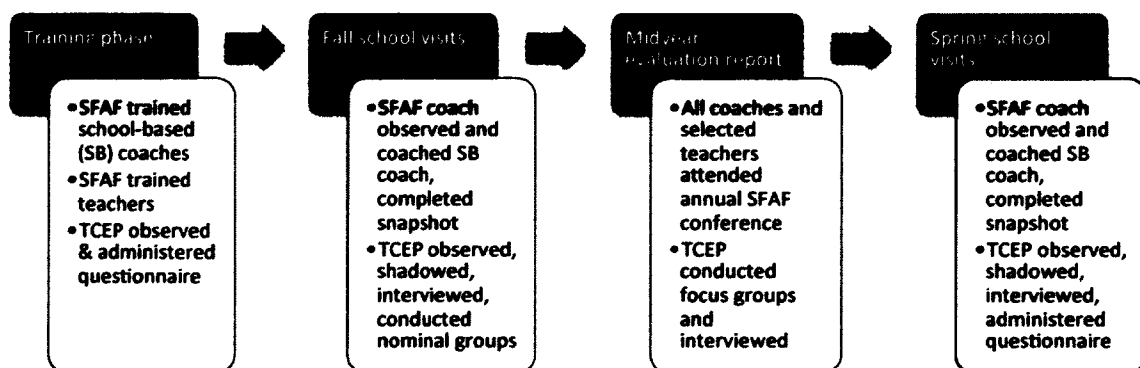
3. How did teachers perceive school leader's support during implementation of PowerTeaching?
4. To what extent did teacher's concerns about implementation, beliefs about the impact of team learning on students, and perceptions of leadership support relate to variation in implementation of PowerTeaching?

## **Design**

Mixed-methods methodology has become increasingly well defined over the course of the last ten years (Johnson, Onwuegbuzie, & Turner, 2007; Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Leech, 2006). Earlier, throughout the 1990s, a struggle between the quantitative and qualitative research paradigms tended to assign priority to one method or to maintain the strict dichotomy between the two types of research (Guba, 1990). Emerging as a third way, proponents of mixed-methods research chose to pursue both intentionally. To understand the world more accurately and to represent it precisely in research reports, both qualitative and quantitative data sources are used to great advantage. Qualitative sources provide a richness and depth not usually available with a quantitative measure, but quantitative measures offer the opportunity to use wider samples and conduct predictive research or to make causal claims through carefully constructed designs. Although common for decades in fields like evaluation or health sciences, specific mixed-methods research methodology and journals are now becoming more widely recognized in education. Depending on the question one is addressing, one or the other approach might provide the best means to the end, or perhaps

both methods provide complementary information. Recommended prescriptions for writing mixed-methods research questions and designing mixed-methods research are now available, particularly by the *Journal of Mixed-Methods Research*, and I have tried to use these recommendations (Creswell & Plano Clark, 2007; Creswell, 2009; Tashakkori & Creswell, 2007; Tashakkori & Teddlie, 2010; Teddlie, 2005). This is an applied mixed-methods research project grounded in pragmatic philosophy (Ivankova, Creswell, & Stick, 2006).

This mixed-methods study occurred during the spring of the pilot year of a five-year i3 scale-up grant and focused on the level of use of PowerTeaching at the end of the initial year of implementation. The grant was awarded to three program partners: The Center for Educational Partnerships at Old Dominion University (TCEP), The Success for All Foundation (SFAF), and the Center for Technology in Education at Johns Hopkins University (CTE). TCEP researchers conducted research at multiple points in time throughout the pilot year (Figure 6).



*Figure 6.* Phases of pilot year of TCEP research on PowerTeaching implementation.

This exploratory study included only data collected during or after the spring phase of school visits. I employed a complex, concurrent mixed-methods design. Initially, a QUANT and QUAL phase took place via data collection in each of the eight middle schools. Another qualitative interview phase clarified and enhanced data from the school visits. A final connecting phase allowed for coding and quantifying of data, early data cleaning, and eventual analysis during which the overall research questions were answered (Table 2). Because of the complex nature of the phenomena of implementation and school change, a mixed methods approach was crucial to provide a comprehensive analysis of the pilot year of study.

Table 2

*Research questions and associated designs.*

Research Question	Method	Data Source	Analysis
1. What are the project managers' perceptions of variation in implementation of PowerTeaching?	QUAL	Project manager interviews	QUAL: coded transcriptions
2. What are leaders' perceptions of factors important to implementation of PowerTeaching?	QUAL	Leader interviews	QUAL: coded transcriptions
3. How did teachers perceive school leader's support during implementation of PowerTeaching?	QUANT	Teacher Quest. (school leader support scale)	QUANT: teacher questionnaire - descriptives for school support / climate scale
	QUAL	Teacher interviews	QUAL: coded transcriptions
4. To what extent did teacher's concerns about implementation and perceptions of leadership support relate to variation in implementation of PowerTeaching?	QUAL	Document/artifact analysis <ul style="list-style-type: none"> <li>• TCEP Classroom Observations</li> <li>• SFAF School Snapshots</li> </ul>	QUAL: content analysis of lead-researcher observations and school snapshots)
	QUANT	Teacher questionnaire <ul style="list-style-type: none"> <li>• Concerns</li> <li>• School support</li> <li>• Teacher implementation</li> </ul>	QUANT: <ol style="list-style-type: none"> <li>1. Descriptives <ol style="list-style-type: none"> <li>a. Perceived concerns scale</li> <li>b. School support scale (from above)</li> <li>c. Tchr implementation scale</li> <li>d. School observation scores (quantified by school)</li> <li>e. School snapshot scores (quantified)</li> </ol> </li> <li>2. Cluster analysis by school <ol style="list-style-type: none"> <li>a. Teacher concerns</li> <li>b. School support</li> <li>c. Teacher implementation</li> <li>d. Observation-structure,</li> <li>e. Observation- IP,</li> <li>f. Observation- SE</li> <li>g. Snapshot- structure,</li> <li>h. Snapshot- IP,</li> <li>i. Snapshot- SE</li> </ol> </li> </ol>
		Quantified observations  Quantified school snapshots	

*Note:* IP = Instructional Processes, SE = student engagement.



## **Participants**

During the pilot phase of the scale-up grant eight high-needs middle schools participated in the PowerTeaching implementation. All math teachers in each school participated in the PowerTeaching implementation. Participants in the sample of pilot schools included 91 middle school math and inclusion math teachers, eight school leaders, and two program personnel. Recruitment for participation in the pilot year of the grant was completed in early 2012 and was influenced by grant regulations and the project stakeholders. The entire population of high-needs middle-schools participating in the pilot year of the grant ( $n = 8$ ) participated in the initial year of PowerTeaching scale-up. Because the population of teachers was small during the pilot year, this comprehensive sample of all math teachers and school leaders were included in the study (Hays & Singh, 2011; Patton, 2002).

**Teacher questionnaire and observations.** The entire population of teachers participating in all schools ( $n = 91$ ) were asked to fill out the questionnaire during the spring 2013 TCEP school visit and were included in TCEP classroom observations during the visit. Eighty-five teachers completed and returned the questionnaire resulting in a response rate of 93.4%. All teachers were also included in semi-structured classroom observations by TCEP researchers. During spring school visits the nine researchers conducted observations with two researchers observing in each of the eight schools. A few teachers were excluded due to illness or standardized testing on the day of the school visit, but 52 classroom observations were conducted.

**Interviews.** The entire population of school leaders ( $n = 8$ ) were interviewed by TCEP researchers using a semi-structured protocol during the spring school visit.

Individual teacher interviews were also conducted during the school visits. Because the population of teachers was too large to complete interviews for each participant, a stratified, purposeful sample of three teachers from each school was selected ( $n = 24$ ) with the assistance of the school-based PT coach. The coach identified three teachers in each school who had differing levels of implementation: emergent, routine, and proficient in a manner similar to Datnow and Castellano's study (2000). In addition to these interviews occurring during the spring school visit, both project managers that participated in the grant process from recruitment through the first year of the grant were interviewed after the conclusion of all spring school visits.

## **Measures**

**Teacher Questionnaire.** A 70 item spring questionnaire was administered during the spring TCEP visit of the school year (Appendix A). Because it was easy to distribute and collect in during the school visits, anonymous paper-and-pencil surveys were used. A standardized protocol was followed including distribution of an informed consent notification and reminding participants that they were not required to complete the survey. Questionnaire data was entered immediately after collection and digital files were stored in a secure file on a computer that was only accessible to participating researchers.

The participating teacher questionnaire was composed primarily of closed-ended questions with a four-level Likert-style response scale of agreement and included two open-ended questions. The program theory guided construction of the questionnaire, as augmented by requests from the stakeholders, in creating a blueprint used for item construction. Because of concerns with respect to response burden, the number of items

for the questionnaire was limited for each scale. To enhance psychometric properties of the questionnaire, enough items were written to allow a few items to be cut after pilot testing in order to retain a minimum of three items per scale.

Most items were piloted in a fall questionnaire before inclusion in the spring version, the basis of this research. The scales from the fall questionnaire were reevaluated based upon expert review, psychometric validation, and stakeholder needs before creating the spring questionnaire. Where reasonable, an attempt was made to keep scales constant in order to complete longitudinal research, but where warranted, scales were revised, added, or removed based on the needs of the stakeholders and the reliability of the initial scale.

Four scales on the spring questionnaire were used for the quantitative sections of this study. First, a levels of concern scale was used to measure the intensity of teachers' concerns about the PowerTeaching implementation. It was based on a modified version of the SoCQ from CBAM and the number of subscales (originally seven) was reduced to four according to other validation studies (Bailey & Palsha, 1992; Cheung, Hattie, & Ng, 2001). Second, a scale measuring teacher beliefs about the impact of team learning on students (both socially and academically) was based on a review of the literature. Third, a scale measuring teachers' perceptions of school leader support was created based on literature review and in discussion with stakeholders. Finally, a scale measuring teachers' level of implementation of PowerTeaching was based on the school snapshot objectives and their prioritization for implementation as described in the SFAF teacher peer-observation form located in the Administrative PowerTeaching handbook (Success for All Foundation, 2012).

**Interviews.** Standardized semi-structured interviews were conducted with the project managers (see blueprint, Table 3). Interviews lasted approximately 40 minutes and used a protocol that allowed for cross-interviewee analysis (see Appendix B). A principal goal of the interview was to ascertain multiple viewpoints describing implementation levels for the different schools. A second goal was to discover factors that might have impacted variability in that implementation. The project managers had a unique perspective to offer in that they had been involved in each school district since the award of the grant and participated in the recruitment process. Participants were asked to describe each school in light of its implementation level – whether proficient, routine, or emergent adoption of the PowerTeaching program. Proficient schools were described as having moved beyond “mechanical” stages of implementation at a school-wide level according to the CBAM levels of use. Emergent schools were those schools who were still struggling with achieving the “mechanical” level of use in a school-wide manner – substantive pieces of the program were still missing or substantive portions of the staff were not yet implementing. Routine schools were those that had perhaps achieved the “mechanical” level of implementation but had not moved beyond that point.

Table 3  
*Blueprint for project manager interview*

	Item #
Recruitment process including district concerns and characteristics	1, 6
Characteristics influencing implementation level	2, 3
Specifics about school and district leadership	4, 5
Changes to the process for future pilot implementations	7
Overall impressions	8
<i>Total # questions</i>	<i>8 items</i>

Additional TCEP interview data was used from spring interviews of school leaders ( $n = 8$ ). A semi-structured interview protocol was created according to a blueprint (Table 4) and piloted with each of the eight school leaders. Pilot testing during fall school visits demonstrated that the semi-structured protocol worked well with minor follow-up questions and only minor changes were made in advance of spring use (Appendix C). (Patton, 2002; Weiss, 1998). Interviews were intended to give a rich description of each school's implementation story from the perspective of the school leader. Factors supporting implementation as well as barriers to effective implementation were included in the protocol.

**Table 4**  
***Blueprint for school leader interview***

	Item #
Description of school's implementation (supports, barriers)	1
Role of leadership in implementing PowerTeaching	2
Alignment with district objectives or programs	3
Teacher response, concerns	4
Role of school-based PT coach in implementing PT	5
PT's impact on students (advantages, obstacles)	6
Additional information or opinions	7
<i>Total # questions</i>	<i>7 items</i>

Finally, limited data from the teacher interviews was included in the study. Due to time constraints and in accordance with the research question, a single leadership-focused question from the TCEP interviews of teachers was included in the study. The question, "Describe the role of school leadership in adopting PowerTeaching?" was used to clarify and triangulate the school support scale on the teacher questionnaire for research question number three. This question was part of a semi-structured interview protocol (Appendix D) used by TCEP researchers during spring school visits. Before choosing to limit the teacher interview data to one question, 10% of the teacher interviews were analyzed in their entirety to determine whether observations or comments about school leadership were mentioned in other areas of the interview. Within the small sub-sample, no mentions of the principal or school leadership support occurred outside question three. For this research, only one question was included.

Teachers were asked to share their perceptions about the role of leadership in implementing PowerTeaching.

**Other implementation measures.** Content analysis was conducted using documents from the grant partners (TCEP and SFAF). TCEP classroom observations and SFAF school snapshots (Appendix E) were collected and quantified using a code sheet for each school. These documents were used to complete a more rich description of the implementation level of each school and to triangulate the information within the questionnaire implementation scale and the interview data.

***SFAF School Snapshot.*** From the School Snapshot the final SFAF evaluation of each school's level of use of the implementation was coded, including scores for instructional processes, student engagement, and school structures (Table 5). This information was collected at the last spring school visit by SFAF coaches and not necessarily concurrent with the spring school visits by the TCEP research team. A total of 20 objectives were quantified and entered as separate scales, as well as one overall school score. The code sheet was developed according to the theoretical framework, pilot tested with fall data, and validated by content experts. An overall score for each school was revised after discussion with content experts and each category weighted equally (instead of the heavy weighting for school structures due to the greater number of objectives rated).

Table 5  
*Blueprint: Quantifying of SFAF school snapshots*

	# points
School structures (11 objectives)	55
Instructional Processes (5 objectives)	25
Student Engagement (4 objectives)	20

**TCEP Classroom Observations.** During spring school visits by pairs of TCEP researchers, classroom observations were conducted using a structured, open-ended observation protocol (Appendix F). For this study, each classroom observation by that school's lead researcher was scored (1 observation per classroom), using a code sheet, in terms of instructional processes, student engagement, and classroom structures related to PowerTeaching (Appendix G). Observations included many open-ended field notes that were included and coded as well. The code sheet was developed using the SFAF levels of use framework, pilot tested on fall observation data, and then reviewed and validated by content experts. Points were awarded in coding each category (Table 6); categories were evenly weighted and percentages used to report classroom scores. Each classroom score was aggregated together with other classrooms in the school to form a school observation score for each category. An overall school implementation score was also calculated by averaging the observation scales at the school-level. All scores were based on percentages in order to account for the uneven number of classrooms in each school. Inter-rater reliability of 87% agreement was calculated based on a 10% sampling of observations across each school.



Table 6  
*Blueprint: Quantifying of TCEP school observations*

	# points
Classroom structures (2 objectives)	6
Instructional Processes (3 objectives)	4
Student Engagement (2 objectives)	4

### **Procedure**

Data were collected during the spring semester after gaining IRB approval. During spring TCEP school visits, two members of the TCEP research team visited each of the eight schools and completed classroom observations and school leader (20 minute) and teacher (40 minute) interviews. I conducted 40 minute interviews with project managers in April and August. Transcripts were coded and thematically analyzed using a priori codes based on the theoretical frameworks. (Corbin & Strauss, 2007; Hays & Singh, 2011; Saldaña, 2012). TCEP observations of classrooms lasted an average of 6 minutes each and were conducted during spring 2013 school visits by two members of the team. Only observations from the team leader were used in this study. Teacher questionnaires (paper and pencil) were administered in a group setting at each school and collected by a TCEP researcher during the same school visit. Small incentives (iTunes card or professional development hours) were awarded to participating teachers whenever feasible via school district negotiations. The SFAF overall school-level outcome measure - the School Snapshot – was collected from SFAF coaches at the close of the pilot year and coded using the code sheet as described above.

## **Trustworthiness**

Verification and trustworthiness strategies were used wherever possible. Research team meetings, multiple researchers completing reliability checks of analysis methods, and debriefing with team members also enhanced trustworthiness of the findings. Although there was no formal external auditor, additional research team members functioned as informal internal auditors throughout the entire process. I kept a reflexive journal throughout the entire project along with post-analytic memos completed after school visits and codebooks during analysis. Journaling included thoughts about the process, emerging topics, notes on stakeholder or participant comments or opinions, and general reflections on the project while immersed in the data. These detailed records included the researcher's feelings and thoughts throughout the study during planning, data collection, analysis, and writing stages. This attempt to reduce biasing effects on the data collection and analysis process served to keep emergent themes close to the data and to carefully record results and conclusions that were drawn. Immersion in the data for the entire pilot year also enhanced credibility of findings (Hays & Singh, 2011; Patton, 2002).

**Questionnaire reliability and validity.** In all cases, care was taken to standardize the procedures for data collection that would result in reliable measures with strong content validity. Content validity was addressed using blueprints as well as expert review with a panel of school leaders, teachers, and program evaluators. Particularly the leadership support scale, after expert review, was revised based on substantive recommendations stemming from the theoretical framework and from agreements made with school districts during the grant process. Reliability of the teacher questionnaire

scales and subscales was calculated using Cronbach's  $\alpha$  (Table 7). Scales were found to be reliable with some scales having very good internal consistency ( $\alpha = .71$  to  $\alpha = .89$ ).

Table 7

*Spring Teacher Questionnaire for PowerTeaching implementation (selected scales)*

Scale name	Item	$\alpha$
Levels of concern	16	
Subscale 1: Informational/Personal	3	.82
Subscale 2: Management	4	.82
Subscale 3: Impact / Collaboration	4	.73
Subscale 4: Refocusing	5	.73
Beliefs about student team learning	6	
Academic	3	.89
Social	3	.84
Perceived school leader support	9	.87
Level of implementation	12	.83
Mechanical		.71
Routine		.72
Refined		.78
<i>Total # of items</i>	<i>35-39 items</i>	

**Trustworthiness of Interviews.** Trustworthiness of the interview data was established by using interview protocols and a research team to maintain multiple viewpoints of the data. The research team wrote field notes and completed analytic memos during the process to attempt to address researcher bias and its effects. Notes from multiple research team members were used continuously to clarify transcripts when questions arose. Because multiple interviewers and observers participated ( $n = 9$ ), the semi-standardized protocol formats were important to reduce interviewer and observer effects. Implementation procedures and the PowerTeaching math program itself are

highly defined and routinized so it was not difficult to create a structured protocol.

Although not all protocols were piloted, the school leader interviews were. All protocols underwent development within the research team according to a theoretical framework, as well as multiple stages of expert review and revision by members within and outside the TCEP research team. Evidence to disconfirm coding structure was sought for and discussed with modifications to the theory where necessary. Data from interviews were, where possible, triangulated with other data sources as part of the mixed-methods design. Reliability of interview coding was calculated by the QDA program, Dedoose, based on the inter-rater reliability of code application across excerpts (Table 8) and Cohen's kappas of .76-.92 demonstrate good and very good agreement (Hays & Singh, 2011; Patton, 2002).

Table 8  
*Stability check and Inter-rater reliability for interviews*

	Stability check	Inter-rater reliability
Project manager interview	.95	.74
School leader interview	.92	.74
Teacher interview	1.0	.92

*Note:* Reliability coefficients are pooled Cohen's kappa (Cohen 1960).

**Trustworthiness of TCEP Classroom Observations.** Not unlike the interview data, analytic memos, field notes, and journaling served to enhance trustworthiness of the classroom observations. Although two TCEP researchers visited each classroom, only each school's lead researcher's observation was coded for this study due to constraints of time and availability. Two classrooms for each school were selected at random (15%) and independently coded by two research team members. After coding, an inter-rater

reliability check was performed which showed 87% agreement demonstrating that the measure was reliable.

### **Protection of rights**

Human subjects approval was obtained from the university institutional review board in advance of research. Participants were given notifications stating their risks and benefits before interviews, observations, or questionnaires were administered. Data from all interviews, observations, and questionnaires were stored electronically on a secure drive accessible only to grant researchers. SFAF School Snapshots to be used for secondary data analysis were transferred electronically to the same secure database. Identifiers were coded or removed. Printed copies of data used for coding and analysis had identifiers removed and were kept in secure cabinets. Electronic copies of data within QDA program for coding and analysis had identifiers removed and were password-protected and stored in encrypted files on a secure drive fully accessible only to myself and partially accessible to the team of researchers who participated in inter-rater reliability checks.

### CHAPTER 3: RESULTS

Results for this mixed-methods exploratory study will be organized here by research question. To begin each section, analysis methods as well as themes, categories, and patterns from all data sources will be described (Figure 7). The theoretical framework around which the categories were developed was based on the literature discussed in chapter one, particularly the leadership literature that posited three main roles of the school leader that impact achievement: 1) focus on a unified vision and commitment to change, 2) the importance of building relationships with actors involved in the change including a willingness to give and take feedback, and 3) the necessity of marshaling resources whenever necessary, whether they be needed people, time, or equipment to facilitate the implementation of the reform (Datnow & Castellano, 2001; Leithwood et al., 2009; Robinson et al., 2008; Waters et al., 2003). These all can occur at district, school, and even classroom levels, but for this chapter they have been organized by factor within each research question, and not by domain. Where appropriate, teacher-level factors are described, such as beliefs about the impact of team learning on students' academic achievement and social skills (Rowan-Kenyon et al., 2012; Slavin & Karweit, 1984; Tracey, Madden, & Slavin, 2010), concerns about the implementation and "buy-in" to the reform, and lastly, teacher perceptions of the level of support provided by the school leadership (Bol et al., 2002; Datnow & Castellano, 2000; Geijsel et al., 2001; Nunnery et al., 1997; Pedersen & Liu, 2003). Common themes are certainly present across individuals, however unique themes also emerged for different individual actors interviewed.

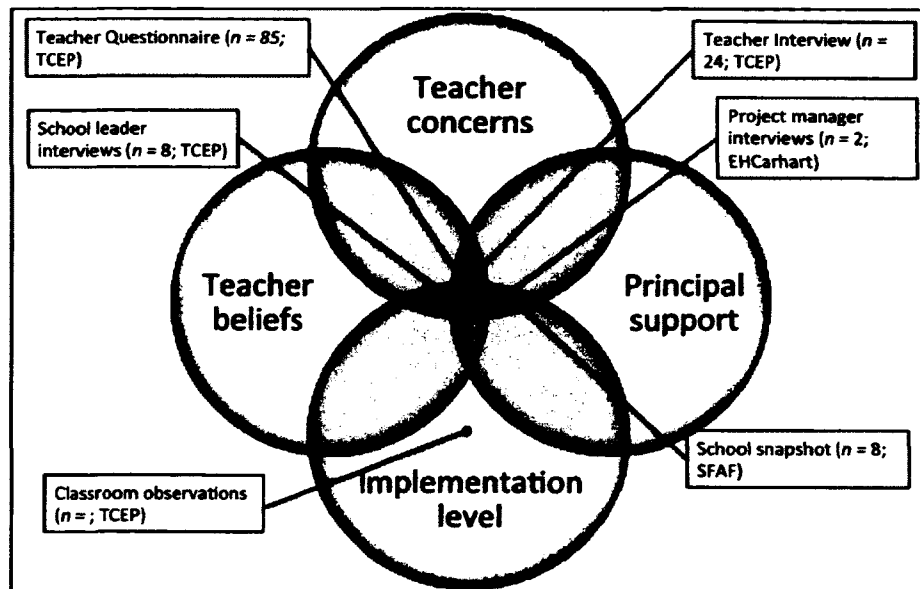


Figure 7: Findings from multiple measures as sources of information

### RQ 1: Project Manager Perceptions of Variation in PT Implementation

The two project managers had a unique vantage point of the pilot year implementation, having been involved from recruitment through the entirety of the first year of implementation. Prominent factors that arose from discussion with the project managers were the importance of a unified vision and commitment to change at all levels of the school system, a strong relationship between the actors responsible for implementation, and a detrimental lack of resources, most especially a lack of stable individual actors in positions of leadership and highly qualified teachers of math.

Two interview transcriptions were analyzed to answer this question. Interviews were analyzed based on naturalistic inquiry with an emergent design. Descriptive codes were used during early data analysis within a process of constant comparison to refine codes and infer conclusions according to grounded theory methods using techniques of

progressive coding. Memos and process journals were kept during all stages of analysis (Corbin & Strauss, 2007; G. R. Gibbs, 2005; Hays & Singh, 2011; Saldaña, 2012). **In this recursive process, axial codes were crafted as they emerged from earlier noted patterns in the data with existing a priori categories from the literature. A codebook was maintained that described the process, noting both codes and emerging patterns, but also areas of overlap and discrepancy.**

**More specifically,** the transcribed interview data were divided into units of analysis (excerpts) based on meaning – each unit contained one main idea. These main ideas were initially coded with terminology that closely represented the speaker's words. Eventually, these initial codes were combined into descriptive categories. Each textual unit could be coded with one or more categories depending on the ideas within that unit or excerpt. Ultimately, and with the theoretical framework in mind, a hierarchy of codes was created. These code categories were organized into a codebook that was used by the researchers and tested for inter-rater reliability, as well as stability. Due to the nature of the sample (relatively small, based on access and membership as participant in the project) it should not be assumed that saturation was reached. Certainly, many themes were stated in a redundant manner, but the topic is complex and it can be assumed that if a few more individuals were added new themes might come to light. **After initial rounds of analysis had been completed, an online qualitative data analysis (QDA) package (Dedoose.com) was used.** The QDA software was used only for latter stages of coding, for reliability checks, and to aid in sorting and in initial analysis.



### **Unified vision and commitment to change**

The most prominent factor in these interviews was that the school system needed to exhibit a clear intent to pull together all the actors and to implement PT with a unified message and consistent vision.

And for it to be successful, all of those program elements need to be in place, so it's the district who knows that, who appreciates that, who is willing to acknowledge where, within their own system, they need work... and just being open to trusting a system that has been proven to be effective. If things don't go well initially, that's ok. As long as they maintain the vision and the support and not join the people who are trying to jump ship then that's ok. (Project manager 2)

Some schools in the pilot program did not have their leadership network aligned. In these cases, the project managers saw a clear connection between having multiple weak spots in the system and a lack of mandate with schools that were at the lowest level of implementation.

...unfortunately when it comes to those types of schools, it was more than just one system that was pulling them down. From the school-based coach, to the school leader, to the teachers, I mean there was a whole slew of things, you know nobody was really committed and keeping the vision of the program. (Project manager 2)

### **Resources needed to affect change**

Lack of stability in district and school leadership frustrated project managers' efforts. Turnover was a problem: during the grant process and pilot year, one district had

three different superintendents. Drawing attention to the “tremendous turbulence” within leadership and pointing out the consequences of staff turnover, one project manager stated:

So that compromised our ability right out of the gate. So there’s really no reflection, per se, on the principals or teachers, or even district administrators that are involved – it was just because the head was cut off of the beast twice, ... so that context really was not helpful.

Excessive turnover resulted in communications problems, frustrating delays in procurement of resources, and damaged relationships and lack of trust from the initial stages of the project. Some teachers did not know about the reform until the week before school started. One project manager observed that it took the first six months of the project just to make it past the third stage of concern (regarding personal impact) – when ideally teachers implementing the reform would begin the school year already at the fourth stage. Delays, broken relationships, and serious communication issues influenced fidelity of implementation across schools.

#### **Relationship between actors and feedback about implementation**

Not only on the level of school leaders, a lack of stable individuals at any point in the system resulted in lower levels of implementation. One project manager discussed a lack of communication between the actors in the schools so profound that the principals and math coordinators found out about PowerTeaching implementation only in June, two months before the PowerTeaching reform was to begin and after the teachers were gone for the summer (Project manager 1). District plans and scope and sequence had already

been freshly revised for the following year and professional development plans already shaped before school leaders knew anything about PT.

In rural schools, unstable relationships were seen to be less of a problem. Rural districts often only have one middle school and frequently have no other competing grant programs within the district. In some cases the district leadership knows individual teachers within the school due to the tight-knit nature of the rural community. In rural districts, observed one project manager,

...the other thing is the communications flow much more quickly and there's an awareness at the superintendent level of everything that's going on in the schools because they have so few schools to actually worry about. So I think that visibility, the prestige, the lack of reform burnout, and the ready communications in the smaller districts made everything go more smoothly. (Project manager 1)

In addition to effective communication from top to bottom, the willingness of the principal to build relationships with teachers but still hold teachers accountable to implementation was seen as an important variable in school-level implementation.

I think being willing to constructively confront teachers who were resisting or in a pro forma adoption, those who were willing to take the time to really learn about the program, and so I mean we've had both sides. We've had those that didn't understand but were sort of cracking the whip, and maybe not in the most constructive way because they only had limited understanding, and that was associated with clusters of teachers doing it and clusters not. Like the teachers who could sort of figure it out on their own and could sense that the principal

thought it was important for them to do but maybe wasn't giving them the most constructive feedback... But we also had a principal who was very well familiar with the program but ... probably [had an] overall weaker teaching staff, and also was maybe less inclined to engage teachers constructively with constructive criticism... [the principal was] afraid of the teachers. (Project manager 1)

Lastly, with respect to the importance of relationships, project managers insisted on the importance of the interaction between the school-based coach and the principal. As part of the grant and to assist in developing strong implementation of such a complex framework, schools were provided a school-based coach to assist teachers, ease the transition, and model the new PT strategies. In some cases the coaches taught a math class, in some cases they were full time employees and in other places only part time. These factors were mentioned less often than the ability of the coach to carve out a specific role and build relationships with the school leader and teachers.

Really, the principal and the coach should be good-cop, bad-cop. The coach should be that good cop and the principal should be the one holding the teachers accountable... If a teacher says that they have this goal and it's a realistic goal that they've established with their team or with their school-based coach and they're not living up to that goal, then the principal needs to come in and have that accountability piece in play, because ultimately they are the ones who can do that. The coach is not there to hold teachers accountable in that perspective. They can set up systems so that there is peer accountability, but ultimately they do not evaluate teachers in any kind of way that would give them that influence over

their wanting to do this. Principals can make this a requirement. And the coach can come in and show how these systems can eliminate the stress of this requirement. (Project manager 2)

In an observation that combines this idea of coach relationship with the importance of unified vision, one project manager discussed the coach's ability to help direct the different actors effectively implement the reform.

I think that [school 7] after they got their coach, became very quickly a routine school. In fact I could see them becoming very proficient because of their school coach. That was the missing link in those systems. I mean [the coach] really came in and was able to really align all of those systems. (Project manager 2)

#### **Teacher concerns and relationships with teachers**

One problem noted by the project leaders was that the grant began so quickly that obtaining buy-in was virtually impossible, particularly at the school or teacher level. The timing of the grant required schools to commit to participation while the program was still being developed. In a few schools there were "awareness" sessions for teachers and school leaders similar to SFAF traditional practices, but these sessions were impossible for some pilot year schools.

"Because the window of time ... was very, very limited. And so there was not an opportunity to really get stakeholder buy-in at the school level." ... "In [some schools] we were able to arrange awareness sessions ... starting in January right after the award and ... so the teachers early on had some awareness but in [a large district] the teachers pretty much didn't know until it was time for them to show up. (Project manager 1)

Another look at the pilot year and obtaining buy-in also pointed to grant factors as getting in the way of a carefully structured program:

I think with the pilot year itself, I think if we were ever to do it again, we should have developed proper relationships with school districts and, you know, looking at concerns-based adoption model, typically we go in at level three which is mechanical. They've already bought into the program, they already knew what they were getting themselves in for. I think a lot of the initial part of the pilot year was going through the first phases of the concerns-based adoption model and I don't think in many places, outside of the proficient schools, I don't think in many places we got to mechanical until the second half of the year... until these people knew that we weren't going away, you know here we show up once or twice a month. You know, it's that relationship building that we had to play catch-up on because it was never done prior to the awarding of the grant. But like I said, I think that's just the nature of the grant. You sign up and your odds of getting the grant are a lot less than not getting the grant, so most school districts are willing just to say, "sure", but not necessarily realizing what comes along for the ride if you get the grant. (Project manager 2)

Clearly the grant process made it impossible to gain the teacher buy-in that SFAF's implementations usually have before embarking on the implementation journey. Both project managers discussed this as a negative influence on implementation.

#### **Unique themes from the project manager interviews.**

The most prominent factor seen in the project manager interviews was the importance of a shared vision or clear commitment to change. A willingness to continue

working toward an area of focus, to bring other members of the school community along with them, and a willingness by school leaders to provide resources and build the relationships necessary for achieving a common goal was seen as an important factor for successful implementation.

The importance of the school-based coach was a second strong theme across the project manager interviews. The coach was important not only in assisting teachers, providing resources, or copying handouts, but also in helping all the actors to see the common vision and work toward it. Whether with respect to vision, resources, or relationships, even teacher concerns and beliefs, the coach had the ability to affect change. The consistent presence of a coach was seen to be a primary factor in successful implementation.

## **RQ 2: School Leader Perceptions of Factors Important to PT Implementation**

The interviews with principals at each of the 8 schools were rich sources of information. Interviews were coded a few at a time as they were transcribed. This provided an opportunity for a coding process similar to the one used in research question one. Many of the same factors were identified by school principals as by project managers, but for this research question one additional category was added – that of standardized accountability testing.

### **A unified vision and commitment to change**

A common theme in school leader interviews was the alignment of school and district programs. Prompted by the phrasing of one question on the protocol, every leader discussed the alignment (or lack thereof) with PowerTeaching and the district's own programs. Many principals found it frustrating to try to combine the district initiatives

with PT goals, and when combined with staff turnover and shortage of time it was increasingly frustrating.

Well, I tried to be active with it. I will say at the beginning I was very much involved. This year has been, for us in the district, with new teacher evaluations and everything and all the new initiatives, I can't say that once we hit about March that I had as much hands-on involvement as I did. Just running out of time. Yeah, it just...trying to balance the administration piece. That is just one subject area for me and trying to hit all the meetings and go to the component meetings and then still do the other subject pieces. It is a really tough balancing act. Time and then like I said we had a new Superintendent and a lot of other new initiatives so it was time constraints were really tough for me this year. (School 6)

Where the principal of school 6 found the introduction of a new superintendent disruptive to implementing PT, the principal of a different school in the same district appeared to find the new superintendent supportive and new district initiatives as aligning with those of the PowerTeaching reform.

We have a brand new superintendent and his very first power point that he put out there was about the cycle of results. [The superintendent] talks about teachers know what to teach, they're implementing best practices to teach them, they're assessing them, they're analyzing data, and they're reteaching, reassessing, and it's a cycle. So, when you think about power teaching and you think about assessing, you think about those checks for understanding all the time. You're talking about a lot of different strategies that definitely fall in line. (School 8)



A third principal proudly noted a diverse group of initiatives within another district that might help build a stronger school. “I have a lot of initiatives on this campus. STEM program is starting up. I have a lot of initiatives that are happening right now on this campus because basically I want this campus to go from good to great.” (School 1)

Clearly among school leaders, there was no consensus about whether multiple district initiatives were good or bad, nor even consensus about whether or not multiple initiatives were at play.

At the school level, a clear mandate to implement PT was stated in some schools. In school 5, the principal consciously chose to present a clear message to the staff from the beginning.

We talk sometimes that you sometimes have to make the change before you become a believer. You can preach about it forever and it doesn’t necessarily change anything so sometimes just saying we are going to do it and then see what happens. There were a couple of us...you bring the data to me to show that what you were doing was successful and we will sit and talk about it, but otherwise right now this is what we are going to do. (School 5)

Some principals made a clear commitment to PT only later in the year, for whatever reason. At school 7, the school-based coach started mid-year and that was perceived to be a turning point.

Well, when we go and do full observations, we write-up what is going on with PowerTeaching. Every full observation that we have written up for our math teachers, especially after [the school-based coach] has gotten here. The teacher has been incorporating PowerTeaching and the teacher has a new unit on random

reporter. Teacher has been rewarding points. We don't just talk about it, but we actually put it in their formal documentation. I think once you put it in the formal documentation it becomes a binding legal document. The teachers understand that it is kind of non-negotiable. We are utilizing this so we have got to embrace it. You know one of the things that we try to emphasize with our teachers is that we are not incorporating this because it is non-negotiable, but it is here and we are going to use it and we are going to embrace it and try to do a better job of facilitating a classroom of collaborative learning. (School 7)

Another school whose principal didn't believe it was important to have all the teachers using the same method stated, "I don't think we have become an i3 school. I've been trying to get everyone to do Kagan for years and I don't think I'm fully a Kagan school.... and maybe never will be." This principal encouraged the teachers to use PowerTeaching as one strategy among many in the "tool box." That school showed a lower level of implementation (school 4). A principal's choice about how to present the implementation effort – whether committed to a strong unified vision, open to PowerTeaching as one reform among many, or critical of the reform effort influenced implementation levels.

### **Providing resources to implement PowerTeaching**

Factors that related to both district level and school level resources were common. Concerns about the district scheduled PT training, its proximity to the school year, timely hiring of school coaches, procurement of the iPads, teacher training, and coach assignment were the most common factors mentioned at the district level. Responding to a question about what would facilitate faithful implementation of the reform, the

principal from school 8 noted, “I think having a math coach at the very beginning. Having the resources. I know we're supposed to have iPads at the very beginning. We didn't get those until a couple of months ago basically.” Another principal openly questioned, “My biggest concern, and I am going to put it out there, is not knowing whether we are going to have a full-time math coach next year.”

Taken as a whole, resources were understood by school leaders as being an important factor affecting fidelity of implementation at the school level. School leaders perceived that highly qualified teachers were an important factor. The two factors most often mentioned were time (professional development, planning time, class time) and the availability of coaching. At school 2 the principal brought up their math class time of 47 minutes a day and commented, “Well, I just think the biggest factor there is to find out what that, what is the right amount of time that is needed. Right now, that is the biggest obstacle.”

### **Relationship building during implementation**

At the district level discussions of relationships and feedback were less common than among teachers and PT program managers. Only a few times did principals note a discontinuity between district actions and their relationship with the staff in their schools when new initiatives that were implemented by the district caused teachers to “panic,” and created difficulty for the principal.

I don't think they restructured the curriculum to meet the timeframe and to look at what time would be needed to implement. I think those are some things that for whatever reason and when teachers know there is the new evaluation system and

everything was going to be based on scores and goals, I think a panic attack set in.  
(School 6)

Principals expressed concern about building relationships with their teachers. One way they did so was to comment on factors affecting implementation that they saw from the teachers' perspective. Supporting and encouraging comments were often stated like this principal at school 5:

I think that they have done, they being the math teachers, have done admirably well. I was quite concerned at the beginning. I still have the same concerned at the end. An awful lot was thrown to them at once. They were having difficulty mastering, and I use that word exactly as it means, mastering anything. They were floundering trying to try a lot of things and that would be my suggestion. A little slower. (School 5)

In school 2, the principal also heard the teachers' frustrations and commented during the interview.

The training was right before school started and that doesn't work well. That just really got the stress of math teachers. They had the training and the next day they had kids. That was a challenge. It did not give the math teachers a chance to process what they learned. Collaborate, etc.. So we hit the ground running and that was stressful. (School 2)

Beyond these relationships, individual teacher's concerns are also prominent factors.

### **Teacher concerns**

Clearly, relationships between school leaders and teachers and feedback from leaders to teachers are impacted by the intensity of concerns the teachers are experiencing

in that moment. Teacher concerns were considered to be a factor helping or inhibiting implementation according to school principals. At school 7, the principal noted initial teacher concerns that PT was just another fad:

You had teachers saying “Is this something new that is coming in and in a year it is going to be gone and we are going to be doing something else? Or is it here to stay?” So you really had to get a lot of buy in by the teachers and it varied.

(School 7)

Another principal offered that teachers were used to being in control and did not appreciate being told they had to implement PT.

We had a couple of teachers who were very resistant to it and I think it was just so much happening at one time and they just kind of...they are used to being very much in charge and in control of situations so giving up that power was difficult.

(School 5)

A similar mention of a lone resistor from another school suggested that the resisters were a barrier to implementation. The school 2 principal stated, “Sometimes, like we say, one bad apple can spoil it. If you have one that is not implementing, that tends to start to trickle out to the others at times. That has been a barrier to fight that.” The same principal continued to describe more about the situation:

I tell you what the scary thing is. The one teacher that was resisting and didn’t implement had the best test results. So, not sure. My problem is if they find that out, how is that going to affect implementation? (School 2)

Principals clearly thought that teacher concerns about the implementation were significant. Whether repeating the concerns during the interview and adopting them as

their own (concerns about time, concerns about complexity of the program) or in describing their own concerns about teachers such as the resistant one above, the teachers' concerns about PT were considered to be significant influences on PT implementation.

**An additional factor: standardized accountability testing**

In the original set of code categories, school leaders' concerns about the effect of the reform on standardized test results was not included. But such concerns did emerge about test results at a district level, school level, teacher level, and student level. Because this research used spring interviews (that occurred in some cases within days of the school accountability test in math), the school leaders clearly viewed test scores as a factor that impact implementation. Without exception, each school leader referred to standardized accountability tests multiple times throughout the interview, although there were no questions on the interview protocol that referred to testing.

**PowerTeaching vs. testing.** The idea that implementation of PowerTeaching and test preparation were separate and distinct targets was clearly voiced by more than one school leader. One school leader described the context around a spring visit from the SFAF coach to the local school in which implementation had taken a small step back and teachers were using less PT saying that the school was

... two weeks away from <state testing> and teachers are focused on <state tests> and they have so much content it is like 'team huddle or do I teach the concepts?' That is the big problem that we are having right now. The pressure is coming on the closer we get to <state> testing. We are two weeks away from beginning our

<tests>. I think that is why you saw a difference between this time versus what they saw last month. (School 7)

The distinctions were overt and clearly stated. This principal perceived the teachers were choosing between teaching with a team huddle *or* teaching the concepts.

**State accountability testing as measure of PowerTeaching.** In another school the leader was hoping to use the scores on accountability testing to evaluate the first year of implementation. One principal acknowledged that although researchers consistently point out that student effects are not demonstrable in the first year of implementation,

Then, on our end, from a statistical standpoint of view, in terms of the data, we can use those, that same data that is teach and reteach reliability, to confirm the things that we are looking for gains. ... When I get those scores back, facts don't lie and then I am going to disaggregate those scores and drill down. Not only per teacher, but per student. I am going to show you something. (School 1)

**PowerTeaching is a means toward improving student achievement.** Another principal chose to view it differently. Instead of separating the two goals and setting aside PowerTeaching once state testing arrived, this participant saw PowerTeaching as a way to achieve better test results.

I think for teachers here, we're data, data, data, ... the way that [this school district] does data, data, data, and how in May you get the [state] test and everything falls on that. So, I think we just have to keep developing the PowerTeaching strategies so that we always know the strategies. PowerTeaching is a part of us getting to the end result. (School 8)

Here testing and implementation might be separate directives, but the principal made a clear choice to keep PowerTeaching as a consistent strategy that would help achieve other goals such as state testing for school accountability.

### **RQ 3: Teacher Perceptions of School Leader Support as Factor in PT Implementation**

Focusing now on one set of factors, those related to leadership support only, I examined the teacher's viewpoint. Teacher perceptions of school leader support were measured using multiple methods – one scale on the teacher questionnaire as well as individual interviews. Teachers had somewhat unique perceptions of the support or lack of support by school leadership, defined broadly to include district level personnel as well as school level principals.

#### **QUANT Teacher Perceptions of School Leader support during PT Implementation**

Before analysis of the questionnaire results could take place, initial data exploration and cleaning were conducted to ensure accurate findings. After cleaning, a set of 85 teacher questionnaire responses was used for this analysis. Scale scores were calculated for each scale and subscale. Teachers with missing data were not removed from the analysis unless more than one item was missing from the scale. If only one item was missing from the scale, the mean of that teacher's remaining items was substituted for the missing score for that scale. Mean scale scores were then generated. Descriptive statistics were calculated for each scale on the questionnaire. For this research question only one scale was used. Results for that scale were presented here (Table 9) while the full display of results is found later (Table 10) in the discussion of the fourth research question.



Teacher perception of school leader support was measured by one scale on the teacher questionnaire. As noted earlier in chapter 2, this scale was revised before use to eliminate any reference to the school leader or principal, due to ethical constraints against the teachers evaluating the principal in any manner. The new revised scale is less concrete (it excluded reference to principals specifically), but approximates the perceptions of the teacher with respect to the level of school support generally (Table 9). The scale had a mean value of 2.36 and median of 2.33, suggesting that on average, teachers disagreed that their school leadership was supportive with respect to PowerTeaching implementation.

Table 9

*School leadership support scale for spring teacher questionnaire: descriptive statistics.*

	N		Mean	Median	SD
	Valid	Missing			
1. Teachers and staff at my school are unified in wanting PowerTeaching to succeed.	85	0	2.18	2.00	.88
2. Our school climate encourages effective PowerTeaching implementation.	84	1	2.51	3.00	.81
3. School and district leaders believe PowerTeaching will help our students.	82	3	2.84	3.00	.74
4. I was given clear expectations about implementing PowerTeaching.	85	0	2.46	3.00	.88
5. School and district leaders worked consistently on making PowerTeaching successful.	83	2	2.37	2.00	.88
6. I understand how PowerTeaching math fits in with other district objectives.	84	1	2.55	3.00	.83
7. I had adequate preparation time to implement PowerTeaching.	84	1	1.80	2.00	.80
8. I had adequate professional development for implementation of PowerTeaching.	84	1	2.15	2.00	.84
9. Leaders at my school were interested in my opinions regarding PowerTeaching.	85	0	2.39	3.00	.90
<i>Overall school leader support scale</i>	<i>83</i>	<i>2</i>	<i>2.36</i>	<i>2.33</i>	<i>.59</i>

### **QUAL Teacher Perceptions of School Leader support during PT Implementation**

As with research questions one and two, the coded teacher interview responses were assembled into categories. The structure of the categories was similar and based on the same theoretical framework. The process was much simpler and themes more limited as only one question was included in the analysis. Teachers addressed similar themes in their interviews: consistent message, unified vision, the importance of support in resources and encouragement.

### **Unified vision and commitment to change**

Like the program managers, teachers also noticed whether the principal was committed to implementing PowerTeaching. One teacher from school 5 noted the importance of the principal supporting PT by maintaining a clear message.

I would say, it's huge that they're supportive. I think that's the main issue is that they really need to be behind the program. And our principal and assistant principals really were, or are now. At least they are now, I know. And through the process they've seen the kids in action, they've seen them share what they thought, they've seen them respond to the team work, to share out afterwards and have their thoughts really situated, like they were ready to share out. So I think, as long as the administration's really supportive on it then you're really good to go.

(School 5)

Other teachers noted that their school leaders were not very involved and said, "Now if you mean like administration and leadership of the school, they haven't really been too involved in that process as a whole, so I don't really know." (School 1) Some teachers had different observations about the same principal. One teacher at school 7 negatively stated, "They basically just said 'You need to do it.' There was not a whole lot of leadership." while another teacher at the same school said this in support of the same principal:

My principal just kind of dumped it on me and trusted me to do it. [The principal] told us it was not negotiable and we had to do it. [The principal] was nice about it ... [and] said to implement small pieces and that they didn't expect me to [implement everything]. [The principal] told me [there was no] expectation of

coming in and seeing it flowing and expecting an award of the month or PowerTeacher of the year or whatever. They were very supportive and they were understanding. The whole chunking thing. Bringing it to pieces. Don't try and dive in – it was good. (School 7)

Another teacher also noticed the competing district objectives that made implementing PT more difficult. One teacher at school 1 discussed district goals that seemed to conflict with PowerTeaching:

That's one concern I have with the way it was done here, our principal understands it well, we met [about it], but we have a curriculum specialist at the district level who doesn't know a lot about it, so I wish that would have been more coordinated. I wish, because we have a lot of district mandates put on us inside the classroom, and I wish that would have been more communicated so that way everyone up the chain in our district, like our superintendent all the way up to assistant principals all know what's expected of us. So that was one concern I had with it. The fact that the expectations of it, what were expected, don't really correlate with our district goals sometimes. (School 1)

Competing district goals were seen as a barrier to implementation by some teachers.

Related to the support of the principal was the discussion of resources being provided by her or him. It was clear that in a few cases the teacher perceived their principal's commitment to change as beneficial, but many teachers felt they were implementing PowerTeaching without support from their school leader.

### **Resources for PowerTeaching implementation**

Teachers had less to say about resource allocation than other themes when asked about the supportive role of their school leader. Although the question did not name specific resources, the research team expected that teachers would mention resources like time and coaching, and perhaps some comments on electronic tablet distribution as well. Instead, only one teacher brought up their leader's support in providing time to learn PT saying, "Just them giving us the time to learn it and it can take a while" (School 2). Others recognized that the resources were coming from the grant or the district and noted that in their remarks, saying, "I mean, they have done well with helping us get the stuff. I think that might come from you guys though, the technology and grant part of it" (School 2). Broadly speaking, then, teachers did not see PT resources as a way they were supported by their school leader.

#### **Relationship with principal and feedback from principal**

On the contrary, the primary theme noted in the teacher interviews was school leader support - attending meetings, discussing observations, and encouraging teachers. Teachers appreciated the principal's efforts to understand PT, the complexity of the PT framework, and the difficult nature of their task of implementing it in the classroom.

I think that having [my principal] know what was going on in the classroom definitely helped because [the principal] could come in and say, 'I'm not seeing this, make sure you're including that...' When we finally got a coach, our PowerTeaching coach, like halfway through the year, that was a big help. Because [the coach] really knew the program [and had] been trained with [the SFAF coaches] and they knew what to look for, they knew what we were struggling with, and I definitely think the coaching aspect and having that person always

there where [the coach] can always come into the classroom and really help us out, I think that part was very helpful.

One teacher was glad the school leader understood why it was hard to implement, saying that it was important to know:

...what we are doing. I know they cannot step in and do it their selves as Administrators, but understanding what we are doing, the steps to it helps a lot. Especially like I said earlier, when it comes to it...I am implementing 60% of it right now. I cannot do all of it. I will go nuts if I try to. Them understanding that and why. (School 2)

Some teachers perceived the same principals as being less present for their teachers (School 2), “At first it was pretty gung ho. We had an administrator at our component meetings and then it dropped off. I really didn’t feel much support at all” and “I just feel like administration-wise there wasn’t a lot there.”

In one case where the school leader was lacking, the teacher mentioned the school-based coach in answer to the interview question on leadership support.

[Our coach] has done probably the most work for us. I know at the beginning of the year and we kind of struggled with the supplies and those first couple of days right before school started. [Our coach] had made copies and got our folders organized for us for that first introductory unit and tried to make it as user friendly as possible. All year when we have needed copies or laminated things, ...[our coach] is always wanting to help us out and has done a great job. Sometimes that maintenance stuff that needs done that I put on the back burner. I am not great at

going to get things laminated or going to get posters made and <our coach> was real good at that stuff, at helping us out. (Teacher, school 2)

Although coding only one question on the teacher interview did not allow as much depth to the answer to this question, it is clear that some teachers perceived a lack of support from their school leaders and may have begun to view their school-based coach in a leadership role in light of that vacuum.

#### **RQ 4: Relative importance of factors in variation of implementation of PowerTeaching**

The teacher questionnaire and document analysis were used to answer this question and to examine the factors that might affect variation in school-level implementation of PowerTeaching. Quantitative measures from the questionnaire were aggregated to school-level scores and qualitative document analysis at the school and classroom level was transformed into school-level quantified scores for each school. The teacher questionnaire yielded school-level scores for teacher concerns, teacher perceptions of school leader support, teacher beliefs about academic and social impact of team learning, and teacher perceptions of the level of use (implementation) of PowerTeaching at the mechanical, routine, and refined levels. Qualitative classroom observations yielded school scores on classroom PT structures, instructional processes, and student engagement. Similar school-level scores for school PT structures, instructional processes, and student engagement were drawn from qualitative document analysis of the SFAF school snapshots. A cluster analysis sorted the schools into categories of schools with similar clusters of scores. Analysis showed that the observation measures demonstrated statistically significant differences between schools.

**Questionnaire Findings.** For the teacher questionnaire, overall descriptive statistics were calculated for each scale and subscale and are shown in Table 10. As described in Chapter 2, all items used a four-point Likert scale of agreement ranging from strongly disagree to strongly agree. The results center around the midpoint or the general “Agree” category with only the perceived school leader support scale falling slightly below the midpoint. Little variation was evident throughout these scales, but as noted above it is interesting that a majority of teachers disagreed that they had received adequate school leader support or that they had worked in a supportive school climate (Table 10).



Table 10

*Teacher questionnaire scales: Descriptive statistics*

Scale	N		Mean	Median	SD
	Valid	Missing			
Concerns: stage 1	84	1	2.95	3.00	.69
Concerns: stage 2	84	1	3.13	3.25	.70
Concerns: stage 3	84	1	2.87	3.00	.62
Concerns: stage 4	85	0	3.01	3.00	.54
School ldr support	83	2	2.36	2.33	.59
Beliefs about team learning: academic	84	1	2.84	3.00	.69
Beliefs about team learning: social	85	0	2.83	3.00	.71
Implementation: mechanical	85	0	2.87	3.00	.60
Implementation: Routine 1	83	2	2.58	2.75	.60
Implementation: Routine 2	84	1	2.79	3.00	.64
Implementation: Refined	83	2	2.92	3.00	.59

Selected individual teacher scale scores were aggregated by school. The questionnaire data were then aggregated into a score for each school (Table 11). The school level measure of each scale was assigned by calculating the percentage of teachers in each school whose scale score was above the median score for that scale, representing the likelihood that teachers in that school agreed more uniformly with the items in that scale. For example, the overall mean score on the school leader support scale shows that in 55% of schools, the teachers perceived the school leader to have been supportive.

Table 11

*Teacher questionnaire scales aggregated at school level: Descriptive statistics (n = 8)*

	Mean	Median	SD
Teacher concerns			
% teachers in school above median level for stage 3 of concerns (impact on students and collaboration)	29.53	33.33	14.45
School leader support			
% teachers in school above median beliefs on support of school leader	53.05	54.55	17.53
Teacher beliefs			
% teachers in school above median beliefs on ACAD impact of team learning on students	28.35	30.00	17.44
% teachers in school above median beliefs on SOC impact of team learning on students	21.18	25.00	13.31
Teacher implementation			
% teachers in school above median on implementation scale, level 2, routine implementation	54.61	50.00	19.87

### **Document analysis of classroom observations and school snapshots.**

Classroom observations from TCEP spring school visits were coded to create school-level scores for each category: classroom PT structures, instructional processes, and student engagement (Appendix G). The SFAF school snapshots, collected at final SFAF school visits, were also coded using a code sheet for scores on school PT structures, instructional processes, and student engagement (Appendix E). The school snapshot score is based on a percentage of teachers that have reached a particular implementation level for each objective. In smaller schools, each individual faculty member has a more pronounced impact on the school's snapshot score. In a school with only 5 teachers, each resistant teacher drops the school score by 20 percent. With three teachers, each teacher is worth 33%, with 20 teachers, a resistant teacher only lowers the school score by 5%. This accounts for some of the difference in the rank ordering,

particularly for school 8, a very small school. Levels of use of PowerTeaching for the snapshot are measured with specific ranges of participating teachers:  $M = 95\%$ ,  $P = 80\%$ , etc. As measured by the SFAF snapshot, smaller schools have a more difficult time reaching the higher levels of use with even just one teacher who is resisting the process. Results of the school-level data (Table 12) were later used for further analysis in determining clustering of pilot schools.

Table 12

*Document analysis scores: aggregated at school level (n = 8)*

	Mean	Median	Std. Deviation	Minimum	Maximum
SFAF Snapshot: School Structure	42.05	45.45	12.80	18.18	54.55
SFAF Snapshot: Instructional Processes	53.00	52.00	7.33	40.00	64.00
SFAF Snapshot: Student Engagement	54.38	55.00	9.43	40.00	65.00
Observation: Instructional Processes	35.57	26.74	29.19	.00	75.00
Observation: Classroom Structures	53.33	53.13	21.44	20.83	80.00
Observation: Student Engagement	35.13	32.29	18.97	.00	65.00

School-level data were also examined by rank ordering the implementation levels according to the various measures. In Table 13, the school rankings are shown for each measure of implementation. School 8 is not stable, perhaps due to its small size, but schools 2, 3, and 5 are all in the upper half of implementation rankings and schools 4, 6, and 7 all have lower levels of implementation. The teacher self-report measure, as aggregated, does not support the conclusions of the other two measures and could be a result of the measure or aggregation method.

Table 13

*School ranking using various overall school level implementation measures.*

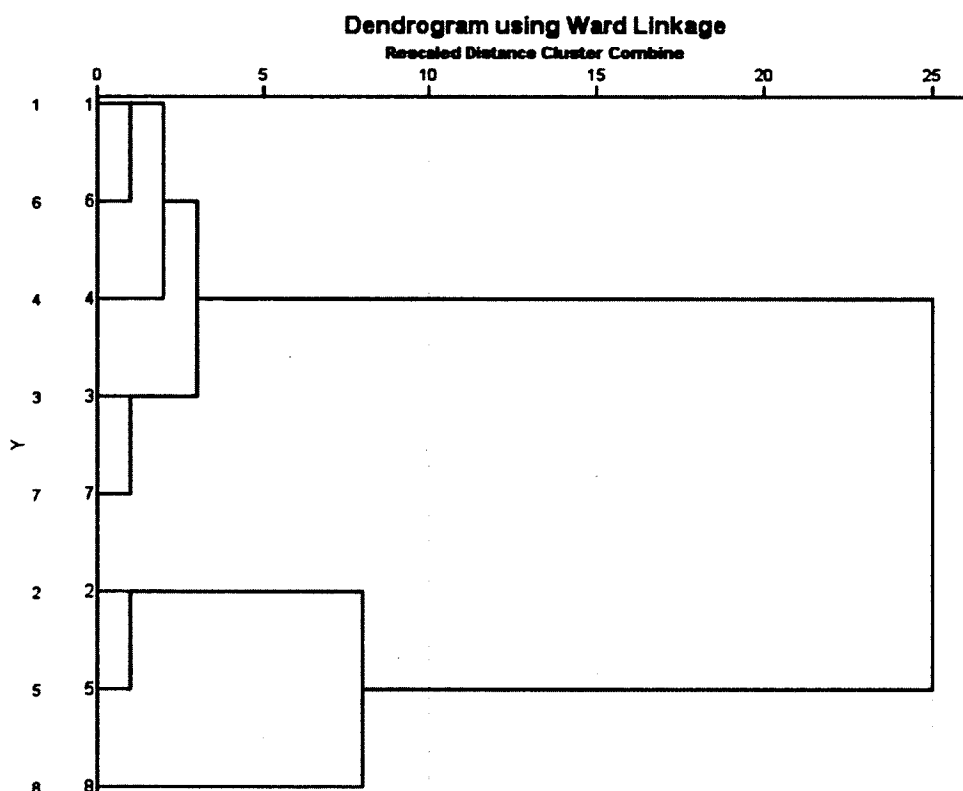
SCHOOL RANK	SCHOOL SNAPSHOT (SFAF) SCHOOL # (OVERALL SCORE)	CLASSROOM OBSERVATIONS (TCEP) SCHOOL # (OVERALL SCORE)	TEACHER QUESTIONNAIRE SCALE (TEACHER SELF-REPORT)
High Impl.			
1	3 (61.18)		8(100)
2			2(83)
3			1 (82)
4	1 (52.48)	3 (40.97)	3 (60)
5		7 (36.57)	6 (50)
6	6 (41.82)	6 (28.97)	4 (43)
7	7 (40.09)	1 (23.96)	5 (40)
8	4 (40.06)	4 (6.94)	7 (27)
Low Impl.			

### Cluster analysis at school level

A cluster analysis was conducted at the school level to determine whether clusters of schools could be identified in terms of their level of implementation and other factors. In order to provide more data by which to sort the schools, multiple variables were included in the cluster analysis. As individual measures of implementation, I used individual implementation subscales from both the school snapshot and the classroom observations. Scales from the teacher questionnaire were applied to the school level by determining what percentage of teachers was above the median for that scale. Finally, teacher beliefs about team learning, perceptions of school support, and concerns about the intervention were also included. Using Ward's method, schools were sorted and grouped into clusters that had similar variance on the variables included in the analysis.

Analysis of these variables for the eight pilot schools produced the cluster dendrogram displayed below (Figure 8). Dendrograms can be interpreted with multiple numbers of cluster sets, not unlike factor analysis results. The validity of the three clusters depicted below was triangulated by the project manager interviews. By the

spring school visits, schools 2, 5, and 8 were implementing at a school-wide routine level by the spring school visits. Schools 3 and 7 were implementing at a mechanical level. Schools 1, 6, and 4 were regressing by the spring visits.



*Figure 8: A dendrogram of the cluster analysis of schools.*

The cluster analysis having been completed and cluster memberships identified, a post hoc ANOVA test was conducted to determine which factors, if any, contributed significantly to the creation of the clusters. This post hoc test was conducted to determine the relative importance of the different factors in the clustering process (Milligan & Cooper, 1987). The factors that contributed significantly to the clustering of the schools were the classroom observations and the self-reported teacher perceptions about the value of team learning (see Table 14 below).

These significant factors suggest that there are definable clusters of schools and that the TCEP observations were instrumental in determining the placement of the schools into the clusters. The cluster definitions are in general agreement with the descriptions of school implementation levels in the project manager interviews. Certainly, the cluster of schools with higher implementation levels (schools 2, 5, and 8) was seen to have that characteristic across multiple measures. According to the SFAF snapshot, all these schools had a supportive principal at the close of the pilot year, although in at least one case the views expressed in the teacher interviews were in disagreement, suggesting that the principal had been involved early on, but no longer was involved. In all cases there was a coach involved in the school; in one of the three schools the coach was half-time. One characteristic which merits further exploration is that these schools were able to unify and present a united front in which all actors (with the exception of one or two teachers in a school) were working toward a clear mandate: implementation of PowerTeaching. The cluster of schools with low implementation levels (schools 1, 4, and 6) were also seen to have low spring implementation levels across multiple measures. According to the project manager interviews, the reasons vary widely: leadership concerns about standardized testing results, lack of leadership buy-in, or an ineffective coach all may have played a role. In these cases, however, it was clear that the actors were not aligned and working toward implementation of PowerTeaching with a clear and focused drive and unified vision across actors in the school and district.

Table 14  
ANOVA post-hoc test comparing the relative significance of the factors on the creation of three clusters of schools

		Sum of Squares	df	Mean Square	F	Sig.
SFAF Snapshot: School Structure	Between Groups	212.81	2	106.40	.57	.60
	Within Groups	933.88	5	186.78		
	Total	1146.69	7			
SFAF Snapshot: Instructional Processes	Between Groups	67.20	2	33.60	.54	.61
	Within Groups	308.80	5	61.76		
	Total	376.00	7			
SFAF Snapshot: Student Engagement	Between Groups	179.38	2	89.69	1.01	.43
	Within Groups	442.50	5	88.50		
	Total	621.88	7			
Observation: Instructional Processes	Between Groups	5385.38	2	2692.69	23.27	.00
	Within Groups	578.55	5	115.71		
	Total	5963.93	7			
Observation: Classroom Structures	Between Groups	2254.11	2	1127.05	5.85	.05
	Within Groups	963.23	5	192.65		
	Total	3217.34	7			
Observation: Student Engagement	Between Groups	983.46	2	491.73	1.60	.29
	Within Groups	1535.15	5	307.03		
	Total	2518.61	7			
School level teacher beliefs on academic impact of team learning	Between Groups	5275.15	2	2637.57	30.09	.00
	Within Groups	438.30	5	87.66		
	Total	5713.45	7			
School level teacher beliefs on social impact of team learning	Between Groups	2319.31	2	1159.66	12.03	.01
	Within Groups	482.09	5	96.42		
	Total	2801.40	7			
School level teacher perceptions of school leader support	Between Groups	918.20	2	459.10	1.84	.25
	Within Groups	1250.74	5	250.15		
	Total	2168.93	7			
School level teacher concerns: % of teachers above median concerns for student impact of implementation	Between Groups	1564.42	2	782.21	3.95	.09
	Within Groups	990.86	5	198.17		
	Total	2555.27	7			
School level implementation at the routine level	Between Groups	1891.62	2	945.81	1.83	.25
	Within Groups	2590.33	5	518.07		
	Total	4481.95	7			

## **Summary of Findings**

To answer the first research question, of the project managers' perceptions of variation in implementation, it was clear that project managers believed it was important for the school and all the actors and systems to be willing and able to work together to implement PowerTeaching. Like a tug-of-war, everyone must pull together in the same direction. Minor obstacles, presence or absence of iPads, issues with standardized test scores, or a lack of buy-in, could all be dealt with from within the implementation routines as long as the actors were working together. One unique theme in the project manager interviews was the importance of the school-based PT coach and her or his ability to forge relationships with school leaders and teachers alike.

The second research question, of school leaders' perceptions of factors important to implementation, demonstrates the importance of the principal's projection of and commitment to a single unified vision. Unsurprisingly, schools whose principals sent multiple, competing messages showed lower levels of PT implementation. Principals alone strongly asserted the importance of standardized test results, and some principals directly tied those test results to the fate of the program in their schools. Some overtly stated that if test scores declined, then they would eliminate the program. Some told teachers that test scores were more important than PT implementation. A few principals, however, were persuaded that if PT were fully implemented, then improved scores would follow. Like the project managers above, the principals expressed the importance of the school-based coach in helping the teachers to implement the program and helping to relieve some of the burden of oversight of PT from the school leader.



For the third research question (teachers' perceptions of support from the school leadership), both in interviews and on the self-reported questionnaire, teachers expressed frustration with a lack of support from their school leaders. Although a few teachers stood out in support of their principals and the specific supports they had been offered, it was clear that the majority of teachers perceived a lack of school support. The main themes that arose from the teacher interview question were the principal's providing (or not) a unified vision and commitment to change, the resources and time teachers required to implement the program, and feedback and interest in observing and learning about PowerTeaching.

Lastly, variations in implementation of PowerTeaching were complex in nature. Although the different measures largely agreed on the relative levels of implementation of schools, the factors measured in this study were not sufficient to give a clear answer to this question. It was clear that an articulated commitment to change and a unified vision across actors in the school system made a difference. The exact process by which a commitment to PowerTeaching was forged and carried through is unclear from these data. What is clear is that it was not the work of only one person in any case where it worked well and, where PowerTeaching was not implemented well, it was not the failure of only one person. Further research into the interactions between the network of actors involved in school change processes is warranted.

## **CHAPTER 4: DISCUSSION**

The purpose of this study was to describe factors that school leaders, project managers, and teachers identified as influential in the implementation of a middle school math reform. The relationship between teacher beliefs about team learning, teacher levels of concern about PT, and school leader support on level of implementation (level of use) were examined. Results included common themes across all data sources, such as the importance of a clear commitment to change and unified vision (or mandate) within the system. Principals were uniquely concerned with standardized test score results, although their reasons differed. Project managers viewed school-based math coaches as key individuals, who were able to unify the actors within a school, including some who attempted to stand in for school leaders who were not working effectively toward PT implementation. Across the board, all participants valued the extent to which leadership (district, school, or school-based coach) sought to build and nurture relationships with teachers who, in busy classrooms with middle-school kids learning math, valued any attempts leaders made to understand the intricacies of implementing PT and to offer a helping hand.

The theories in chapter one describe these experiences of individuals adopting and implementing changes. Remembering the adoption curve from Figure 5 in chapter one, Rogers suggests that early on in the implementation cycle a few early adopters try the new innovation, or in this case they embraced PowerTeaching. In smaller schools this might be only one teacher. If implementation occurred according to the model, the coach and perhaps school leader would mobilize a few more into adoption of PowerTeaching

through encouragement or pressure. Throughout the year a few more were drawn in as they saw others using it successfully or waited to see whether the innovation would go away – whether the external SFAF coach was still visiting the school and encouraging the school-based coach, for example. Another small group served as “resistors” or “insulators” and tried to prevent the implementation from moving forward – in some cases attempting to discredit PowerTeaching in audiences within or even outside the school. Data collected in the pilot year of implementation did not allow for effective application of this model. Longitudinal study of the implementation at the close of the grant would provide a clearer description of the trajectory of implementation efforts. Clearly there are hints of Rogers’ model throughout, both in the school with many insulators caught at the bottom end of the curve, and the early-adopting school that effectively focused vision and resources with a powerful coach that reached to the upper end of the curve within the first semester of implementation. The story, however, is unfinished and to suggest that either school was at a fixed point on the adoption and implementation curve would overreach the available data and ignore the ongoing complexity of the situation in participating schools. The journey is ongoing.

This concept of “the journey” and the importance of flexibility in implementing innovations while on the journey, Van de Ven’s theory (1999), was certainly borne out in the predominant themes of these interviews. Whether school district partners changed due to turnover, resources were unavailable due to red-tape or unavailability, the implementation moved forward. Absent a school-based coach or iPads for teachers, the participants still were together on the journey to implement PowerTeaching.

### **Project Manager Perceptions of Variation in PT Implementation**

The project managers' views that implementation did not reach a refined and "school-wide" level are supported by Rogers' theory of adoption of innovations over time (1962). In a few schools the same problems existed during each visit (no school-based coach, no iPads, lackluster implementation by teachers, and no new progress toward school targets). Project managers concluded that the external SFAF coach was unable to problem solve and garner stakeholder "buy-in" because the school leader and/or district personnel themselves had not bought in. In these cases, even effective communication with the district-level leaders was challenging due to excessive turnover or lack of direct lines of communication. Administrative disorganization frustrated the efforts of coaches, and consequently these schools generally were less successful at achieving school-wide implementation. This experience confirms what other researchers have found (Bol et al., 1998; Datnow & Castellano, 2001; Peurach, 2011; Smith et al., 1997). When school leaders cannot effectively focus on the pressing issues within a school, change is less likely to take place (Robinson et al., 2008). An inability to marshal resources and encourage practices aligned with change has also been shown to negatively impact implementation (Waters et al., 2003). These problems can all be somewhat alleviated by negotiating flexible routines to address implementation and the obstacles that inevitably appear on the journey (Peurach & Glazer, 2011). In this case, successful dialogue about the routines with all actors in the district united behind the intent to implement PT led to more successful implementation. The complex nature of school change and the importance of navigating these situations, including complexity resulting from federal

funding issues, is not new and continues to inhibit the effectiveness of school change efforts (Elmore, 2004; Fullan, 2007; Nunnery, 1998; Peurach, 2011).

### **School Leader Perceptions of Factors Important to PT Implementation**

That the principal could become a catalyst for change was supported by these results. In some cases, the principal was a clear supporter of the program, presented a strong unified vision, encouraged teachers and listened to their concerns, and tried to learn about the program in order to deepen the principal's relationship with the teachers (Datnow & Castellano, 2001). In other cases, teacher concerns and even school leader concerns seemed to make a single, unified vision more difficult to achieve and led to lower levels of implementation (Evers et al., 2002; Mazur & Lynch, 1989). The importance of both internal and external supports during school change has been clearly demonstrated and was borne out by the interviews with school leaders (Bol et al., 1998; Smith et al., 1997),.

Principals, when interviewed about PowerTeaching, were not apathetic. A few suggested that their roles had become more difficult or that it was impossible for them to force teachers to use "one method" of instruction. Not surprisingly, this response was found in the schools with lower levels of implementation at the school-wide level. Many principals saw PowerTeaching as a means by which to gather the entire math staff under the same umbrella, facilitating team collaboration with peers as well as making observation and evaluation much simpler. These principals suggested that it made supporting and encouraging teachers much easier ("it is easier to talk about instruction" *school 2*). They also found that it streamlined the observation and evaluation process when "we are all looking for the same thing" and "We are looking at core specific

strategies, instead of going in and each math teacher teaches differently.” Some principals were excited to note changes they had observed in student engagement – particularly that “student-talk” was often exceeding “teacher-talk” and that these student discussions were about math. They noted that the students were discussing math in more depth and seeming to come to greater understanding, in some cases suggesting that this was the first time they had seen students so actively engaged in owning their own learning. They attributed PT’s emphasis on team learning to the students’ willingness to work together and techniques like random reporter or team celebrations to encouraging students to buy in to working together as a team.

Principals’ stark differences in attitude were prominent during the interviews. These comments were coded as part of the “shared vision” or “consistent commitment to change” category, but perhaps in future research this particular attitude and behavior could be further explored, as an important interface between the individual leader and her or his situation. If a principal is philosophically opposed to one system of instruction being employed in the school and willing to express that view in an interview, then is he or she less likely to encourage teachers to implement a particular reform? If the principal views the PT instructional strategies as “individual tools to pull from a toolbox” then the driving point of the framework, the implementation of a well-researched cycle of effective instruction, has been undermined.

Research exploring the identity and attitudes of the school leader (whether the principal perceives himself or herself as an instructional leader as opposed to a manager or as a transformative leader) exists, but much of that research focuses only on one individual (the principal) and excludes much of the complexity of the situation (Harris &

Spillane, 2008; Leithwood & Seashore-Louis, 2011; Scheerens, 1990). In watching the pilot year of implementation, it is evident that the complex network of actors who work together implementing is a much stronger force than the individual principal can be and merits study of its own. The attitude or intent of the school leader with respect to the situation was as important, and perhaps more so than the choice between specific behaviors (i.e. instructional leading vs. transformational leading). With different attitudes in response to an externally imposed situation, the leader had a profound effect on implementation level and, perhaps even on student achievement. Individual school leader's responses to high-stakes testing are one example of implementation being affected by an externally-imposed situation, or not.

**Impact of high-stakes testing on implementation.** Clearly, school leaders are concerned about their school's test results. Also clear is that their focus on high stakes test scores impacts classroom instructional processes and likely student learning. Teachers have identified testing pressure as a contributor to student disengagement as well as a rationale for using specific instructional processes like test review and practice (Bol et al., 2002). In other studies as well, testing has pressured teachers and school leaders to change practice and resource allocation, in some cases affecting implementation of reforms (Bol, 2004; Datnow, 2005; Desimone, 2002; Fischer, Bol, & Pribesh, 2011). Successful implementation of PowerTeaching, or any change in instructional processes, requires overt attention to testing pressures, particularly in high-needs middle schools like those in this study. School leaders can choose explicitly to direct the school's focus away from test scores instead focusing on better instructional processes, ultimately improving student achievement.

Until this takes place, models of school accountability based on AYP and benchmarks on achievement tests will likely dominate if for no other reason than the educational-industry complex control the situation (Kohn, 2002; Ravitch, 2010). Until all members of the educational community express a desire to focus on deeper understanding, it remains difficult for school leaders to refocus their school's vision away from high-stakes testing.

### **Teacher Perceptions of School Leader support during PT Implementation.**

Teacher perceptions of leadership support were primarily focused on the school or district leader's understanding of what was being asked of teachers in the implementation of PowerTeaching, their acknowledgment of the complexities and difficulties with implementation, and the support and encouragement they provided. Teachers were frustrated with the absence of leadership support, encouragement, or even interest in PT implementation. Where present, teachers appreciated leadership acknowledgement of the importance of continued professional development and the presence of a school-based coach to help them. Such teacher concerns are borne out by decades of research into school reform efforts, and the structure of PT implementation in the pilot year attempted to ensure adequate support for the teachers both internally (school-based coach) and externally (SFAF coach, online resource hub) (Bol et al., 1998; Murphy & Datnow, 2003). In this case, the school-based coach emerged as an important supporting actor. The project managers clearly identified that schools where coaches were present were more likely to have better implemented PT. Especially in schools with effective coaches, the school leaders were vocal about their appreciation of the support that the school-based coach provided to the teachers on a daily basis. Teachers too found their school-



based coach to be an important piece of successful implementation. Often when interviewing teachers and discussing “school leaders” they immediately understood the term to refer to their coach and not their principal, reflecting a reliance on the coach for direction and encouragement. A successful in-house coach seemed to be able to help establish the unified vision and help all actors stay committed to PT.

### **Factors in variation of implementation of PowerTeaching across measures**

Results for the last question demonstrated, to the extent possible with this dataset, the relative importance of multiple factors in defining clusters of schools with varying levels of implementation. Implementation levels were defined by multiple data sources, classroom observations being the most significant in terms of creating clusters of schools. Also prominent in the quantitative clustering process were the extent to which a school’s teachers believed that team learning had a positive impact on students, academically and socially. From interviews with participating teachers, school leaders, and project managers, it was evident that a clear commitment to PT, plus effective communication and strong relationships between school actors were significant in determining a school’s level of implementation (Bol et al., 1998; Marzano, Waters, & McNulty, 2005; Peurach, 2011; Robinson et al., 2008). In fact, while schools in the higher implementation cluster may have been missing one part of leadership buy-in, they were able to create strong PT implementations during the pilot year due to effective communication of a clear commitment to PT. Schools in the lowest cluster with least implementation at the close of the pilot year (either no progress or regressed in spring) all had multiple different players going in multiple directions. These schools lacked a principal or district with a clear commitment to PowerTeaching and in two cases were openly discussing giving up

the reform effort in favor of test preparation strategies. A clear commitment to change, ability to focus on pressing issues, and willingness to marshal resources and practices in the school toward one goal was again shown to be of utmost importance (Marzano et al., 2005; Robinson et al., 2008).

Teacher beliefs in the impact of team learning on students were also significant in the post hoc ANOVA, implying that school implementation of change can be helped by having a large percentage of teachers in that school believing in the change. Although only teachers participated in the questionnaire scales measuring beliefs about the impact of team learning, principals also commented on the impact of their teachers' use of team learning in their interviews. Those who discussed seeing increased student engagement in math classes, increased discussion between students about math, or even just more student talk and less teacher talk in math classrooms expressed their excitement, and in some cases surprise, at the positive changes that came with the first months of implementation. The findings here that teacher beliefs are significant, support other research in school change, but these findings also confirm that "teacher beliefs" continue to be a "messy construct" that is difficult to measure and constrain (Datnow & Castellano, 2000; Isikoglu, Basturk, & Karaca, 2009; Pajares, 1992).

Messy though it is, all three sets of actors (teachers, principals, and project managers) seem to understand that, in order for the reform to be implemented fully and with fidelity, a concerted effort with unified intentions must be made by all. Teachers were generally willing to carry out the reform mandate in their classrooms, and they were grateful for any resources they were given – practical advice from their school-based coach, time to learn the PT techniques, acknowledgement from their principals of the

daily battles they face. But gratitude is the least of it. It might be tempting to dismiss acknowledgement by their administrators as mere hand-holding, but in fact, in schools where teachers complained that such positive acknowledgement was lacking, implementation of the reform suffered. The presence of an effective school-based coach seemed universally to be viewed as an irreplaceable asset toward this end. All sources agreed that a clearly communicated common vision helped successful implementation.

The usual role of the individual school administrators was most clearly articulated by the project managers, both of whom are well experienced in observing school change, and neither of whom was surprised by the personnel dynamic at any of the schools regardless of the widely-varying levels of implementation. From this study it appeared to be the case that principals, to a much greater degree than teachers, felt themselves under tremendous pressure to put up big numbers on standardized tests. This could be due to the differences in interview protocol, however, and not an accurate representation of reality.

Due to these differences it is difficult to make fine-grained comparisons across the measures. Clearly, the interviews showed that the leadership of a school and district affects variability of implementation and that clear commitment, resource allocation, and supportive relationships are all important. Because only one question from the teacher interview was used, it is only possible to discuss the teachers' perceptions of the role of leadership in implementation. From the questionnaire, it is evident that they perceived a lack of leadership support or at least a less supportive school climate, also apparent in their interviews. Their beliefs about team learning's impact on student achievement and social skills were not evident in the teacher interview data, nor were the teacher

perceptions of the factors most important for successful implementation. Further study using additional teacher interview data is ongoing. The classroom observations and school snapshots were in general agreement at the top and bottom levels of implementation, but not in total agreement. They generally triangulated the project managers' perceptions of each school's implementation level. An additional difficulty with measures of implementation is that school implementation is not static or unidirectional. From all sources, for example, it was clear that implementation was increasingly challenged with approaching high-stakes tests, with a few schools regressing in their levels of implementation. Although not problem-free, including multiple measures in this study was important in order to triangulate implementation levels, concerns about presence or absence of school and district leadership support, and also the pressure of high-stakes testing.

### **Limitations**

Of course due to the exploratory nature of this study the present findings are not generalizable externally. Certainly the number of participants was limited due to the scope of the study. For interviews it is not obvious that a point of saturation was reached. Additionally, the work explored only the implementation of PowerTeaching at the middle school level and findings may not hold true for school change in other settings in elementary or high school.

The use of a research team was of overall benefit to be sure. Nine researchers worked together in teams and sub-teams to create measures and gather data. Two members of the team visited each school during the spring school visits and were able to provide multiple data sources for observations and even interview notes. However,

limitations to the study from use of a team also are present. The reliability of the research team is a limitation, including its less than extensive training in semi-standardized protocols, and the individual members of the research team asking different and sometimes substantively different questions as follow-ups across participants. Nine observers gathered classroom observation data with one research pair visiting each of the 8 schools. The protocols created by the team sometimes did not align with my research questions. Differently asked questions across participants resulted in challenges when determining whether unique responses were based on the unique perceptions of the individual or merely the way the question was worded. Fortunately, inter-rater reliability, stability checks, analytic memos and an audit trail all contributed to strengthen the trustworthiness of this study.

With respect to classroom observations, teachers may have behaved differently due to our presence in the classroom and, in fact, a few times we heard student comments to that effect. In order to avoid this response, ideally the TCEP observers would have been in the classroom often and completed a few observations before the observation used in this research. However, financial and time constraints of visiting remote schools as well as issues of access and the level of disruption of the school day precluded such procedures.

In addition, the threat of reactivity in self-reported measures applies to the teacher questionnaire and interview responses. Social desirability is likely to have colored teachers' questionnaire or interview responses. Participants may have been more optimistic about their own levels of implementation than the observations show, for example, or principals more enthusiastic about their support of PowerTeaching and team

learning. Due to difficulties with items on the questionnaire scale (and the unique and unpredictable issues of implementation of the Teacher Cycle Record Form), it is not clear to determine the extent to which they agree. However, trustworthiness strategies such as using multiple observers and examining the results across multiple data sources lessened the nature of these threats. Audit trail and journaling of these issues as they unfolded helped to guard against bias. Inter-rater reliability and stability checks for qualitative coding added to trustworthiness as well. A more comprehensive and rich description of factors explaining variation in implementation resulted from these practices, despite the inherent limitations.

Individual scale development was also not without limitation. Ideally an existing and validated measure would have been used to gather data. This being unavailable, scales were developed in relation to the program theory and with initial creation of a blueprint, followed by multiple rounds of expert review and revision, and eventual piloting where possible. Ethical issues with the school leader support scale resulted in substantial rewriting and weakening, including the removal of the word “principal” from all items. The resulting scale in school support loosely estimates the perceptions of teachers on the level of support from school leadership without restricting the responses to their perceptions of the principal. In light of the results that revealed the importance of an overall network of leadership, perhaps this was beneficial in the end.

The questionnaire scale that was based on the CBAM stages of concern was very limiting. Because the developers of PowerTeaching use the CBAM model as their theoretical framework it was also used for this study. The scales are intended for use in longitudinal study and the curve of the line observed to detect changes in the profile of

the types of intense concerns that the teachers were feeling. Because only spring data was used for this work, and there was little variation, the CBAM measure was of limited value. The school snapshots, completed by the SFAF coaches who have undergone extensive training and years of practice, were considered to be objective.

### **For future research**

#### **Theoretical models and leadership theory**

Literature shows that implementation can start with a few individuals buying in during the initial stages and gradually moving toward full buy-in over time (Rogers, 1962). This journey requires flexibility and relationship-building throughout the process (Ven et al., 1999). Routines can be developed as part of this journey to establish common ground for the actors to share while the discursive process of implementation moves forward as seen in this years-long ethnography tracing the implementation of a success for all reform (Peurach & Glazer, 2011; Peurach, 2011). These theories describe a school change effort, over time, but do not model the way the leadership network functions, within schools and districts.

Based on the findings in this study, I can envision a future research project that examined more closely the set of actors and the relationships between those actors as a school reform effort unfolded. Actors might include traditional members of leadership hierarchy (superintendent, district-level, principal, department level, teachers) but also could include other members of the school community (students, parents, community members, business partners, coaches, etc.). Using a theoretical framework that helped map out the many relationships between the many actors involved in school reform and model their significance would be useful in examining the structures that influence

reform in any year – the limited view most usually available to researchers (Scheerens, 1990). A model that would allow closer examination of a complex system of people, continually changing, and working within a flexible set of institutional structures would have been helpful for organizing this work. Indirect effects models attempt this task. Scheerens' concept of the school leader in a position of "meta-control" is based on control theory (including the importance of flexibility), for example (De Leeuw & Volberda, 1996; De Leeuw, 1986; Scheerens, 1990). Quinn and Rohrbaugh's concept of "competing values" has also been used as a model for leadership interactions in studying effects of school leadership (Heck & Moriyama, 2010; Quinn & Rohrbaugh, 1983; Ten Bruggencate, Luyten, & Scheerens, 2010). Distributed leadership theory and its focus on leadership practice is also such a model (Spillane, 2006). Based on complexity science and network theory, it is less concerned with certain processes or outcomes, instead focusing on the "rich networks of relationships" (Harris, 2009; Leithwood et al., 2009).

The distributed leadership and other indirect leadership models are unique in emphasizing the network of leadership influences within a school or district. Unlike leadership models that focus on the behaviors of one person and his or her influence as an instructional leader, transformational leader, or managerial leader, these newer models use control theory, complexity theory and theories of distributed cognition to view leadership practice in a wider sense within a specific multi-dimensional context (Harris, 2009; Scheerens, 1990). Vertical and lateral dimensions of leadership (i.e. hierarchical or peer relationships) are modeled in simultaneous tension with the two realms of formal and informal leading (structured meetings or informal focus on peer relationships, e.g.) (Harris, 2009; Spillane, 2006). Such research is beginning to be carried out, but models



are not yet agreed upon, though a few examples are present in recent literature (Leithwood, Mascal, & Strauss, 2008).

School change and implementation of external programs such as PowerTeaching math must be carefully implemented with the attention of all the actors in the network of school leadership. To researchers of comprehensive school reform, this is not news (Bol et al., 2002; Borman et al., 2003; Nunnery et al., 1997; Peurach, 2011). Teacher concerns and participants' beliefs about an intervention matter but are perhaps less important than internal and external supports during the implementation (Bol et al., 1998). Research shows that throughout the implementation journey the multiple players must be flexible and be headed in the same direction – a task made more simple through overt routines (Leithwood & Jantzi, 2000; Peurach & Glazer, 2011; Winter & Szulanski, 2001).

Another related direction of research stems from organizational psychology research and research on conceptual change and examines the culture for sustainable change (Schneider, Brief, & Guzzo, 1996). For example, Myran et al. found relationships between an individual's commitment to change, implementation (participation) level, and the behavioral support for the reform, (2013). Although research investigating the complexity of school organizations and the nature of changing such complex structures is not a new (Marks & Printy, 2002; Printy, Marks, & Bowers, 2009), the attempts to apply newer organizational psychology and leadership and control theories to schools are infrequent to date. A gap in research exists, for example, in examining the impact of school leadership using indirect effects models and these network or complexity theories applied to educational settings, such as distributed leadership or integrated leadership. Scheerens suggests that both qualitative and

quantitative studies could help describe the pathways of functioning of school networks (1990). To some extent, the results of this study contribute to that effort.

### **Quantitative analysis.**

In later years of the grant when more schools are participating, it would be fruitful to carry out a multilevel analysis of the level of implementation using the variables from this study that look promising, as well as some school demographic variables that typically have been shown to influence school reform successes. Factors like supportive school or district leaders, demonstrated teacher beliefs in team learning, and levels of participant concern could be used. If it were possible to find an applicable network model for successful functioning of school networks (communication, resource support, relationships, etc.) that too could be added (Harris, 2009; Myran et al., 2013; Scheerens, 1990).

*To examine the odds that a school would be more likely to achieve successful implementation, it would be useful to perform an ordinal logistic regression using a composite, categorical school-wide implementation level from the cluster analysis as the dependent variable and the teacher-level scores from the questionnaire as independent variables, along with some school-level markers. Unfortunately, due to small sample size this was not possible for this study.*

**Measuring concern.** To circumvent the issues with the CBAM scale noted above, it may be beneficial to use a validated burnout inventory (e.g. Maslach's burnout inventory) to measure participants' concerns instead. Over and over again in interviews

the teachers state that they don't have enough time, that they have too many obligations, that there are conflicting demands placed on them by school and district leaders. Much of this emotional energy might be measured very effectively with a burnout scale. Unless for practical reasons it is important to measure the progression of the teachers' concerns with respect to the implementation, it might be better for evaluation purposes to be measuring more accurately the intensity of their frustration and burnout.

## **Conclusions**

The extent to which a multitude of factors is present in any school change effort was part of my lived experience this year. The complexity of the path toward change and the actions between the participants while travelling on this journey is worth further study. The strength of the organization's network of players, and its ability to point in one direction, are central to a reform's success or failure.

In a more practical sense, this research speaks to school principals about the extent to which they can support change in their schools by keeping a consistent and focused message that is clearly communicated to the staff. Building a relationship with the staff around that message and participating in their discussions, hearing their frustrations, and encouraging their efforts is also important. Finding a way to support the teachers or coaches by insulating school staff from district-level initiatives that cloud the reform effort and by ensuring a prompt delivery of needed resources is also important (Bol et al., 1998; Borman et al., 2003; Nunnery et al., 2008; Robinson et al., 2008).

Politically speaking, the unfolding story sheds light on some frustrations and shortcomings of the government funding and requirements educational research. The nature of the pilot year experience, with only 6 months of preparation and recruiting time,

certainly affected the level of reform implementation. The requirement that results be demonstrated in a formal evaluation by the third year of the grant precluded decisions to take more time in setting up the program, developing materials, gathering resources, and recruiting schools. The i3 grant system is doubtless an improvement on prior structures of federally funded educational research in that research-proven programs are eligible for larger awards that facilitate nationwide broad scale-up of programs (Bol et al., 1998; Slavin, 2008). However, the term of these scale-up grants might be reexamined, as might the requirements for the type of evidence needed to demonstrate effective school change. It is unrealistic to expect to see immediate results in student improvement when given such a short time span in which matched schools in school districts must also be recruited.

Given the available data here assembled, the limited data bear out the conclusion that successful implementation includes multiple factors and multiple actors. No single set within the school can alone take command and force the implementation of a curricular reform with much expectation of success. Neither the teachers, individually or collectively, nor the principal (to say nothing of district administration) nor even the lynch-pin of PT, the school-based and SFAF coaches, can expect successful implementation without substantial cooperation from the other constituencies. That is, these data show that a school-wide programmatic effort, the product of multiple factors, is necessary to lasting institutional change.

The good news is that neither does any one constituency alone possess the power to defeat implementation. When I began this research, I greatly suspected that a single disgruntled teacher, fed up with yet another mandate from on high, might have the

persuasive power to sabotage the entire program. But this is not the case, at least in the limited data assembled here. Instead, in schools that did not successfully implement PowerTeaching reform, or in the case where the level of implementation regressed after showing initial promise, in all cases, the failure to implement occurred across the board. That is, like success, failure was the product of multiple factors. Certainly some factors carry more weight than others. The school leadership sets the tone, and teachers in high implementing schools pointed to the active engagement of the principal.

PowerTeaching is not a magical pill that produces instantaneous results. Although some of the eight schools examined here are off to a good start, the story of PT implementation is not over for any of them. Despite the pressure placed upon them, principals cannot realistically expect dramatic increases in measures of student learning in only one year. But through patient, assertive, programmatic reform addressed across the board to the multiple factors within the institutional setting and applied consistently, they can expect positive outcomes in school change that eventually result in measurable improvements in student learning.

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## **APPENDICES**



## Appendix A: Spring Teacher Questionnaire

### TEACHER QUESTIONNAIRE ON POWERTEACHING MATH

The potential benefit of this questionnaire is to help us improve professional development and project implementation efforts for PowerTeaching. We will also look for changes in responses across schools and years. To explore these changes, we are asking you to provide a unique codename rather than actual names or other identifying information in order to protect your anonymity. Completing the questionnaire should pose no risk to you and is voluntary. It should take you no more than 20 minutes to complete the survey.

**Codename:** Please fill in the spaces below to create your unique codename. *Be sure to use the same code if you completed the fall questionnaire.* An example is also provided.

Prompts	Your response	Example
1. What is the first letter of your birth month?		M
2. Write the first letter of your mother's name.		E
3. How many brothers and sisters do you have? If none, write 0		3
4. Write the year you graduated from high school using the last 2 digits.		77
5. Write the first letter of the city where you were born.		W

Write your responses from 1-5: \_\_\_\_\_  
 Example: M E 3 77 W

#### Demographics:

What grade level do you teach? (Check more than one box if necessary.)

☐ 6<sup>th</sup>   ☐ 7<sup>th</sup>   ☐ 8<sup>th</sup>

What math classes do you teach? (Check more than one box if necessary.)

☐ General   ☐ Honors   ☐ Algebra I   ☐ Geometry   ☐ Other

What is your role at your school?

☐ Math teacher   ☐ Inclusion teacher

**Questionnaire Directions:** Please indicate the extent to which you agree with the questionnaire statements regarding PowerTeaching. Select one of the four response options.

## Teacher Questionnaire: PowerTeaching

Concerns about PowerTeaching	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I would like to know what the use of PowerTeaching will require in the immediate future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I would like to have more information on time and energy commitments required for PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I would like to know how my role will change when I am using PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I am concerned about not having enough time to organize myself each day.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I am concerned about how to accomplish effectively what is required in PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I am concerned about my inability to manage all that PowerTeaching requires.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I am concerned about time spent working with nonacademic matters related to PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I am concerned about my impact on students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I would like to develop working relationships with other teachers using PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I would like to familiarize others with the progress of PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I would like to coordinate my teaching with other teachers to maximize the effect of PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I would like to use feedback from students to change PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I am concerned about revising my use of PowerTeaching to improve its effectiveness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. I would like to revise the approach of PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. I would like to modify PowerTeaching based on students' learning experiences.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. I would like to determine how to supplement, enhance, or replace PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Coaching	Strongly Disagree	Disagree	Agree	Strongly Agree
1. My <b>school-based coach</b> models PT implementation in the classroom.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. My <b>school-based coach</b> regularly observes my classroom.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I receive valuable feedback from my <b>school-based coach</b> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I receive instruction from my <b>school-based coach</b> on how to integrate technology into my teaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. We attend component team meetings regularly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. During our component team meetings we set goals to improve PT implementation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Our <b>school-based coach</b> effectively plans and conducts these meetings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Technology use for PT implementation is a consistent theme in our meetings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. The <b>school-based coach</b> provides on-line coaching via the PT Hub (PowerTeaching website).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I use the PT Hub to network with other PT teachers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. The <b>Success for All coach</b> is a regular presence on the PT Hub.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. The <b>Success for All coach</b> comes to my classroom to provide support.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. The <b>Success for All coach</b> makes valuable contributions to our component team meetings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Support and Climate	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Teachers and staff at my school are unified in wanting PowerTeaching to succeed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Our school climate encourages effective PowerTeaching implementation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. School and district leaders believe PowerTeaching will help our students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I was given clear expectations about implementing PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. School and district leaders worked consistently on making PowerTeaching successful.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I understand how PowerTeaching math fits in with other district objectives.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I had adequate preparation time to implement PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I had adequate professional development for implementation of PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Leaders at my school were interested in my opinions regarding PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

PowerTeaching (PT) Collaboration	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Getting to know other PT participants gives me a sense of belonging to this project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I am able to identify with the thoughts and feelings of other teachers during the PT project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I feel comfortable participating in discussions about PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I feel comfortable interacting with other PT participants.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I feel comfortable disagreeing with other PT participants while still maintaining a sense of trust.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I feel that my point of view is acknowledged by other PT participants.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Online discussions help me to develop a sense of collaboration.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

PowerTeaching (PT) Implementation	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I am beginning to understand the basic lesson structure of PowerTeaching.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I continue to add more PowerTeaching components in my instruction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. The students in my class are familiar with PowerTeaching routines.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. My students know how to fill out the team score sheet.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I use PowerTeaching instructional strategies daily (eg. think-pair-share, random reporter).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I record individual data on the teacher cycle record form.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. My students were engaged in their team discussions daily during team practice times.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. My students value their team scores.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. My active instruction time has guided practice time for student teams built-in.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I facilitate team discussion by circulating, questioning, or challenging students to increase depth of discussion.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I encourage team participation by teaching students about the team cooperation goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Students use rubrics for random reporter to meet my expectations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<b>Teamwork Impact</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
1. Teamwork will promote a sense of belonging among students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Critical thinking is enhanced when students engage in group discussions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. A sense of trust among students will occur as a result of teamwork.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Teamwork will enhance the achievement of all students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Students are more academically engaged when working together.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Students will feel responsible for the success of their teammates.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**For questions about the PowerTeaching Hub, please rate the quality and helpfulness of the materials offered to you on the PowerTeaching website at [www.sfapowerteaching.org](http://www.sfapowerteaching.org).**

<b>Quality of PowerTeaching Hub</b> Please rate your satisfaction with the following aspects of the PT Hub.	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
1. Accessibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Structure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Appearance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Ease of navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Content included	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<b>Helpfulness of PowerTeaching Hub</b> Please rate the helpfulness of each PT Hub component in implementing PTM in your classroom.	<b>Have not used</b>	<b>Not helpful at all</b>	<b>Somewhat helpful</b>	<b>Very helpful</b>
1. Bulletin Board	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Calendar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Your SFAF Coach	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Site Map	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Classroom Resources (eg. Alignment and Scope & Sequence, Grade/Subject Content)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. My Classes/My Work Space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Professional Learning Resources (eg. PT component resources)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Teacher's Lounge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Team Workspace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**What would help you better implement PowerTeaching?**

## Appendix B: Project Manager Interview Protocol

### Project Manager Interview Questions—Spring 2013

Instructions: This is a 40-minute interview with 8 questions and a general request for comment. Please gauge time wisely as interview progresses so that all questions on the protocol can be addressed. In your answers, please consider schools that have attained *emergent*, *routine*, or *proficient* levels of use of PowerTeaching.

1. How were the 8 pilot schools chosen to participate in the i3 scale-up grant?

*For the next few questions, please think about the schools that are implementing PowerTeaching most successfully and with fidelity. These schools have moved beyond “mechanical use” for at least some objectives and have all the basic school structures in place. They might be schools that have achieved the “mastery” or “power” stages school-wide according to the snapshot. For the duration of the interview, they’ll be called the “**proficient**” schools.*

*The schools that have not yet fully implemented PowerTeaching will be referred to as “**emergent**” schools. These might be schools that are still in the “learning” or “significant use” stages according to the snapshot. They may not have completed or moved beyond “mechanical use” or do not have basic school structures in place.*

*“**Routine**” schools are schools that are not yet “proficient” but are further along the implementation journey than the “emergent” schools.*

2. What distinguishes the proficient schools from the emergent schools?
  - a. Teachers?
  - b. Leadership?
  - c. Coaching?
3. What teacher characteristics do you think were most helpful to achieving successful implementation?
4. What leadership characteristics do you think were most helpful to achieving successful implementation?
5. What did school leaders do to influence successful implementation this year?
  - a. How did *district* leaders influence successful implementation?
6. When recruiting schools to participate in future years, what school and district characteristics will you look for?
7. If you could begin the pilot year over again and know what you know now, what might you do differently?
8. What else can you tell me about your conclusions at the close of the pilot year?

## Notification Document for Project Manager Interviews

**PROJECT TITLE:** Characteristics Influencing Implementation of a Math Reform in 8 high-needs middle schools: A Mixed Methods Study

### **RESEARCHERS**

Linda Bol, Ph.D., Responsible Project Investigator  
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### **DESCRIPTION OF RESEARCH STUDY**

Researchers at Old Dominion University and the Success for All Foundation have contracted with 8 schools to implement a technology-facilitated mathematics instructional model over the next three years. The purpose of this phase of the implementation is to determine the effective and efficient use of resources and methods used during the initial phases of the intervention. This interview will focus on your perceptions of the implementation process to date – particularly the characteristics that influenced implementation during the pilot year of the project. Approximately one other project manager will be participating in this phase of the study. The interview will take about 40 minutes to complete.

### **RISKS AND BENEFITS**

**RISKS:** There is a risk that you may be identified as the sampling process in this study is purposeful sampling. The researcher will reduce the risk that you may be identified by removing all linking identifiers for all participants. And, as with any research, there is some possibility that you may be subject to risks that have not yet been identified.

**POTENTIAL BENEFITS:** The potential benefit to you for participating in this study is improvement in your guidance and management of the implementation process. Students, teachers, and administrators in the schools may also benefit by these changes, as can the school-based and SFAF coaches.

### **CONFIDENTIALITY**

All information obtained about you in this study is strictly confidential unless disclosure is required by law. The results of this study may be used in reports, presentations and publications, but the researcher will not identify you.

### **WITHDRAWAL PRIVILEGE**

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the study -- at any time. Your decision will not affect your relationship with Old Dominion University or otherwise cause a loss of benefits to which you might otherwise be entitled.

### **CONTACT INFORMATION**

The researchers should have answered any questions you may have had about the research. If you have any questions later on, contact Linda Bol, lbol@odu.edu, or 757-683-4413.

If at any time you feel pressured to participate, or if you have any questions about your rights, then you should contact the Old Dominion University Office of Research, at 757-683-3460, or George Maihafer, Institutional Review Board Chair, at 757-683-4520.

### **INVESTIGATOR'S STATEMENT**

I certify that I have explained to this subject the nature and purpose of this research, including benefits and risks. I have described the rights and protections afforded to human subjects and have done nothing to pressure, coerce, or falsely entice this subject into participating. I am aware of my obligations under state and federal laws, and promise compliance. I have answered the subject's questions and have encouraged him/her to ask additional questions at any time during the course of this study.

---

Researcher's Signature

Date

## **Appendix C: School Leader Interview Protocol**

### **Principal Interview Questions: Spring 2013**

#### **Facilitator Guidance:**

This is a 40-minute interview with 7 questions. Plan to spend about 5 minutes per question (including prompts).

---

**Interviewer:** We would like to ask some questions about your experiences with PowerTeaching this year.

1. Now that you have been a PowerTeaching math school for one year, how would you describe progress in implementation at your school?
  - a. What kind of support have you received?
  - b. What barriers have you encountered?
2. What has been your role in implementing PowerTeaching?
  - a. How has your role changed since implementing PowerTeaching?
  - b. In what ways do you support PowerTeaching implementation?
3. How does PowerTeaching math align with district initiatives?
4. How have teachers responded to PowerTeaching?
5. How do school-based coaches help to support teachers?
6. How has PowerTeaching affected students?
  - a. How does teamwork benefit students?
  - b. What obstacles do students face in PowerTeaching classes?
7. What else can you tell us to help us better understand implementation of PowerTeaching at your school?

## Notification: School Principal

PROJECT TITLE: A technology-facilitated scale up of a proven model of mathematics instruction in high need schools

John Nunnery, Ed.D., Responsible Project Investigator  
Executive Director,  
The Center for Educational Partnerships  
Old Dominion University  
4111 Monarch Way, Suite 3113  
Norfolk, Virginia 23508

As you know, we work at Old Dominion University and are collecting information about the technology-facilitated mathematics instructional model called PowerTeaching (PT). We need your feedback to help to improve it. This interview will focus on your perceptions of PT that include the usability and efficiency of the technology-facilitated resources. If you decide to participate, then you will join a study of principals from participating pilot schools across the United States. Approximately 7 other principals will be participating in this phase of the study. The interview will take about 40 minutes to complete.

The potential benefit of your participation is improvement in your instructors' mathematics and educational technology instructional strategies. Students, other teachers, coaches, and administrators in your school may also benefit by these changes. Risks are minimal, but there is a risk that you may be identified because there is only one principal per school. The researchers will maintain strict confidentiality unless required by law. We will reduce the risk by removing all linking identifiers for all participants. We are audio-taping the interview, but only project researchers at ODU will have access to these tapes. We will remove all identifiers from the transcripts. The results of this study may be used in reports, presentations and publications, but the researcher will not identify you. We will report only summary information about principals in general.

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away from this interview at any time. Your decision will not affect your relationship with Old Dominion University or your school, or otherwise cause a loss of benefits to which you might otherwise be entitled.

The researchers should have answered any questions you may have had about the research. If you have any questions later on, contact, John Nunnery, the Principal Investigator at 757-683-3596 or [jnunnery@odu.edu](mailto:jnunnery@odu.edu). If at any time, you have any questions about your rights as a participant, then you should contact the Old Dominion University Office of Research, at 757-683-3460 or George Maihafer, Institutional Review Board Chair, at 757-683-4520. Thank you very much for your consideration.




---

Co-Investigators at The Center for Educational Partnerships\*

Linda Bol, Ph.D.  
Gary Morrison, Ph.D.  
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\*Address same as RPI

Pamela Arnold, M.A.  
Terrell Perry, Ed.D.  
Elizabeth Hoag Carhart, M.A.  
Julia Zaharieva, M.S.



## Appendix D: Teacher Interview Protocol

### Teacher Interview Questions Spring 2013

#### Facilitator Guidance:

This is a 40-minute interview with 20 questions. Plan to spend about 2 minutes per question.

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Interviewer: We would like to ask some questions about your experiences with PowerTeaching this year.

1. What are the major benefits of PowerTeaching?
2. What helped you the most in getting started with PowerTeaching?
3. Describe the role of school leadership in adopting PowerTeaching?
4. What were some of the hurdles you faced in adopting PowerTeaching?
5. What PowerTeaching resources have you used most frequently?
  - a. Which have you used least frequently?
6. What other resources do you need to be able to implement PowerTeaching effectively?
7. How has the SFAF coach helped you implement PowerTeaching?
8. How has the school-based coach supported your implementation of PowerTeaching this year?

#### Prompts:

- a. How did **feedback** from the school-based coach support your implementation of PowerTeaching?
  - b. How has being a member of a **component team** support your implementation of PowerTeaching?
9. Describe how the PT Hub is connected to your PowerTeaching:
10. What barriers hindered your use of the PT Hub?
11. What would help you increase your usage of the PT Hub?
12. What has access to both online and face-to-face support at the same time meant for your PowerTeaching?
13. What skills are most important for math learning?
14. How does PowerTeaching influence mathematics learning?
15. How has PT influenced the way you teach math?
16. If you teach students with IEPs, think about them for a moment. How is PowerTeaching connected to their learning?
17. You may also teach other socio-economically, racially and linguistically diverse groups of students. How is PowerTeaching connected to the learning of students from any of these groups?
18. In what ways have the cooperative learning aspects of PowerTeaching affected students' learning?

- a. How has students' **higher order thinking** been influenced by using the cooperative learning strategies of PowerTeaching?
  - b. How have the cooperative grouping strategies of PowerTeaching affected **relationships** in the classroom?
19. Describe your experiences in implementing cooperative learning in the classroom.
- a. What are the benefits?
  - b. What are the challenges?
20. What else can you tell me about PowerTeaching or its implementation that I have not already asked?

## Appendix E: SFAF School Snapshot



School: \_\_\_\_\_

District: \_\_\_\_\_

State: \_\_\_\_\_

Principal: \_\_\_\_\_

Math Coach: \_\_\_\_\_

Grades Implementing: ☐ 6 ☐ 7 ☐ 8 ☐ Other

Math and Attendance Data					
Math					
Attendance					

Baseline Data		
Baseline		
1		
2		
3		
4		

SMARTS Data										
G = Goal R = Results	Baseline		1		2		3		4	
	G	R	G	R	G	R	G	R	G	R
Grade 6										
Grade 7										
Grade 8										
ESL										
SPED										
Schoolwide Average										

## Snapshot Report

B 1 2 3 4						IP = In Place; N = Not in Place
<b>Fundamentals</b>						
						1 All leaders and staff have received essential training. (1)
						2 Materials necessary for program implementation are complete. (2)
						3 School-based Math Coach is a full-time position. (4)
						4 The principal is fully involved with PowerTeaching Implementation. (7)
						5 Instructional component teams meet at least twice a month to address professional-development needs and connect teachers to online and print resources for program support. (6)
<b>Assessment</b>						
						6 Accurate School Summary Form is maintained for every grading period. (19)
						7 Formal math-benchmark assessments with consistent measures are conducted at the beginning of the year and at the end of each grading period. (20)
						8 Teacher cycle record forms or weekly record forms are used by all teachers to record classroom data throughout the grading period. (21)
						9 A Classroom Assessment Summary is submitted quarterly by each teacher. (22)
<b>Leadership Team</b>						
						10 The Leadership team meets monthly to review schoolwide data, and prepare for the quarterly meetings. (31)
						11 The Leadership team knows the number and percentage of students achieving at grade level and meeting quarterly proficiency goals. (32)
						12 Quarterly meetings are held at the start of school and quarterly to review schoolwide progress toward achievement goals. (33)
						13 Instructional component teams set SMARTS targets based on program data, chart progress, and work collaboratively to meet their targets. (34)
						14 The school-based math coach uses the GREATER coaching process to support continuous improvement of student achievement through high-quality implementation. (35)

Priorities for implementation: 1 mechanical 2 routine 3 refined

✓	B	1	2	3	4	
						● Teachers use the basic lesson structure and objectives. Teachers use available media regularly and effectively. (1)
						● Active instruction is appropriately paced and includes modeling and guided practice that is responsive to students' understanding of the objective. (2)
						● Teachers use Think-Pair-Share, whole-group response, Random Reporter (or similar tools that require every student to prepare to respond) frequently and effectively during teacher presentation. (3)
						● Teachers restate and elaborate student responses to promote vocabulary mastery at a high standard of oral expression. (4)
						● Teachers provide time for partner and team talk to allow mastery of learning objectives by all students. (5)
						● Teachers facilitate partner and team discussion by circulating, questioning, redirecting, and challenging students to increase the depth of discussion and ensure individual progress. (6)
						● Following Team Talk or other team study discussion, teachers conduct a class discussion in which students are randomly selected to report for their teams; rubrics are used to evaluate responses, and team points are awarded. (7)
						● During class discussion, teachers effectively summarize, address misconceptions or inaccuracies, and extend thinking through thoughtful questioning. (8)
						● During class discussion, teachers asks students to share both successful and unsuccessful use of math strategies and graphic organizers. (9)
						● Teachers calculate team scores that include academic achievement points in every instructional cycle and celebrate team success in every cycle. (10)
						● Teachers use team scores to help students set goals for improvement, and students receive points for meeting goals. (11)

✓	B	1	2	3	4	
						● Students are familiar with routines. (1)
						● Students speak in full, elaborate sentences when responding to teacher questions. (2)
						● Student talk equals or exceeds teacher talk. (Each student should be engaged in partner/team discussion as a speaker or active listener during half of class time.) (3)
						● Students are engaged during team/partner practice and labs. If needed, strategies such as talking chips or role cards are in use. (4)
						● Students use rubrics to meet expectations (e.g., Random Reporter). (5)
						● Teams are engaged in highly challenging discussions, in which students explain and offer evidence from their work to support their answers. (7)
						● Students value team scores and work daily to ensure that team members are prepared to successfully report for the team during Random Reporter and to succeed on tests. (8)

Fill in:

- ✓ = Area of focus  
 P = Power schoolwide - Objective is verified for 95% of teachers.  
 M = Mastery - Objective is verified for 80% of teachers.  
 S = Significant use - Objective is verified for 40% of teachers.  
 L = Learning - Staff members are working toward verification of this objective.

\* Verified by observation or artifacts such as team score sheets, facilitator observation records, videos, audio records, transcripts of instruction, or teacher records of student responses. Leave blank if documentation is not yet available.

## Appendix F: Observation Protocol

### Observation Field Note Template

**Event:** 10-20 Minute Walk-Through

**Researcher:**

**Date:**

**School:**

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**Guiding Questions for 10-12 Minute Observation:**

- What evidence do I see or hear that suggests PowerTeaching (PT)?
- How does the room structure to facilitate PT?
- What do I hear individuals saying about PT?

<b>Grade Level &amp; Lesson Phase BME (Beginning, middle or end)</b>	<b>Structure for Learning GRO (Groups, rows, or other)</b>	<b>Estimate of Who's Talking Teacher (%) Student (%)</b>	<b>Observations (Notice what is posted on the walls; listen for PT and mathematics-focused conversations; look for mathematical/PT agency; use of PT resources, PT Hub)</b>	<b>Analytic Notes (Record impressions related to what you observe; capture questions or comments)</b>

## Post Observation Analytic Memo

At the end of each day of a site visit complete the following memo.

Site Visit Dates:

Site:

ODU Team:

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### Guiding Questions:

- What did I learn about the schools preparedness to implement PowerTeaching?
- What evidence was there that PowerTeaching classroom resources were being utilized?
- What evidence did I see related to classroom PT resource usage in Grade 6? Was it different from other grades?
- What did I learn about attitudes and challenges related to technology?
- How often and well was cooperative learning implemented?
- What questions do I have after today?

## Appendix G: Observation code sheet

## POWERTEACHINGI3 OBSERVATIONS: CODE SHEET FOR SPRING 2013

SCHOOL # \_\_\_\_\_ CLASSROOM # \_\_\_\_\_

	THEORETICAL FRAMEWORK	LEVEL OF USE / LEVEL OF IMPLEMENTATION			SCORE
		No use (0)	Mechanical (1)	Routine (2)	
1	Instruction (verbal cues)	No cues related to PowerTeaching observed	Isolated verbal cues related to PT (zero noise signal, get the goof)	Use of PowerTeaching framework is evident (multiple verbal cues related to PT)	___/6
	• Verbal cues according to PT framework	No reference to student teams	Isolated references to student teams, one mention	Continued reference to student teams, instruction is volleyed back and forth from active instruction to team activities	
	• Evidence of random reporter rubric use	No random reporter used or mentioned	Random reporter in evidence (sticks, number called, etc.) but rubric not used	Random reporter rubric used or verbal reference or prompt given ("you didn't justify your answer but you gave a complete sentence")	
	Classroom PT artifacts	• No artifacts observed	• Some artifacts present • May not be observed in use • May not be current	• most artifacts present • most current • Perhaps observed in use	___/4
	• Team celebration pts poster • Team cooperation goals poster • Team celebration certificates • Team folders • Current team score sheet				
	• Desks/table arrangement (student seating)	• rows • horseshoe • circle	• Groups • Pairs	• Teams	
	Student Team Interaction	Direct instruction only (i.e. continuous lecture by teacher seated at overhead projector)	Both student-student interactions and active / direct instruction	Significant observed student-student interaction <i>about math</i>	___/4
	• Active instruction vs. team interaction	90-100% Teacher talk 0-10% Student talk	50-75% Teacher talk 25-50% Student talk	0-40% Teacher talk 60-100% student talk	
TOTAL CLASSROOM SCORE					___/10

## Appendix H: Codebook

		Definition	Example
District level factors			
	DIST vision	<p>A commitment to change that is a clear mandate (or not), a consistent message about PowerTeaching including expressed beliefs in cooperative or team learning, concerns about district-level turnover or inconsistency, communication of said message with schools or grant partners, competing district initiatives, or allowing flexibility with district initiatives</p>	<p><i>That's one concern I have with the way it was done here, our principal understands it well, we met with [the principal], but we have a curriculum specialist at the district level who doesn't know a lot about it, so I wish that would have been more coordinated. I wish, because we have a lot of district mandates put on us inside the classroom, and I wish that would have been more communicated so that way everyone up the chain in our district, like our superintendent all the way up to assistant principals all know what's expected of us. So that was one concern I had with it. The fact that the expectations of it, what were expected, don't really correlate with our district goals sometimes. (Teacher, school 1)</i></p> <p><i>The district initiatives, as it relates to instructional strategies, is all about best practices, and so, when you think about best practices and you think about you have this power teaching initiative and it's about engaging, it is about empowering students to be team leaders and to work together as a team, it's definitely aligned to the initiatives in the public schools. We want students to be empowered to ask questions and of course with the power teaching they have their random reporter, they have their team leaders, they have the celebration points, they have a lot of different components that's about best practices. And so, that is definitely aligned to [our school district]. (Principal, school 8)</i></p> <p><i>The alignment piece is maybe on the district level is if we have to take some time out at the beginning. That revamping of the quarterly tests to align with...maybe the first couple of weeks they have got to set up the program so we cannot cover as much curriculum. Little alignment structures like that. I am trying to implement this program half and half to still keep pace with the curriculum. (Principal, school 6)</i></p>



	DIST Resources	Creating conditions for change at a district level, providing necessary resources for schools (coaches, ipads, PD time, initial training)	<p><i>My biggest concern, and I am going to put it out there, is not knowing whether we are going to have a full-time math coach next year. I have no idea where we stand with that. (Principal, school 7)</i></p> <p><i>Our Superintendent gave us some safety net funds that was to provide additional support within the school day. I threw all of mine into math and the PowerTeaching model lent itself to having extra people come in. (Principal, school 5)</i></p>
	DIST relationships	Supporting the schools, principals, or teachers, attendance or interest in professional development and PT training, attending meetings, etc.	<p><i>I think it put everybody at the 8 ball starting at the beginning because everyone was worried that we wouldn't get everything covered in the curriculum. Because of the way it was put in I don't think they restructured the curriculum to meet the timeframe and to look at what time would be needed to implement. I think those are some things that for whatever reason and when teachers know there is the new evaluation system and everything was going to be based on scores and goals, I think a panic attack set in. (Principal, school 6)</i></p> <p><i>I mean at school 2, it happens that the district person was very visual in the school. [The individual] has a relationship with those teachers, ... never lost that direct connection to the school ... [and] ... was evident in the school. (Project manager)</i></p>
<b>School level factors</b>			
	SCH vision	At the school level, a shared vision (or not), clearly communicated, a commitment to change (or not), a consistent effort (or not), turnover or consistency in SCH leader, beliefs about cooperative learning/team learning, beliefs about role as instructional leader, etc.	<p><i>Now if you mean like administration and leadership of the school, they haven't really been too involved in that process as a whole, so I don't really know, (Teacher, school 1)</i></p> <p><i>At first when they didn't have a coach, the mentality was do what you can and don't stress out about it. Our student's performance is more important than worrying about implementing PowerTeaching strategies, especially since we do not have a coach. ... They have been very supportive. There hasn't been any of the "You will do this." It is more of "The important thing here is that our students are successful. If this helps our students to be successful all the better, but if it is hindering our students from being successful then we need to go back and this has to go on the back burner." (Teacher, school 7)</i></p>

SCH Resources	Time (PD, prep time for preparing materials for class whether math or PT, class time to fit in PT structures or framework),	<p><i>We can't even take pictures. We just don't get the support we need. We don't even have iPads yet – I bought mine out of my own pocket. (Teacher, school 4)</i></p> <p><i>So, I think having a math coach at the very beginning. Having the resources. I know we're supposed to have iPads at the very beginning. We didn't get those until a couple of months ago basically. (Principal, school 8)</i></p> <p><i>We have to find a way to give them a little more time for math. Just find some minutes somewhere. What I am hearing is that if they had even five minutes more it would work perfect. (Principal, school 2)</i></p>
SCH relationships	Attending component team meetings (or not), interest in PD (or not), learning about PT (or not), posting on hub (or not), observing, walkthroughs with coach, participating in goal-setting with coach, helping teachers and boosting morale (copying, pizza, etc.)	<p><i>But yeah, [the principal's] 110%, you know, pep talks, support, anything we need, special meetings on the side, [and would] sit in on our weekly team meetings occasionally. Just phenomenal, that's all I can say, just above and beyond the call in all regards. (Teacher, school 8)</i></p> <p><i>Oh, I think what the difference is that it is more language and common structure to it because we are all looking for the same thing. It is not... We are looking at the core specific strategies, instead of going in and each math teacher teaches differently. It is easier to talk about instruction. I heard some of the common language that they use in math I have not heard forever. (Principal, school 2)</i></p> <p><i>At first it was pretty gung ho. We had an administrator at our component meetings and then it dropped off. I really didn't feel much support at all. (Teacher, school 2)</i></p>
<i>Teacher level factors</i>		
Concerns about reform	What is PT, how will PT affect me, I don't have time for PT, I don't want to do PT, etc.	<p><i>I had some that fell in love with it, loved it, ran with it and a couple found their niche because of their style of teaching. The ones that didn't get trained all the way struggled and then fought. (Principal, school 6)</i></p> <p><i>You had teachers saying "Is this something new that is coming in and in a year it is going to be gone and we are going to be doing something else? Or is it here to stay?" So you really had to get a lot of buy in by the teachers and it varied. (Principal, school 7)</i></p>
Beliefs about teamwork's academic impact	Teacher beliefs about how PT teamwork affects students' academic skills or achievement.	<p><i>If kids can't do that and you are in a group of four and you are working together, how can they help each other if they don't understand the concepts themselves. (Principal, school 7)</i></p> <p><i>I've, in talking with some of the students, they've said it's helped them to share. They're not out alone on their own working on a problem; they're working together. So it has increased their confidence level and they feel, you know, they're not put on the spot by themselves because they work together in a group to answer the questions or to work the problems. (Principal, school 3)</i></p>

Beliefs about teamwork's social impact	<p>Teacher beliefs about how PT teamwork affects students' social skills.</p>	<p><i>We constantly said that to them. "Don't go in and throw them the little life rings right away. Let them struggle. Send them back to the teams and get them to work together. You are not going to be there when they are out in life." (Principal, school 5)</i></p> <p><i>The obstacles I think would be the group, the groups where, as I stated earlier, probably the discipline. Sometimes they're in a group where there may be some conflicts between two students and I think that has happened on several occasions where the teacher has had to move them or switch the groups out to cut down on some of the discipline issues. (Principal, school 3)</i></p> <p><i>I think it's very beneficial because the students feel like they have a buddy system, someone to help them, or somebody to, if there answer is wrong then somebody can give them, there's another person available to say, "OK, that's wrong. Let's work it over." It causes them to build relationships. It helps to build relationships among students. (Principal, school 3)</i></p>
Collaboration	<p>Component team meetings, collaboration, goal-setting and planning together, etc. (NOT related to time - put time in SCH resources or DIST resources category).</p> <p>Expressions about teachers working together or teachers unwilling to work together belong here.</p>	<p><i>Today, just kind of getting together to say we're one team even though we teach different things, kind of doing a team building piece within our teach. (Principal, school 8)</i></p> <p><i>I like the fact that all the teachers are basically using an effective teaching strategy the same. That helps. I think it helps because when they collaborate they have a common language, they have a common model format of teaching that they are talking about. They can actually have discussions about what is working and what is not working for them. That may be working for one, but not for the other and they can collaborate that way and they just have that common way of teaching. It just opens up discussion. (Principal, school 2)</i></p>

## VITA

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